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Robotics, prosthetics, and orthotics – Towards a thesaurus

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Abstract

Medical translation has always required the use of specialised terminological resources, but it was not until the development of structures with robotic characteristics, that a specific resource for the sub-domains of robotics, prosthetics, and orthotics in the branches of biomedicine and bioengineering was needed. The few terminological resources available to the translator are often found included among other specialties and scattered around different resources, making the translator's task a considerably tedious one. In addition, controlling the terminology in this field is an inconceivable task, due to the increasing number of devices. This research aims to begin with the collection of specialised terminology used in robotics, prosthetics, and orthotics, as well as main characteristics, sources of information and other terminological resources. The terminology compiled has been analysed and organised into a bilingual thesaurus in the language pair English-Spanish following Montalt's (2014) "Medical Translation Step by Step", Claudet et al. (2002) "La traducción científico-técnica y la terminología en la sociedad de la información", Hurtado Albir (2001) "Traducción y Traductología. Introducción a la Traductología" and Wright (2012), "Scientific, Technical, and Medical Translation", among others. This thesaurus contains terminology from the field of robotics, prosthetics, and orthotics, and consists of 277 entries. It constitutes the basis for organised terminology in the mentioned field, it is effective to index and elaborate documents with controlled language, and it opens paths for further development.

Keywords: Translation; bioengineering; biomedicine; terminology; robotics; prosthetics; orthotics; thesaurus; bilingual thesaurus; online thesaurus.

Contents

1. Introduction

The art of translation has probably existed in some form or other ever since human beings felt the need to communicate with other groups of their own kind. (Montalt, 2007) Past and present translators would be required to communicate messages efficiently and accurately in different languages for receptors without this knowledge, in a way creating a metaphorical bridge between tongues. Therefore, professionals must demonstrate deep knowledge of at least two languages and several topics, as well as being capable of proficiently coordinating and combining two language systems. In medical translation specifically, it is recommended to learn about its history and, as Montalt mentions:

> Knowing about the different views on translating that have existed at given historical moments (…) can help us to understand our position in the professional world better, to be aware of different translation strategies and the functions translations have fulfilled at different stages, to be critical and analytical while considering alternatives, and to learn to justify our choices and argue in an informed way about them. (Montalt, 2007)

The translation of this science shares many features with other types of translation; it not only requires knowledge on the technological tools available such as online glossaries, forums, translation memories and CAT tools among others, but also and most importantly, the adaptation of cultural and local differences "to facilitate communication between different linguistic communities". (Montalt, 2007) To do so, a translator must be familiar with the specific and general terminology used in the topic of the document to be translated; in addition, the translator should be aware of the resources available to aid with the research process of particular or unknown terms. For decades, terminology has been an ever-growing topic of interest in the world of languages, especially for those who worked in areas related to medicine.

As one of the early sciences, medicine has branched out into several fields, consequently creating a whole new array of terms for each one, some of the most familiar objects of study include: psychiatry, neurology, gynaecology, general surgery, all of which require anatomical, histological, and clinical terms.

With the aim of presenting a glossary of terms in biomedical engineering, specifically in the branch of robotics, prosthetics, and orthotics, and a detailed analysis of the terms in both English and Spanish, it seemed paramount to begin with a mention to the history of medical translation and the development of robotics. This paper aspires to open a path for further development of new, or not so new, specialised terms that have not yet found their correspondent in other languages, with its main purpose being the beginning of the development of an accessible, opensource, user-friendly multilingual biomedical thesaurus for professional translators and users from other backgrounds. The first steps covered in the following pages have been based on the method of parallel text analysis, when possible, of scientific texts in English and Spanish, and single text analysis in both languages, guarantying this way the objectivity, precision, and equivalence of the list of terms.

The preliminary layout of this paper is based on the fact that despite the differences in the origin of most of the chosen terms, it is their literal translation or lack of equivalent that frequently hinders the translation process of medical written work.

2. Medical translation: a brief overview of its history

The presence and development of medical translation reaches all big civilisations from the past which had a system for the practice of medicine of their time, along with the continuum of medical knowledge, which stretches back into pre-historic times. (Montalt, 2007) Time and again, gathered medical knowledge was combined with other magical or superstitious ways of reasoning, due to their strong influence, the lack of better methods to carry out research, technical tooling, or further knowledge of all that medicine encompasses. The most remote references to written translation belong in the cities of Ancient Mesopotamia, where knowledge from several sciences was gathered, translated to various languages, and then stored. However, it is believed that verbal translations preceded all written works and was used mainly for trading and sharing of general knowledge. (Montalt, 2007)

With the foundation of Hippocrates' school of medicine in the 5th century BCE, the form of this pre-science limited by the shackles of magic and superstition, morphed into a somehow empiric matter with a philosophical background through the collection of data, such as symptoms of diseases and experimentation; what is more, the Hippocratic Oath set the ethical standards for the practice of medicine still known today. (Marketos, 1997) Based on this Hippocratic tradition, almost a century later, Galen became a prolific author and exponent of Greek medical knowledge; his work was translated into Arabic, which in turn, was translated into Latin in the 11th century with additional comments from new findings. During the period between the X to XIII centuries works by Aristotle (384-322 BCE), Archimedes (287-212 BCE), Pythagoras (569-475 BCE) and Hippocrates (460-337 BCE) were translated and commented upon by renowned physicians; the King Alphonse X of Castile and Leon introduced translations into Romance Castilian and vernacular European languages; even King Alfred the Great himself translated works from Latin into Anglo-Saxon. (Montalt, 2007)

In the Middle Ages, most medical knowledge was stored away in monastic libraries, only available to monks, who offered medical remedies to those in need. The passing down of medical knowledge through written and verbal translations did not cease then, as a matter of a fact, it strengthened through the development of theories about the preferred way in which translations had to be carried out. Montalt mentions how Cicero's defence of translating *non verbum de verbo, sed sensum exprimere de sensu* –not word for word, but sense for sense– generated further discussions throughout the centuries that continued up until now. Mainly during the Middle Ages, a literal way of translating took preference over Cicero's free approach, which was considered unacceptable especially for translations of the Bible, as God's words to humanity might be misinterpreted. (Montalt, 2007)

Latin continued to be the *lingua franca* during the Renaissance, although not for long, as through the following centuries, translations of vernacular languages began to rise in popularity with the "invention of printing in the fifteenth century, (…). Trade and artistic exchanges (…). The growing political importance of vernacular languages, symbolizing the rise of nation states (…). [And] translations of the Bible" (Montalt, 2007), all of which caused the slow disappearance of Latin and the raise of the new *lingua franca*: English. As Montalt points out, the existence of a *lingua franca* does not necessarily invalidate works written in any other language, on the contrary, it has increased the need for translation, for specialised bilingual journals and so on. In the past 200 years, through internationalisation, the first list of human anatomy terms was generated by unifying the knowledge gathered throughout history named *Nomina Anatomica*, which took place in 1895. (FIPAT, 2010).

From the nineteenth century onwards, the interest in laboratory practices began to increase amongst some doctors with a growing focus on the role of biology and medicine together, along with the "homogenization of the methods and techniques used to study fundamental life phenomena and those applied to the investigation of diseases" (Löwy, 2011). It was during the World War II period when the term "biomedicine" was first coined, as the socio-economic turmoil generated by the war accelerated the collaboration between men of several sciences (biologists, clinicians, industrialists, etc.) towards different aims. Quoting Löwy:

> The separation between pre- and post-World War II circumstances is not absolute: laboratory sciences were intertwined with clinical practices from the early twentieth century, while large-scale production and the testing of drugs started in the interwar era with the manufacture of vitamins, hormones, and sulfa compounds. Nor were the post-war transformations of medicine uniform. 'Science rich' disciplines such as haematology, endocrinology, and oncology rapidly became 'biomedicalized', while other medical specialties were slower in turning to the laboratory. (Löwy, 2011)

In the late twentieth century, an increased interest in biomedicine produced an abundance of studies carried out by scholars from a range of fields. Biomedicine was the science that combined biological and clinical investigations, "the new scientific approach to medicine based on an underlying set of ideas about health that has been called 'the biomedical model', [which] rests on some key assumptions about the human body, health and illness" (Russel, 2013). Amongst other features of the biomedical model, these four are highlighted by Lani Russel:

- The body as a machine – The perception of the human body as a machine of mechanical characteristics, brought to life in the nineteenth century, when early doctors were keen on carrying out dissections on human bodies to discover the 'mechanical' way in which the human anatomy works.

- Mind-body dualism – First discussed by the philosopher Descartes, who in trying to understand the relationship between mind and body, suggested that it was possible "to distinguish between a person's brain and their mind". However, the steppingstone for biomedicine to develop, was the idea that "the body is governed by physical laws but is also controlled by the mind".

- Discounting emotion – A new more distanced approach to knowledge was adopted, treating all patients as one. The objective of making the diagnosis prevail over any interference from the patient's opinions or ideas. Its focus remained on "understanding the workings of the body, governed by natural laws that do not differ across individuals".

- One single cause – With the changes in perspective in the field of medicine about the causes of illness and disease during the XIXth century, the "germ theory" was developed. This particular theory offered "an explanation which identified micro-organisms as the essential agent for particular infectious diseases (Russel, 2013).

However, this model did not go uncriticised, in fact, it was the target of increasing criticism after its peak in the late twentieth century, which challenged the more recent biomedicine to change its conceptions of health, illness and health care practice. (Wade and Halligan, 2004 in Russel, 2013).

As for the essence of medical translation, it is by nature specialised and highly technical, it requires from the translator deep knowledge of one or more language pairs, translation memories, specialised dictionaries and being acquainted with the medical topic to be translated. Often, the professional will need to be aware of the slight differences in the way procedures, diseases and so on are talked about in the target language's culture or the locale, including preferred phraseology by the professionals in medicine.

Quoting Montalt (2007): “factual comprehension is a key element in any translation process (…) the medical translator’s priority is to deal adequately with factual complexity and accuracy”. The act of translating often involves details that are determined by the nature of the assignment. However, it is “a professional activity that requires a level of adaptation of cultural differences and use of technological tools such as translation memories or dictionaries” (Montalt, 2007), regardless of, whether it is a legal, literary, or medical translation. As it happens, the main purpose of translation remains the same in all its forms: “communicating beyond the borders imposed by the diversity of languages and their terms” (Sager, in Alcina y Gamero, 2002). Medical translation is no exception to this rule, its aim is to communicate the knowledge that has been generated on the matter throughout years of research and make it available to scholars who speak different languages and to the public in general. To make this task somewhat easier, medical translation, as medicine itself, is divided in various specialities. However, when translating medical texts, knowledge from other disciplines such as anthropology, psychology, and sociology to name a few, must be considered, as sciences do not exist in isolation. Montalt (2007) offers a list of medical specialities that exemplify the intricacy of the accumulated knowledge:

- Internal Medicine: the diagnosis and treatment of cancer, infections and diseases affecting the heart, blood, kidneys, joints, and digestive, respiratory, and vascular systems; disease prevention, substance abuse, and treatment of problems of eyes, ears, skin, nervous system, and reproductive organs.

- Obstetrics and Gynaecology: the medical and surgical care of the female reproductive system and associated disorders.

- Pharmacology: drug composition; mechanisms of drug action; therapeutic use of drugs.

- Orthopaedics: preservation, investigation, and restoration of the form and function of the extremities, spine, and associated structures; musculoskeletal problems including congenital deformities, trauma, infections, tumours, metabolic disturbances of the musculoskeletal system, deformities, injuries and degenerative diseases of the spine, hands, feet, knee, hip, shoulder, and elbow.

- Paediatrics: diagnosis and treatment of infections, injuries, genetic defects, malignancies, and many types of organic disease and dysfunction in children.

- Psychiatry: prevention, diagnosis, and treatment of mental, addictive, and emotional disorders such as schizophrenia and other psychotic disorders, mood, anxiety, substance-related, sexual and gender identity, and adjustment disorders.

- Surgery: preoperative, operative, and postoperative care for a broad spectrum of surgical conditions affecting almost any part of the body.

The above list, as Montalt (2007) mentions, is incomplete and could be extended further if terminology is considered.

2.1 Terminology and other units of specialised knowledge

We create medical terms by means of linguistic procedures in specific historical and cultural conditions. (Montalt, 2007)

Terminology

The basis for the scientific methods of modern European medicine along with its terminology has its origins in ancient civilisations; from Greek and Latin we have inherited the basic combining forms that constitute the core of scientific medical terminology in any language (Montalt, 2007) and, despite the passing of time, it is still possible to observe how the roots of these terms are present in words such as *Polysaccharide* from *Polys* (many) and *Saccharum* (sugar).[1] Centuries ago, the need of terminalizing medical knowledge arose as the knowledge on health and illness, and development on medical tools increased. Many, if not all of these new inventions and discoveries required specific words to refer to them, as a result a vast number of Greek and Latin terms were created and are still in use.

Medical writings are generally standardized in language and concentrated on highly technical terms. (Montalt, 2018) Hence, the need for new terminology arises when an item, body part, animal or any other type of entity has not yet had a name or there has not yet been a need to refer to it particularly; for example, every year new insects are discovered, most of which pertain to a family of insects, but have not had a name assigned to them; in 2021 Potamophylax Coronavirus was found by a team of researchers led by Professor Halil Ibrahimi of the University of Prishtina and named after the

[1] A brief list of scientific terms and their etymology can be found in the article "Etimología y origen de algunos términos científicos" from the Universitat de València.

Coronavirus pandemic as this new species had been described during thee pandemic.[2] (Ibrahimi, 2021) Despite this fact not being related to terminology in medicine, the process followed by researchers to find a noun so that they could refer this recently discovered insect, is somehow similar to the one followed by researchers in the field of medicine. As research advances in all fields and *new* or yet undiscovered entities come to the attention of scientists, the need arises for this knowledge to be conceptualised and transmitted, as:

> Things out there or inside us have not always had a name. In fact, many of them still don't have names either because we don't know they exist yet or because so far, the need to refer to them has not arisen. As we discover or invent them. We attach names to them. And we do it by means of the resources of our language. (Montalt, 2007)

Nevertheless, new terms are not generated randomly, there are several methods of terminologisation and construction of medical terms, most of which are the smallest units with meaning, such as polymorphemics with a root morpheme and prefixes, suffixes, or infixes. For example: dermat<u>itis</u>, <u>mega</u>bladder, <u>hepa</u>toma, bacterio<u>stasis</u>, <u>pneumo</u>therapy and ep<u>i</u>demic. On the other hand, one of the most common and productive ways is nominalisation, as pointed out by Montalt (2007) and Halliday (1994), who believed that nominalization became a significant feature in scientific writing:

> Thus, the device of nominalizing, far from being an arbitrary or ritualistic feature, is an essential resource for constructing scientific discourse. We see it emerging in the language of this period, when foundations of an effective register for codifying, transmitting, and extending the 'new learning' are rapidly being laid down.

[2] The article for this research can be found in the Biodiversity Data Journal, under the name Potamophylax coronavirus sp. n. (Trichoptera: Limnephilidae), a new species from Bjeshkët e Nemuna National Park in the Republic of Kosovo, with molecular and ecological notes. Article

In nominalisation, verb phrases, more often than adjectival phrases, are made into noun phrases, transforming the experience into a meaning. Most grammars allow this type of transformations by imposing categories on the perceptions of phenomena, which in Montalt's words, allows for the distillation of scientific meaning and creation of taxonomies of objects and processes; meaning, that a term will come to life through the combination of a concept, or a categorised meaning, and a denomination, which is the external linguistic form in any language.

"Scientific disciplines are a well organised corpora of concepts based on hierarchical classifications [which] are ordered according to general criteria and grouped into categories with common characteristics" (Montalt, 2007); in a parallel way, research in medicine and biomedicine is also divided in specialities; these subareas of study are conceptualised from various perspectives and include many new terms for the same concept in almost each subarea and register, which limits the possibilities to cross reference information from articles and other works. In fact, a single concept originated in the domain of biomedicine may have not only several synonyms that rise in different areas of use, but also acronyms; this sometimes can be due to commercial reasons, others due to social and scientific development. Often, acronyms become ambiguous and specific to the works they were used on, because they coincide with many others with the same letters. (Marrero et al., 2010)

The table below shows the transformation of the term and acronym HIV for Human Immunodeficiency Virus has gone through since it was first brought up to the attention of scientists.

YEAR	**ENGLISH**	**SPANISH**	**LINKS**
1992-	HIV-1/HIV-2	VIH-1/VIH-2	Origins of HIV and the AIDS Pandemic
1986-1992	Human Immunodeficiency Virus (HIV)	Virus de Inmunodeficiencia Humana (VIH)	HIV
1984-1986	Human T-cell leukaemia-lymphoma virus (HTLV/LAV)/Human T-lymphotropic virus	Virus linfotrópico de células T Humanas (HTLV-1)	HTLV - JNNP
1983	4H Disease – Scarlet H *Gay Related Immune Deficiency (GRID); Community-acquired immunodeficiency (CAID); acquired community immunodeficiency syndrome (ACIDS)*[3]	Enfermedad de las cuatro haches *Inmunodeficiencia asociada a la homosexualidad**	4 H Disease/Scarlet H SIDA - 4 Haches
1979-1982	Immunologic Deficiency Syndrome/Acquired Immuno-deficiency Syndrome (AIDS)	Síndrome de Inmuno Deficiencia Adquirida (SIDA)	AIDS

Table 1. Based on the example provided by Marrero et al. (2010).

[3] These terms were used mainly by the news industry when the virus made its first appearance in the American society and before the Centers for Disease Control and Prevention (CDC) coined it AIDS. (M. Sharp, Paul and H. Hahn, Beatrice, 2011. Origins of HIV and the AIDS Pandemic)

A comparable case, is the one of the pharmaceutical product commonly known as *Paracetamol*, Marrero et al. (2010) have illustrated its many forms in the Spanish setting and includes some international versions:

> Un producto farmacéutico como el paracetamol se conoce también con las denominaciones de DCI o acetaminofén. Su sinónimo en la nomenclatura Iupac (International Union of Pure and Applied Chemistry) es N-(4-hidroxifenil)etanamida, que es equivalente a la fórmula química C8 H9 NO2 , y que se representa con el código NO2 BE01 de la ATC (Anatomical, therapeutic, chemical classification system de la OMS). Además, su nombre comercial varía de un país a otro: en Estados Unidos es conocido con el nombre de *Tylenol* o *Datril*, en Inglaterra como *Tylex CD* o *Panadeine*, en España *Panadol*, *Termalgin*, *Efferalgan*, *Gelocatil* o *Apiretal*, y en Méjico *Tempra*.

In the same way the word *Paracetamol* is affected by the polysemy, so are the common nouns used to describe some of the symptoms that are treated with it, such as *common cold, head cold, bug, virus* or in Spanish, *resfriado, catarro* or *constipado*.

Due to its roots, terminology has been linked to the development of knowledge and structure of societies since its beginning; Sager (Chapter 1 in Alcina Caudet and Gamero Pérez, 2002), in line with Montalt's thoughts, explains how a word will only become a term, when it turns into being recognisable and acceptable to the organised society that has assigned a particular meaning to a task or, for example, a specific tool used only during that task; meaning that a term determined by a society may differ in form and, on some occasions meaning, to the one in another society; often it could be used in other fields, and almost always share cultural, cognitive, or ontological links (e. g. *Paracetamol*: *Tylenol* or *Datril* (USA); *Tylex CD* or *Panadeine* (UK); *Panadol, Termalgin, Efferalgan, Gelocatil* or *Apiretal* (ES) and *Tempra* (MEX). (Marrero et al., 2010)

Medical terminology changes in across cultures or languages and time, however, by standardising medical terminology, a certain level of consistency could be achieved and, language analysis tools could be utilised. However, biomedical terminology lacks patterns that would make the automated identification of terms almost effortless, despite of the fact that most times the terms are only variations of the original that have been through one of the four types of elementary term variation: coordination, permutation, modification/substitution, and elision (e. g. IDDM1 and IDDM2 for insulin). (Jacquemin et al., 2003) Montalt distinguishes between two standardisation practices that would improve the management of the ever-growing number of medical terms and would overcome the difficulties Marrero et. al mention in their work: standardisation of terminologies and, standardisation of terminological principles and methods. Through these processes, the basic principles, requirements, and methods concerning terminology and other language resources could be organised into categories that would work across the several branches of medicine.

Other units of specialised knowledge

The units of specialised knowledge (USK) include specialised terminology, mentioned above, abbreviations, nomenclatures, symbols and set phrases, that consist of a concept and a denomination. (Montalt, 2007) As part of the standardised terminologies, nomenclatures and classifications are developed by organisations, so that writings and translations are carefully controlled. Nomenclatures are lists of terms or the rules to form them, based on taxonomies, that have been agreed on by a community of experts of a particular discipline, linked according to norms that determine their relationship with meaning and organised semantically. The scientific need for standard and internationally accepted systems for naming objects or live entities has generated many formal nomenclatural systems, the best examples being the biological nomenclature.

“Nomenclatures avoid synonymy, homonymy, polysemy, ambiguity and eponymy”, making them precise to communicate and easy to retrieve through information retrieval systems. Being familiar with nomenclatures closely related to biomedical specialities and following them is indispensable for medical translators, since it is the way to achieve the standardisation throughout scientific texts mentioned before. There are several systematised nomenclatures available, such as: the World Health Organization classification, “the international standard diagnostic classification for all general epidemiological and health management purposes”; the Internal Classification of Diseases or the Systematized Nomenclature of Medicine. (Montalt, 2007)

The other units of specialised knowledge are abbreviations or acronyms, which have been briefly talked about when quoting Marrero et. al. These units are of special interest for the translator, as they are often specific to the source text, but may not have equivalents on the target text. Some examples found during the analysis of academic articles about robotics in biomedicine are:

Examples of abbreviations with equivalents on the target language:

EN	MEANING	ES	SIGNIFICADO
ANN	Artificial Neural Network	RNA	Red Neuronal Artificial
BME	BIOMEDICAL ENGINEERING	IBM	INGENIERÍA BIOMÉDICA
DNI	DIRECT NEURAL INTERFACE	IND	INTERFAZ NEURONAL DIRECTA
MMI	MACHINE-MIND INTERFACE	ICC/ICO	INTERFAZ CEREBRO COMPUTADORA/INTERFAZ CEREBRO ORDENADOR

Examples of abbreviations without equivalents on the target language:

BIOROB	BIOMEDICAL ROBOTICS AND BIOMECATRONICS
EEGS	ELECTROENCEPHALOGRAPH SIGNALS
EMGDR	ELECTROMYOGRAPHY DRIVEN ROBOT
HCI	HUMAN-CENTERED COMPUPTING (THEORY, CONCEPTS AND MODELS)

Table 2. Example list of abbreviations

3. Robotics in biomedical engineering: the beginning of a new approach to medicine

The fast-paced nature of biomedicine combined with the contemporary character of the Robotics branch have proposed a challenge to many translators and professionals of other fields. The technological development with its innovative terminology has remained in many cases untranslated from the *lingua franca*, as other languages have been unable to advance at the same pace, leaving as a result, countless words in need of equivalents in target languages. However, before getting into the specifics of terminology in robotics, and rephrasing Montalt's words, knowing about the history can help us understand the world better.

Robotic surgery is nowadays one of the most advanced yet minimally invasive forms of surgery, and even though its development started about 40 years ago, the earliest work in automation and robotics can be traced back to 400 BC. In History of robotic surgery (2010), Kalan et al. point out that some of the earliest pioneers included Archytas of Arentum, Leonardo da Vinci, Gianello Toriano, and Pierre Jaquet-Droz, and it is thanks to them that nowadays minimal invasion surgery can be offered to the ones in need of it.

Although scientists carried on research on automated machines, in the early twentieth century robots were not yet a part of life or even popular science fiction, and this would not be a review of the history of robotic surgery if it did not start with a literary foray into the world of the Czech playwright Karel Čapek. The term "robot" was first brought to life in his play "Rossumovi Univerzální Roboti" (R.U.R – Rossum's Universal Robots).

About the term itself, it derives from the Czech *robota* /ˈrɔbɔta/[4], which describes hard work or forced labour. The verb quickly developed into the term "robot" and adopted a different meaning to reflect the repetitive tasks that machines would undertake. The play begins with the robots carrying out mundane tasks for their human masters, and then revolting against them to take control of their own lives. Even though currently robots are used for repetitive and pre-programmed procedures that require very high precision, it has not been until recently that they have been introduced to the medical sector to enhance the delivery of care. (Lane, 2018)

The transition from science fiction to reality occurred precisely in 1961, when the Unimate was introduced by General Motors to assist in automobile production, proving this way the positive aspects and all the advantages of the presence of robots to aid humans. Robots have since then been used in a variety of applications and forms, they can be characterised as automated arms, mobile devices or even mills. In the field of medicine, there are currently three main types of robotic systems: active, semi-active and master-slave systems. *Active* systems are "totally programmable and carry out tasks independently" (Hockstein, Going, Faust and Terris, 2006) that essentially can work autonomously and undertake pre-programmable tasks, while remaining under the control of the operative surgeon; some examples of active systems include the PROBOT and ROBODOC platforms. (Lane, 2018) With regards to *semi-active* systems, these "translate movements form a surgeon's hands into powered or unpowered movements of the robot end-effector arms" (Hockstein, Going, Faust and Terris, 2006), allowing for a surgeon-driven element to complement the pre-programmed element of these systems.

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[4] From Proto-Slavic **orbota* (hard work, slavery) derived from **orbъ* (slave), ultimately from Proto-Indo-European **h₃erbʰ* (to change or evolve status), the predecessor to **h₃órbʰos* (orphan, slave). Cognate with German Arbeit and Dutch arbeid. (Этимологический словарь русского языка, Словари онлайн 2010-2021)

Master-slave systems on the other hand, lack any pre-programmed or autonomous elements and rely entirely on the surgeon's activity; some examples would be the da Vinci and ZEUS platforms. (Lane, 2018) All along their aim has remained the same as in the beginning: duplicating or improving upon human function or serving in roles to hazardous for human direct work. (Hockstein, Going, Faust and Terris, 2006)

The first robots to be used in live surgical applications did not function with real-time operator input, instead, they were pre-programmed to carry out specific tasks. As an example, around 40 years ago in 1985, the first surgical application using industrial technology took place when an industrial robotic arm was modified to perform a stereotactic brain biopsy with 0.05 mm accuracy, which then would serve as the prototype for Neuromate. Almost ten years later, ROBODOC was introduced in hip replacement surgery, in 1992. Since then, similar devices have been designed and tested, but it is the concept of telerobotics that researchers have been focused on in the past two decades, due to its benefits in several fields, from surveying space to treating patients on the battlefield. With the collaboration of Scott Fisher and Joe Rosen, this technology was introduced into the burgeoning field of laparoscopic surgery with the goal of allowing a trained surgeon to treat wounded soldiers from safety. (Hockstein, Going, Faust and Terris, 2006) Direct founding was provided to Computer Motion to develop the AESOP robotic platform (Automated Endoscopic System for Optimal Positioning), a system that enabled surgeons to voice control the positioning of a laparoscopic camera system. (Lane, 2018) In 1995, with AESOP serving as the inspiration and groundwork for future surgical robot devices, Intuitive Surgical released the SRI Green Telepresence system, which later underwent a radical overhaul before morphing into an early version of the current da Vinci surgical system. The da Vinci was used to perform a laparoscopic cholecystectomy. "The two rival systems went on to dominate the field of robotic surgery for a decade, pushing back frontiers of minimally invasive surgery". (Lane, 2018)

During the development of the mentioned robots, many benefits were found while using them, quoting Kypson in Hockstein, Going, Faust and Terris, 2006: "Clinical data measures document equal or improved surgical outcomes with improved post-operative function, decreased blood loss, shorter hospital stays, and a favourable learning curve for newly trained robotic surgeons."

More recently, in the biomedical domain, the continuing technological developments brought AI (Artificial Intelligence) to life, which in exchange has played an important role in clinical decision support in pre-operative planning, intra-operative guidance and has increased the level of robotic autonomy making them more versatile and lighter. AI has just started to transform modern surgery towards more precise and autonomous interventions. These advances have already significantly impacted the management of both acute and chronic diseases, prolonging life, and continuously extending the boundary of survival (Zhou et al., 2019).

The impact of the fast-paced development in this domain has reached the area of translation, meaning that there has also been an increase in the volume of content produced by experts to be shared with the community in various languages and especially in the *lingua franca* that is English. Biomedical translation, including the area of robotics, is a highly specialised type of translation, distinguishing itself from the more general translation by its reliance on terminology. The abundant number of new terms generated as a result of new findings and development in the area of biomedicine, as well as those from medicine itself, means that some of those new terms may already have translations to Spanish, as it will be shown the following pages in this paper, including a brief analysis of the gathered corpus and the development of a small-scale bilingual thesaurus.

4. Methodology: design and corpus compilation

The rise in academic papers, scientific magazines and so forth, along with the pressing need to translate them, have turned biomedical literature into an increasingly more interesting topic in the information retrieval (IR) field, which propelled the development of text management techniques with the aim of improving the browsers of monitored terminology. (Marrero et al., 2010).

In the past decade, following the goal of standardisation mentioned by Montalt, countless new parallel corpora and information retrieval engines covering a large number of language pairs and document types have been made available to the researchers, translators, and scientists in the field of biomedicine. The researchers in WMT Biomedical Translation Task 2019 and the ones in the article of "The MeSpEN Resource for English-Spanish Medical Machine Translation and Terminologies: Census of Parallel Corpora, Glossaries and Term Translations" (Villegas, et al., 2018) have gathered some examples of such corpora, which has been combined below with those from "Sistemas de recuperación de información adaptados al dominio biomédico" (Marrero et al., 2010) and "Recursos terminológicos en biomedicina. Tratando la terminología con criterio" (Berruezo, 2013).

CORPORA OR ENGINE	MAIN CHARACTERISTICS	FIELD	CONTENT
EMEA – EMEA	Collection of biomedical documents retrieved from the European Medicines Agency (EMEA) from which the corpus was generated through automation. (Villegas, et al., 2018)	Biomedicine	26.51 million sentences fragments in 22 languages.
PubMed (Medline) – MeSH - NCBI	NLM Controlled vocabulary thesaurus used for indexing articles for PubMed.	Medicine	Daily increasing number.
Textpresso – TextPresso	Based on terminological dictionaries and automated processes developed through the *Caernohabditis Elegans* corpus. Includes lists of synonyms. (Marrero et al., 2010)	Biology and biomedicine.	50647 full-text papers in corpus.
UMLS (Unified medical language system) – UMLS	Uses several other resources to generate an extensive ontology. Requires a licence. Marrero et al., 2010	Biomedicine and general medicine.	Over 1 million terms.
Khresmoi – Khresmoi	Multimodal search and access system for biomedical information, knowledge bases, 2D and 3D images and documents, developed through automated IR systems.	Biomedicine and general medicine.	Over 1 hundred thousand new entries per day
UFAL Medical Corpus v1.0 – UFAL	A collection of parallel corpora assembled during the projects KConnect, Khresmoi and HimL aiming at more reliable machine translation of medical texts. (Villegas, et al., 2018)	Medicine	Over 9 million terms for the ES-EN combination.
COPPA – PATENTSCOPE (wipo.int)	Database that provides access to international Patent Cooperation Treaty (PTC) applications in full text format, as well as patent documents of participating national and regional patent offices.	Science	97 million patent documents including 4.1 million published international patent applications
Shared Task – Biomedical Translation Task (WMT) – Shared Task WMT	Project that aims to evaluate systems on the translation documents from the biomedical domain. (Villegas, et al. 2018)	Biomedicine	Increasing number and language pair combination yearly.

Table 3. Based on the example provided by Marrero et al. (2010) and Berruezo (2013).

Following the example set by the models above, among the techniques utilised to gather the vast number of terms into organised corpora, Natural Language Processing (NLP) tasks applied to the Information Retrieval (IR) processes are the ones this dissertation will be focusing on, nevertheless, other techniques applied in the biomedical setting will be briefly mentioned.

Natural Language Processing (NLP) - Information Retrieval Systems (IR)

NPL tasks are applied often to Information Retrieval systems to analyse texts, search words in content and grammar-tagging. IR systems are therefore not only used in the field of medicine or for terminology, but in fact, the most common form of IR is a web browser, which essentially collects and shows the data relevant to the user's query. A schematic of the functions followed by IR systems by Roshdi and Roohparvar (2015) is displayed below:

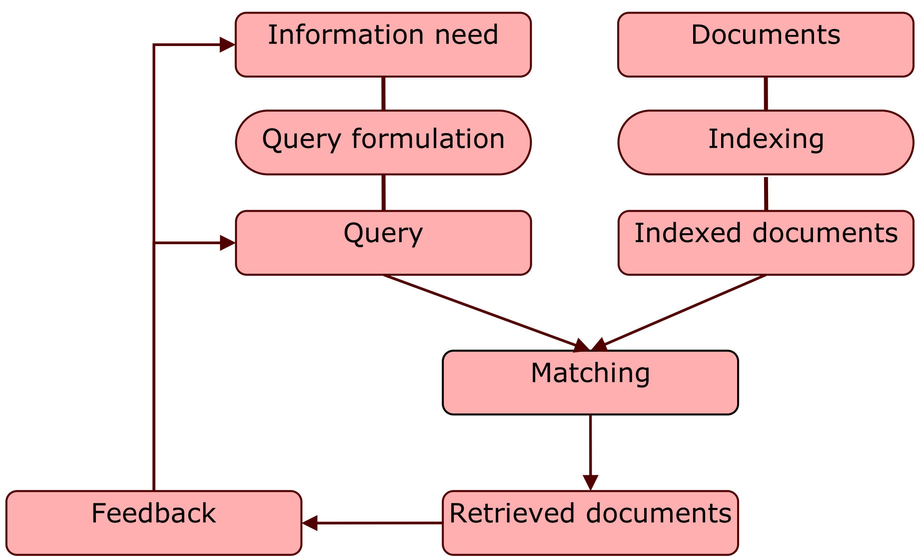

Figure 1. Information retrieval processes from Roshdi and Roohparvar (2013).

Following the above, "[IR] is the field concerned with the acquisition, organisation, and searching of predominantly knowledge-based information" (Hersh, 2021) –texts, images, or sounds–, unless programmed differently.

These systems focus on the structure, analysis, organisation, storage, searching and dissemination of information, and are designed to make a given stored collection of information items available to the user. They are mainly used to reduce the amount of information related to a topic through the ranking of documents by their estimation of the information value in the document for the user's query. There are several models of IR, developed depending on the needs of its user, however, Singhal (2001) highlights three of the most commonly used ones in IR research:

- Vector Space Model: the text is represented by a vector of terms. The definition of a term is not inherent in the model, but terms are typically words and phrases. If words are chosen as terms, then every word in the vocabulary becomes an independent dimension in a very high dimensional vector space. (…) If a term belongs to a text, it gets a non-zero value in the text-vector along the dimension corresponding to the term. Since any text contains a limited set of terms, most text vectors are very sparse. Most vector-based systems operate in the positive quadrant of the vector space, meaning, no term is assigned a negative value.

- Probabilistic Model: This family of IR models is based on the general principle that documents in a collection should be ranked by decreasing probability of their relevance to a query. Since true probabilities are not available to an IR system, probabilistic IR models estimate the probability of relevance of documents for a query.

- Inference Network Model: Document retrieval is modelled as an inference process in an inference network. (…) A document instantiates a term with a certain strength, and the credit from multiple terms is accumulated given a query to compute the equivalent of a numeric score for the document. From an operational perspective, the strength of instantiation of a term for a document can be considered as the weight of the term in the document, and document ranking in the simplest form of this model becomes similar to ranking in the vector space model and the probabilistic models.

In the biomedical setting, although the IR in medicine has been traditionally focused on the retrieval of text resources from the medical literature, in the present day, the types of information that can be searched include images, videos, chemical structures, protein sequences, pharmaceutical drugs, genes and a wide range of other digital material relevant to medical research, education and patient care. With the exponential growth of online content available, IR models are proliferating to cover the needs of all users. Marrero et al. (2010) mention how NPL processes in IR have been modified to suit the needs in biomedicine with the aim of finding the most effective tools to identify specific terms in texts; one of these is the grammar- and semantic-tagger *Genia*, which has been trained on both press and biomedical corpus. Despite the popularity of such tools, and as it happens in many other fields, using programmes and methods, however useful, does not come without complications. With the aim of avoiding issues with the terminological data bases, glossaries, thesaurus, and ontologies are generated. Nevertheless, on some occasions, the IR processes find complications when facing polyhierarchical terms or terms with more than one meaning.

Other methods

There are many other methods available to researchers to ease the collection of terms and analysis of content that are worth a brief mention within the limits of this paper.

Classification Tools

The classification tool that is based on the extraction of information applied by *BioNER* in the *Genoma humano* macroproject quoted by Marrero et al. (2010) has been increasingly utilised in the biomedical setting, as it contains the names of genes and genetic material. Through automated text analysis techniques and automated systems that learned from supervised corpus, has proved to be precise when more recent terminology was not involved.

Semi-supervised models

These types of models have been in use for the past three decades, the *bootstrapping* test has a very simple beginning, it uses a random sampling with replacement, they are based on the ongoing automated learning of lexical and syntactical patterns of the terms and context. On the other hand, in the *active learning* model, the system provides the user with data to be tagged so that they can be used as new learning rules and to detect relations between words or phrases. (Marrero et al. 2010)

4.1 Design

As for the present dissertation, in a much more modest scale, an attempt to start a corpus specific to robotics in biomedicine has been made following the patterns suggested by Marrero et al. (2011) and Montalt (2007). However, due to lack of knowledge on programming and time constraints, it has not been possible to apply NPL tools such as the IR mentioned above for the text analysis.

For the selection of texts belonging in the field of robotics in biomedicine, IR based browsers such as Google Scholar, Medline, NCBI and some of the resources mentioned by Montalt (2007) in the "6.2 Starting up your own medical translation library" have been used. Furthermore, L'Homme's criteria for identifying specialised lexical units or ULE (2004) was followed, along with the aspects of methodologies used in the different projects mentioned above. The author, L'Homme, identifies the specialised lexical units of a field based on the terms surrounding it, in other words, "le terminographe procède à une délimitation du domaine de spécialité dont il compte décrire les termes avant de commencer le repérage et la collecte de données." (L'Homme, 2004).

Unlike at the very beginning of the process of writing this paper, when a lack of text selection criteria produced a mix of scientific texts that belonged to various fields, applying L'Homme's criteria made the selection of the corpus texts far more controlled. By analysing the ULE of the title, abstract and introduction, it was determined whether the combination of these three sections from a particular text matched others belonging to the field of robotics, when that was the case, it was included as part of the corpus, making it possible to constitute the combination of texts from which the candidates to terms were extracted.

Bearing in mind the object of this study, special attention was paid to instrumental articles that would help to create a specialised bilingual database of the technical terms derived from the language used in the field of robotics in biomedicine, both in Spanish and English. To gather the corpus texts, as mentioned before, the criteria brought by L'Homme was followed, however, for the corpus of terms, a different approach, also used in "Metodología para la extracción e identificación de candidatos a términos en el ámbito de la bioquímica" by Françoise Olmo Cazevieille and Coral López Mateo, was considered and applied, along with other aspects that will be mentioned in the following lines.

The objective of this research was to gather a number of scientific articles specialised in robotics or robotic prostheses and analyse the terminology used in them. To be able to do that, it was imperative to recognise which words were actually part of the specific terminology. In Preliminary Recommendations on Text Typology (1996), Sinclair distinguishes between two linguistic criteria: internal and external. The internal criteria focus on linguistic aspects, such as grammar, word order in the phrase or lexis. On the other hand, external criteria analyse sociocultural contexts and the communicative behaviour of the text.

Although Sinclair's method is perfectly viable, to reach the goal of this paper it was deemed necessary to include further specific external criteria to complement Sinclair's, also used by Olmo Cazevieille and López Mateo in the above-mentioned study. These further set of rules composed of the quantity or number of times a specific word or set of words was utilised, the quality of the content of the texts, the language and whether it was technical, as well as the form of the text, which in this case is scientific with technical language.

Among the article inclusion criteria, the below rules were set:

- Type of study: the articles to be used in this research would only be specialised in medical robotics and prostheses.

- Languages: only articles in English and Spanish would be accepted.

- Publication: articles from earlier than 2010 would not be accepted, so that the information extracted for this research would be as up to date as possible.

A total of 40 integral texts of different length, from various authors and published in the period between 2010 and 2021 were collected. The above-mentioned criteria allowed for a delimited field of study, that contemplates external and internal criteria, lexical one specifically.

Following the nature of this paper, several alternatives, along with the criteria already mentioned, were considered to carry out the selection of terms. A combination of automated and manual options seemed to produce the best results, dividing the workload in two parts, one dedicated to the extraction of possible terms with the WordSmith Tool 8.0 and the second part dedicated to the analysis and selection of terms.

WordSmith

WordSmith is a free Windows software used mainly by scholars in the field of corpus linguistics (Alcina Caudet y Gamero Pérez, 2002). The tool gathers a collection of modules that search for patterns in texts, making it possible to generate lists from several texts simultaneously and in various languages. To provide a brief explanation, this software allows its user to carry out searches based on the concordance of words or sentences between texts, to generate lists of key words or complete lists of all the words in the text. (Alcina Caudet y Gamero Pérez, 2002)

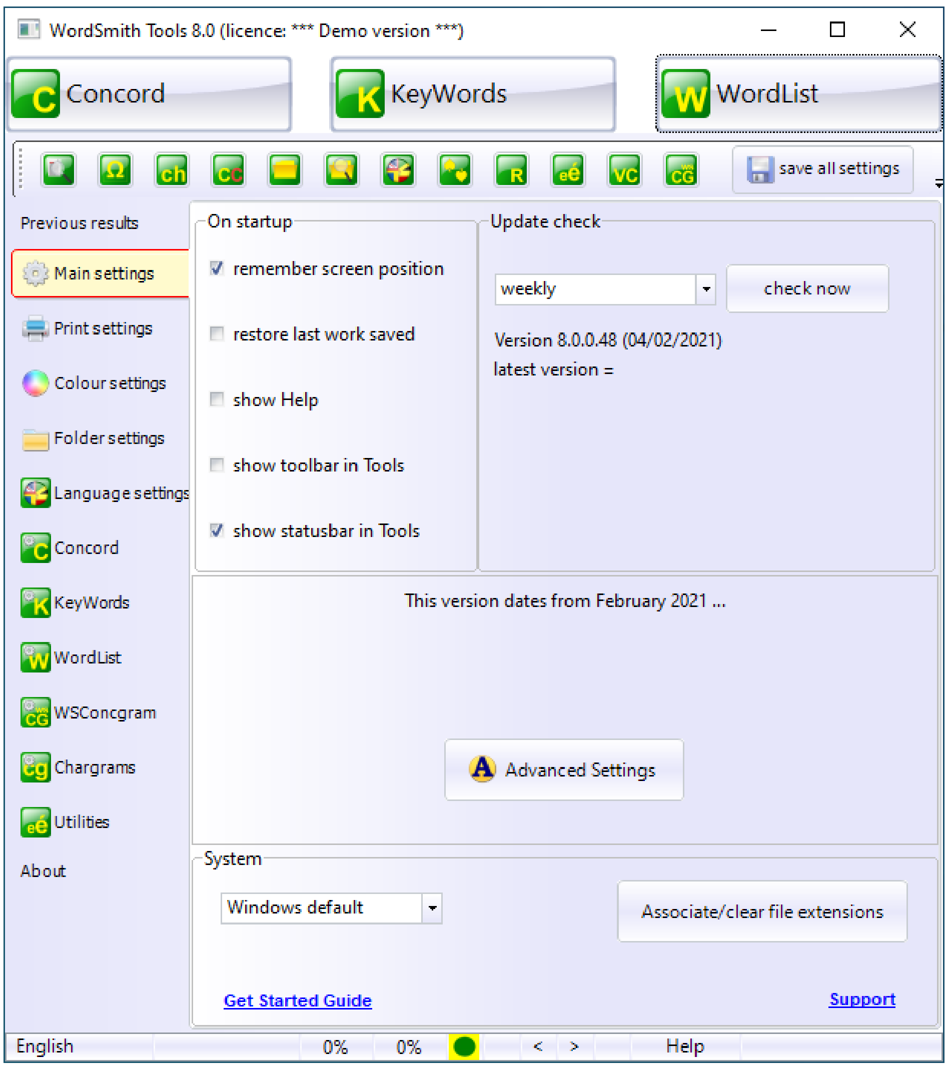

Figure 2. WordSmith Tools 8.0.

Once having decided the system to be followed, it was time to filter through the many articles and make the relevant selections. To be able to analyse them in the WordSmith Tool, they were converted into .txt format. In the WordList window, it was possible to select all the texts or specific ones to create lists from. As it can be observed in the image, it was also possible to generate batches of wordlists selecting several articles at the same time; however, this did not produce the desired results.

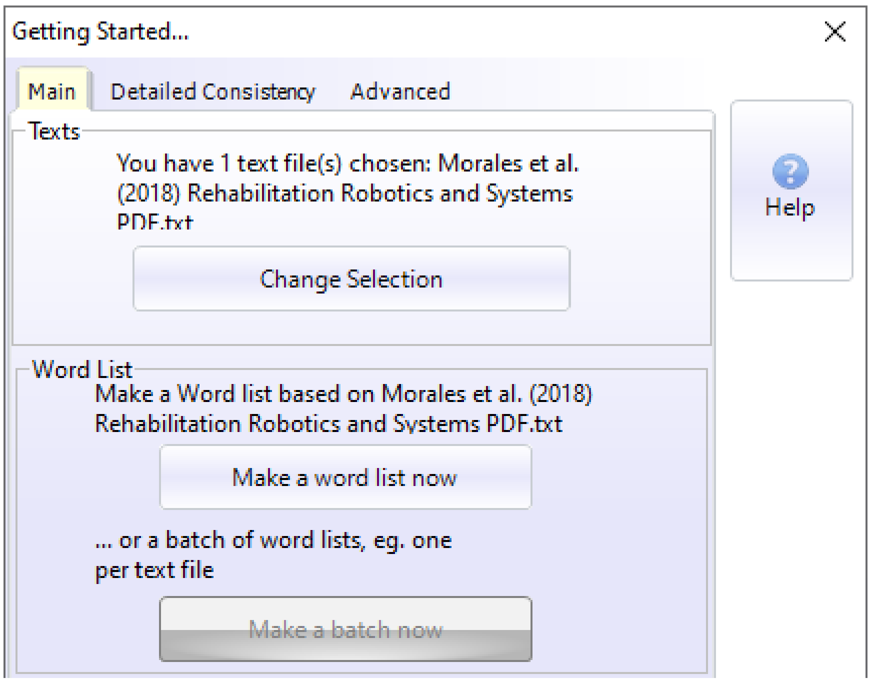

Figure 3. WordList page in WordSmith Tools 8.0.

After the list was generated, a new window would open showing the list of words alphabetically organised, the frequency of use in the text and statistics. Some of the information was not necessary for this research and was discarded. Commonly used conjunctions, verbs or prepositions seen in the image below could be deleted, leaving a reduced list from which to extract possible terms.

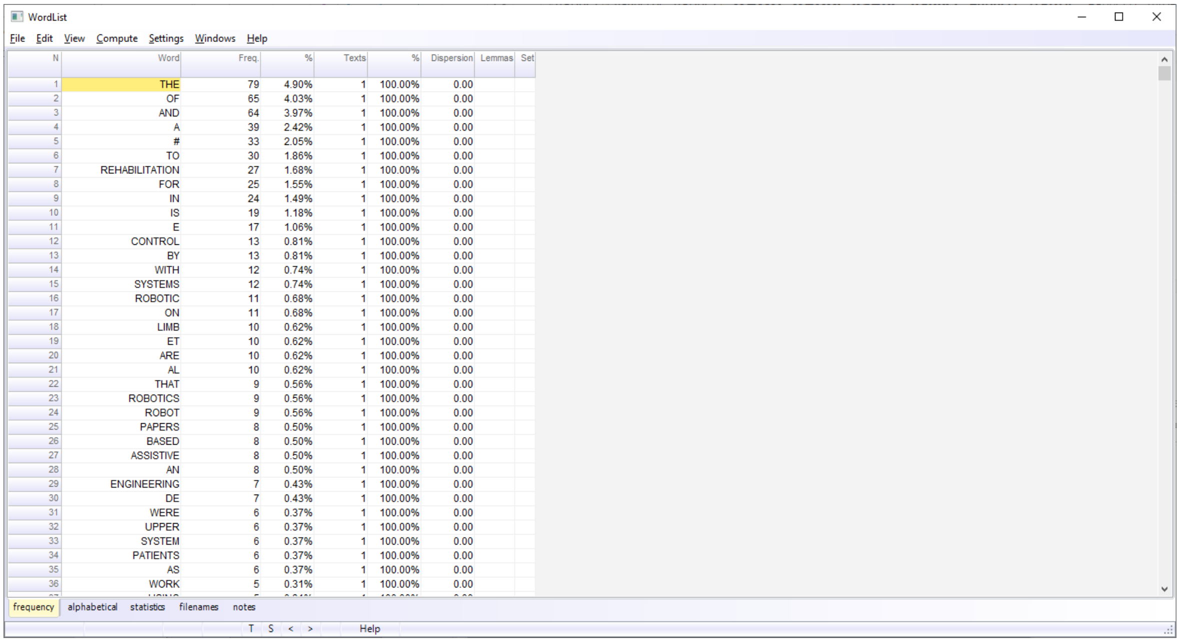

Figure 4. List of words in WordList from WordSmith Tools 8.0.

To better analyse the lists, they were all exported to Excel spreadsheets, and later on combined. The image below shows the unaltered version of the word list above in Excel.

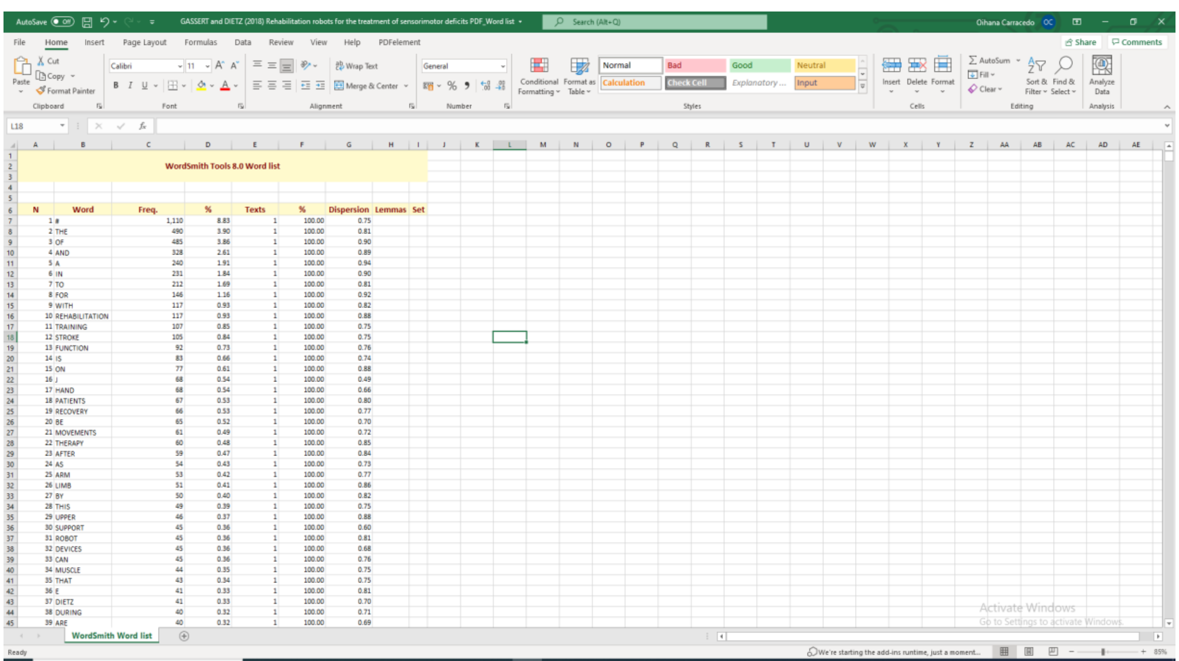

Figure 5. List of words from WordList into Microsoft Excel.

Despite the quality of the lists produced automatically, it required considerable amount of time to separate between terms or specialist vocabulary and semi-technical, sub-technical and context-independent academic words that occur with high frequency across disciplines (Jordan, 1997 in Mićić, 2012), fact attributable to the transmutable nature of words, which may adopt specific meanings in specific fields, one or more general meanings or have an extended meaning in specific fields (Trimble, 1985 in Mićić, 2012). As a result, on some occasions it became necessary to combine both automatic and manual approaches, to observe the slight differences in the use of the same words in different settings ('articulation' referring to both human articulation and robotic, meaning actuator) and for the most part, it seemed to be the way forward to gather word combinations.

In total, 278 entries were gathered from 40 articles and documents. From those entries, 86 were added to the list of terms and later on analysed, 104 were added to the list of abbreviations and a section for the 48 robots was included. In future versions of this research, and thinking of it in a bigger scale, it would not have been possible to carry out the analysis following this methodology, in fact, many inaccuracies could have risen that could well be avoided by developing an IR system with specific rules that focuses on analysing terminology in the field of robotics.

4.2 Corpus compilation and development of a glossary

> The advantage of terminology management can be seen in its important role in the process of acquiring, storing, and applying linguistic and subject-specific knowledge related to the production of the target text. (WMT, 2019)

Greek and Latin are still the basis for medical terminology on the grounds that they are precise and internationally comprehensible, not to mention they can be analysed from prefixes, roots, and suffixes, as it was pointed out by Montalt in the review of the history in medical translation.

The previously mentioned *Nomina Anatomica*, provides a standardised list of anatomical terms in both Greek and Latin, in which, as Mićić pointed out in her article "Languages of medicine – present and future", the full meaning of both Latin and Greek words is present and can be extracted, for instance, the word borrowed from New Latin: *mūsculus salpingopharyngeus* (salpingopharyngeal muscle) can be analysed as – *salping(o)*[5] meaning "of or belonging to tubes"; *pharyng*[6] this is "of or referring to the pharynx, the upper throat cavity" and -*ous/eus* or *-eal/-al*, which mean "pertaining to". It is in such cases and others that terminologies can be extremely useful for translators and scientists in the field of medicine when making use of data mining pipelines, such as identifying specific terms of diseases or treatments, learning that way the various meanings the same word may have in diverse settings or their uses. However, given that specific terms connected with the topic of robotics may not necessarily have their origin in Latin or Greek, during the elaboration of the glossary, those words with etymological aspects that can be traced back to the mentioned languages, have been commented on.

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[5] Greek σᾰ́λπῐγξ, σαλπιγγ-, (sálpinx, salping-), trumpet.

[6] Greek φᾰ́ρῠγξ, φαρυγγ- (phárunx, pharung-), throat, windpipe; chasm

With regards to the style of the thesaurus, as exemplified below, a clear and concise approach has been followed, including the necessary information and some examples, but without overwhelming the user. This type of approach could easily be translated to a website setting, as mentioned in the Online glossary proposal subchapter; in doing that the multimodal thesaurus would become available to all users and fulfil its goal: to be an up-to-date bilingual or possibly multilingual resource for translators and any other interested users in the field of robotics.

The system in which the glossary has been organised, with the aim of improving its readability, is Microsoft Word. At the beginning of the research, Excel was utilised to generate the word lists, however, it did not function well for the glossary itself. In Word, the terms extracted from the word lists were given a "style" and englobed in three main headers: terms, abbreviations, and robots. Using the Table of Contents tool, the document adopted a dictionary-like look, making it easy to navigate and search terms. In the same way as it would in the website proposal, Word includes the Find tool, to search for specific terms without needing to go through the list. As per the information included with each term, it was deemed relevant to mention the following:

- Entry: The term.

- Definition: The definitions of the terms extracted from the studied articles, Medline, Cochrane Library, the Multilingual Glossary of technical and popular medical terms in nine European Languages or other related resources.

- Source: The article or book from in which the term is located.

- Context: The phrase from which the term was extracted.

- Equivalent in Spanish: The corresponding term in Spanish or the closest one to the original meaning.

- Definition in Spanish: Added when applicable, a definition of the Spanish term from RAE, MedLine, Cochrane Library, Federación Internacional de Robótica (IFR), as well as other specialised book cited below.

The image below demonstrates the style followed on the development of each section of the glossary generated in Word and later on transferred to the proposal of a website setting with a more attractive look.

TERMS
AUTONOMOUS ROBOTIC SYSTEM
Definition: A robot with an autonomous robotic system is capable of independent action. The system operates without pre-programmed behaviours and without direct supervision from human beings. **Context:** "Implementing autonomous robotic systems for rehabilitation are presented and discussed (…)" **Source:** MORALES ET AL. (2018) Rehabilitation Robotics and Systems. Journal of Healthcare Engineering. Available in: https://doi.org/10.1155/2018/5370127 **Equivalent in Spanish:** Sistema autónomo robótico **Definition in Spanish:** El sistema autónomo robótico permite al robot operar con un alto grado de autonomía dentro de los límites preprogramados y sin supervisión humana

Table 4. Example of Word version of the glossary

Corpus summary and term analysis

The aim of this research essay was to organise, search and structure a list of terminology from the area of robotics, prosthetics and orthotics in bioengineering and biomedicine, so that a preliminary bilingual thesaurus could be built. This thesaurus has been divided in four parts:

- A list of terms presented in alphabetical order with quoted examples from the articles they were extracted, including their equivalents Spanish equivalents and a definition in both languages.

- An alphabetically organised table of abbreviations in English with their equivalents in Spanish.

- A section dedicated to the abbreviations and terms related to the areas of prosthetics and orthotics specifically with definitions in both languages.

- A table organised in specialities of the robots found during this research with a definition in both Spanish and English.

With the aim of making this thesaurus user-friendly and translatable to a website, as well as including parallel translations of the terms and abbreviations, it has been necessary to adjust the size and orientation of the Word pages, and to use the colour red in line with the UVIC Universitat Central de Catalunya logo to highlight and differentiate the terms from their definitions.

Regarding the results, 277 terms in English and Spanish were collected from 40 sources related to the area of robotics, prosthetics and orthotics in bioengineering and biomedicine, bringing the total of terms in the thesaurus to 554 when counting the original terms and their equivalents. To find translations, synonyms, or quasi-synonyms for the expounded list of terms, a series of resources have been utilised such as the Medline library, the Cochrane Library, the IFR database, the Atlas of limb prosthetics and so on, as well as parallel texts when available. As a result of the compilation of terms, a preliminary yet aiming to be exhaustive thesaurus specialised on bio- robotics, prosthetics and orthotics has been generated, which when applicable contains terminological equivalences or related terms for the elements that belong the field of mechatronics or bionics.

The results are in consonance with the aforementioned in this essay, as it was expected, there were more terms and abbreviations in English that lacked a Spanish equivalent. In fact, in developing the thesaurus mentioned, some terms without correspondents in the target language were detected such as the abbreviation HCI that refers to the theory, concepts, and models of the Human-*Centered* Computing, rather than its other meaning Human Computer Interaction, which refers to the empirical studies carried out in the discipline. The lack of equivalent could mean that a deeper search and expansion of knowledge in this field is necessary to recognise an equivalent, or that the term in question does not exist in the target language and instead a different mechanism has been pursued to be able to explain its meaning.

With regards to the terminology itself, the following characteristics marked the nature of the terms found:

- Multidisciplinary terminology – Often terms belonged to other fields of expertise, such as Medicine, Bioengineering, Mechanical Engineering, Mechatronics or Bionics.

- Highly specialised terminology in the fields mentioned and the subfields of robotics, prosthetics, and orthotics.

- Terminology generated in specific fields from texts produced originally in English. This process of term creation often gets introduced into the professional vocabulary directly in English, which as a result does not get translated and ends up as a borrowed set of terms, because their translation generates confusion or feels unnatural.

- A considerable number of abbreviations and acronyms that have been adopted in Spanish without a translation, but with a definition of the concept.

- Technical terminology not encountered often, in contrast to medical terminology, which tends to be more familiar.

The basis of this thesaurus was built with terms that had synonyms o quasi-synonyms in the target language; however, it was often seen that for example in the case of some abbreviations, the English version did not correspond to the acronym generated in Spanish. The selected terminology in English gathers the principal characteristics mentioned throughout this essay, them being specific to the field of robotics, prosthetics and orthotics or belonging to the area of bioengineering, and they are widely used in the *lingua franca*. On some occasions, being aware of the origins of most medical words, has eased the search of some corresponding terms in both languages, when there was a common basis in the constitution of terms, or when it was possible to observe similar mechanism in which the term was built. Nonetheless, some of the terms in Spanish present certain challenges regarding the descriptions instead of terms, borrowed terms or lack thereof.

The structure in which the thesaurus has been organised and presented, was considered the clearest way to display it; far from the classic dictionary structure, it allows the user to navigate the page and retrieve the desired information along with its context and Spanish equivalent, which eases the comprehension of those more complicated terms. Firstly, a list of terms allows the user to select or search for a specific term from the term section.

ACCEPTANCE TEST / ASSESMENT
ACCUMULATOR
ACCURACY
ACTIVE CONTROL

Table 5. Example of the list of terms

The following section is dedicated to the abbreviations found in prosthetics and orthotics, which has been subdivided in lower, upper, spinal orthoses and surgical prostheses, based on the structure in which the Atlas in Orthotics and Prosthetics had displayed its contents. In this case, the search is facilitated by the search bar.

LLO – LOWER LIMB ORTHOSES			ORTESIS DE MIEMBRO INFERIOR		
ABBREVIATION	**MEANING**	**ENTRY**	**ABREVIATURA**	**SIGNIFICADO**	**ENTRADA**
FO	Foot Orthosis	Foot orthoses are devices that are confined to the foot only and they are most commonly placed inside a closed shoe; this form of support primarily covers the plantar surface and benefits the foot only upon weight bearing.	FO	Ortesis de pie	Las ortesis de pie (FO) son los dispositivos que se limitan exclusivamente al pie y que no incluyen el tobillo. Esta forma de soporte cubre principalmente la superficie plantar y beneficia al pie sólo cuando soporta carga.

Table 6. Example of the list of abbreviations in Orthotics

The thesaurus includes a subpart dedicated to specific abbreviations found to be related to the materials utilised in the robots, prosthetics or orthotics mentioned in the articles; acronyms specific to the field of Biomedical Engineering or Medicine, as well as a section for miscellaneous abbreviations, presented in a parallel table.

ABBREVIATION	**MEANING**	**ABREVIATURA**	**SIGNIFICADO**
AA	ACTIVE ASSISTIVE/ASSISTED	AA	ACTIVO ASISTIDO
ANN	ARTIFICIAL NEURAL NETWORK	RNA	RED NEURONAL ARTIFICIAL
TPU	THERMOPLASTIC POLYURETHANE	TPU	POLIURETANO TERMOPLÁSTICO

Table 7. Example of the list of miscellaneous abbreviations

The last section contains a table of the different robots found during this research divided in the specialties in which they are used. The names of those robots remain the same in their Spanish version, but a definition in both languages has been included to provide information to the user.

ENGLISH	**NEUROSURGICAL**	**SPANISH**	**NEUROQUIRÚRGICOS**
Neurosurgery robots for image-guided tool positioning and orientation		Robots neuroquirúrgicos para el posicionamiento y orientación de herramientas guiados por imágenes	
NEUROMATE	Neuromate (developed by ReniShaw) is a stereotactic robot that can perform biopsies, deep brain stimulation, stereotactic electroencephalography, transcranial magnetic stimulation, radiosurgery, and neuroendoscopy.	NEUROMATE	El robot estereotáctico Neuromate de ReniShaw ofrece una plataforma de soluciones para una amplia gama de procedimientos de neurocirugía funcional, como la implantación de electrodos para estimulación cerebral profunda (ECP) y estéreo-electroencefalografía (SEEG), o aplicaciones estereotácticas en neuroendoscopia, biopsia y otras aplicaciones de investigación.

Table 8. Example of the list of robots

The concepts and terms were selected and analysed based on the aforementioned criteria; nevertheless, due to time and knowledge constraints, only a handful of terms have been displayed, according to the quantity of times they were used, their complexity and technicality. Future developments of this thesaurus aim to increase the quantity of terms and the quality of their display, by uploading them to an up-to-date user-friendly website.

Online glossary proposal

Terminologies can be used to improve the quality of both human and machine translations, standardising the use of specific vocabulary (Montalt, 2007), or aiding with the development of natural language processing systems. (Marrero et al., 2010) The biomedical domain contains several special features that make it difficult for systems and programmes to analyse medical documents. In addition, the disagreements on the standard terminology across companies and organisations complicates the development and application of tools and methods to analyse content. For this reason, following the initiative of standardisation of medical terminology set by Montalt (2007), an attempt to imitate MedLine (NIH) and BioMed, among others, and apply the methods utilised for display of terminology has been made in this bilingual glossary of robotics.

The glossary proposed would take the form of a biomedical translation library that at this precise moment would need constant updating, due to the new resources added to the web daily. However, with the application of a semi-supervised IR model, this somewhat weary task, could be developed into a semi-automated ever-growing resource for translators. The website proposal itself has been planned, following the one used by the MediaWiki engine, an open-source software that helps collect and organise knowledge and make it available to people, which is the aim of this research. The reason behind choosing this software was based on the fact that MediaWiki offers access to all users willing to contribute with new knowledge and a detailed guide on how to build glossaries on their site. As mentioned before, due to time constraints and lack of knowledge in programming, it was only possible to plan what this thesaurus in robotics would look like on a website and what aspects would be necessary to apply. In addition, using the Microsoft Sway tool incorporated in Microsoft Word, a preliminary view of what the website could look like was generated.

This integrated piece of software allows for the transformation of Word documents into an interactive, easy-to-share Microsoft Sway web page that is transferrable to any device. This tool requires the document to be specifically designed to the layout desired for the website, it allows to generate links that work in a similar way to what the ones in the 'Table of Contents' or 'References' would, however, in this preliminary version, only basic aspects of what the website could be included and modified. To view an example of the website view follow this link: Sway (office.com)

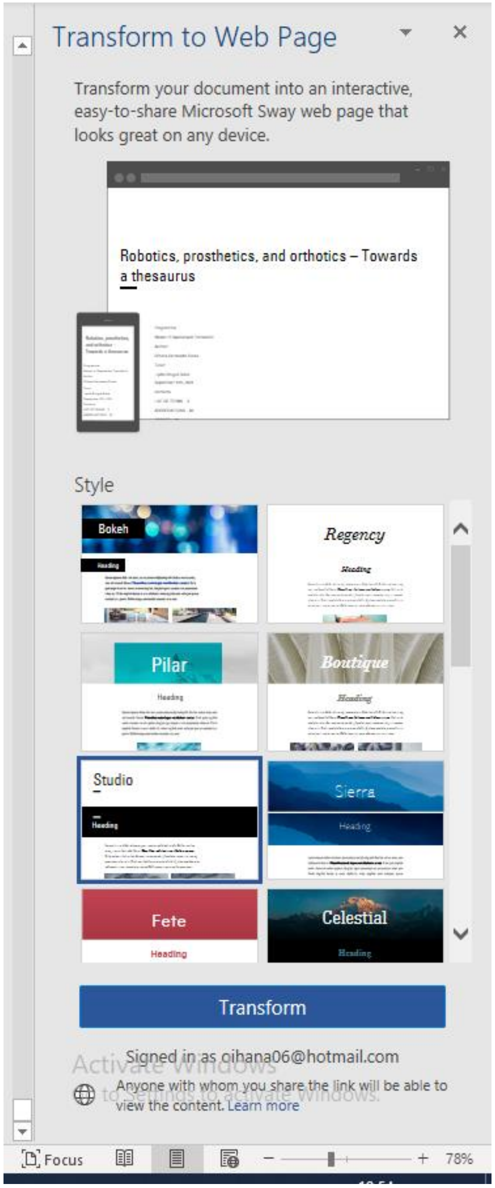

Figure 6. Microsoft Sway

About Wikipedia tool, all glossaries in the site contain vocabulary and definitions relevant to the concepts for a given subject area, including technical terms, idioms, and metaphors, and all are organised hierarchically based on three different structures (template structured, bullet-style, and subheading-style). For the plan of this thesaurus in robotics, the template-structured model was preferred, mainly for its easy application and transformation into standard HTML and the stand-alone character of the glossary.

<table>
<tr>
<td>==A==
Introductory text.
{{glossary}}
{{term |1=term A}}
{{defn |no=1 |1=
Beginning of the definition of term A.
<p>More of the definition of term A.</p>}}
{{term |1=term B}}
{{defn |no=1 |1=First definition of term B.}}
{{defn |no=2 |1=Second definition of term B.}}
{{term |1=term C}}
{{defn |1=Simple definition of term C.}}
{{term |1=term D}}
{{defn |1=Definition of term D, with a...
{{gbq|Block-quoted passage.}}
{{More definition of term D.}}
{{glossary end}}</td>
<td>A
Introductory text.
Term A
1. Beginning of the definition of term A.
More of the definition of term A.
Term B
1. First definition of term B.
2. Second definition of term B.
Term C
Simple definition of term C.
Term D
Definition of term D, with a block-quoted passage.
More definition of term D.</td>
</tr>
<tr>
<td colspan="2">HTML Repressentation
<dl>
<dt id="term_A"><dfn>term A</dfn></dt>
<dd> Beginning of the definition of term A.</dd>
<dd> More of the definition of term A.</dd>
<dt id="term_B"><dfn>term B</dfn></dt>
<dd>1. First definition start.
<p>First definition conclusion.</p>
</dd>
<dd>2. Second definition.</dd>
</dl>
<img src="img_neurorobotics.jpg" alt="Neurorobotics"> (For images)
link text (For links)</td>
</tr>
</table>

Table 9. From the Manual of Style/Glossaries in Wikipedia

The template above could be translated into the following view taking the information collected in the Word version with the structure above. In future versions, with some form of the code in the box above, links and images could also be included, which would enrich the glossary and possibly make it more informative.

For this version, the template for term D has been followed.

A
Biomedical Engineering, Robotics. **Amputate** Verb - \ˈæmpjʊteɪt \ - To remove by or as if by cutting a limb from the body. - "The main reason is that the weight of the device is carried by the soft tissue of the amputated stump (...) instead of by the skeletal structure as in natural hands." LAVRANOS et al. (2020) - Equivalent in Spanish: Amputar - Definition in Spanish: Cortar y separar enteramente del cuerpo un miembro o una porción de él.

Table 10. Example of view

A similar approach has been adopted for the Microsoft Sway version, where sub-headers were included for clarification purposes.

Developing a page dedicated to the terminology in robotics, meaning most recent words related to specific procedures, existing words that have acquired other meanings in this industry and information about surgical robots, would be gathered in the same site, allowing for that standardisation process mentioned by Montalt to develop and take a new form. On this occasion, it has not been possible to achieve such ends, but the first steps towards a multilingual term glossary in robotics have been laid out for other researchers to continue.

5. Discussion

The objective of this final dissertation was to gather and organise a thesaurus in terminology from the bioengineering field, specifically, from the robotics, prosthetics, and orthotics subfield. The topic was chosen due to an increasing interest in the area of robotics, particularly related to the rehabilitation and surgical robotics, and the challenges the constant development in technology brings to translators, scientists in this area of expertise and other multilingual enthusiasts. During the course of the two-year master, it was observed how each specialty had its own set of challenges, but the areas related to technology and medicine proved to be the ones that tested the translator's knowledge in the particular field and lacked easy-access user-friendly terminological resources to aid with the translating task.

The structures and basis learned during the different subjects, helped with the understanding of the *hows* and *whats* found in the process of developing one's own thesaurus. The different translation exercises in which a personalised translation memory or glossary needed to be generated, served as practices for this wider research and as inspiration to begin the creation of a tool that could, on the one hand, ease the translation project, and on the other one, act as a point of reference for specialists in the field of bioengineering when wanting to communicate their findings in another languages without constantly needing to resort to borrowed terms.

The process was enriching and fulfilling, in the sense of how it allowed for the expansion of knowledge not only in the researched field, but on the challenges that brings building a thesaurus both on paper and online. Dismally, the research in terminology belonging to this field can become an endless task, as the constant development and new research does not stop.

This is why, the thesaurus was built with a simple yet functional structure, which makes it possible to keep on adding terms and modifying it to accommodate new sub-specialties in the chosen language pairs, and in other languages.

All in all, this dissertation has made it possible to become more familiar with the following aspects of the field of traductology:

- Research and recognition of well-founded resources for terminology.
- Research and selection of terminological resources.
- Text processing tools.
- Computer tools for processing and extracting terms.
- Computer and online tools for the development of glossaries and thesaurus.
- Normative aspects about the development of bilingual thesaurus and glossaries.
- Research and study of the existing resources.

Last but not least, the research carried out for this dissertation has allowed for the expansion of personal knowledge in all of the above, as well as, in the field of Robotics, prosthetics and orthotics.

5.1 Limitations of the study

There have been several challenges that arose during this essay, one of which was its nature. The research of well-founded resources and the extraction of terms was mostly a manual process that required considerable time to complete. However, the most considerable one was the lack of up-to-date accessible terminological resources such as dictionaries, specialised glossaries, or thesaurus, which meant it was necessary to extract most of the terminology from the selected articles and official libraries of gathered knowledge.

In the preliminary steps of this research, several ways of analysing texts were considered, in addition to word processing tools for term extraction and organisation of terminology for the later task. It was decided that the WordSmith Tool 8.0 would serve as an assistive tool in the extraction of terms, but this made it necessary to download, install and learn how the software operated. In addition, it also meant that even though the tool generated lists of words, these lists had to be analysed and filtered through manually to be able to separate the common words from those that were going to be included in the thesaurus. The time invested in getting familiar with the software and manually analysing the lists, however long, was not a distracting task, as it ended up making the later task lighter and more straight forward.

A noted limitation in this study was the lack of parallel texts in this field, and the fact that specialists are often used to read and utilise these research articles in English, which in turn means that there are not that many texts translated to Spanish. In a smaller scale, something similar seems to happen in texts in Spanish, often their spread is limited to national regions.

Ultimately, being able to carry out the investigation for this essay in collaboration with experts in the domain of Bioengineering and its subfields, would have increased both the quality and the quantity of entries in this thesaurus.

5.2 Conclusions

This research has revealed the increasing development and relation between the sciences of biology, medicine, and technology. In this particular case, this fact has been observed in the growing number of surgical robots, rehabilitation robots and prosthetics and more technical orthotics. The clinician, and as a result the translator, are not only required to become experts in a medical specialty, but also in the technology that has been introduced to that specialty. The multidisciplinary nature of this highly specialised and interconnected domains, requires a high level of understanding in the terminology from each branch.

During the dissertation, it has also been observed that in spite of the fact that terminology in Spanish could have developed at the same pace as it has in English, this has not been the case, because the knowledge related to technology designed and fabricated by foreign countries has been published in English, which in turn has been incorporated by the professionals to their specific terminology in the form of borrowed terms.

To conclude, a tool like the bilingual thesaurus generated in this research could become a very useful resource for several reasons. To begin with, translators and other specialist in the field of linguistics could benefit from it, in the sense of, them being able to consult which terms have equivalents and the used abbreviations, in addition to the information and resources included. It could be valuable for a professional in the field of Bioengineering because a thesaurus with these characteristics can become an essential tool to generate a controlled language database that unifies and gives coherence to the texts, avoids unnecessary borrowed terms, but that maintains the indispensable terms in English. Lastly, it would serve as an indexing tool, as it would allow more specificity in the search of information.

5.3 Future research

This research, far from being finished, opens new paths for development and improvement. The upkeep of the thesaurus would require the continuous study of new articles, books, textual corpus, and other resources, that would add new terms to the current structure and would expand it maybe by adding specific subparts related to the materials, specific parts and so forth, increasing that way the specialisation level of the thesaurus. Another interesting aspect to develop, would be a chapter dedicated to the different robots currently in the market and those in development.

A different line of research could be followed by focusing on the structure of the thesaurus, finding ways of better presenting it and evolving it into a multilingual tool, as well as improving the process of selection of resources, use of tools and extraction of terms. The development of this thesaurus into a multilingual tool would be of special interest, as this research could be easily transferred to main European languages firstly, as they are all under the European umbrella of translation and localisation rules.

As a final suggestion, this thesaurus has the potential to become an excellent online database with a built-in browser for specific terms and other resources, on a similar way to Medline, but specific to the domain of robotics, prosthetics, and orthotics, that could become the 'go to' resource for anyone interested.

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7. Annex

Figures

Tables

Thesaurus

UVIC UNIVERSITAT DE VIC
UNIVERSITAT CENTRAL DE CATALUNYA

Robotics, prosthetics, and orthotics – Towards a thesaurus

Programme:

M.A. in Specialised Translation

Author:
Oihana Carracedo Flores

Tutor:
Lydia Brugué Botia

September 17th, 2021

Annex Contents

LIST OF TERMS

ACCEPTANCE TEST / ASSESSMENT

Definition: In the robot industry, the acceptance test refers to the required formal tests conducted to demonstrate the acceptability of a unit, component, or complete robot system. These tests demonstrate performance to manufacturing specification requirements and serve as quality-control screens to detect deficiencies. (Angelo, 2007)

Context: "Clinical acceptance and accuracy assessment of spinal implants guided (…)."

Source: DOULGERIS ET AL. (2015) Robotics in Neurosugery: Evolution, Current Challenges, and Compromises. *Cancer Control.* Available in: https://doi.org/10.1177/107327481502200314

Equivalent in Spanish: Test o prueba de aceptación; ensayo o prueba de recepción. (Beigbeder, 2002)

Definition in Spanish: Examen efectuado para determinar si los materiales y los equipos concuerdan con las condiciones de producción y para determinar el grado de uniformidad del producto administrad. (Reyes, 2011)

Related terms: Acceptance test report; acceptance trials; acceptance-test programme. (Beigbeder, 2002)

ACCUMULATOR

Definition: A device or mechanism that stores up or accumulates energy. (Angelo, 2007)
Context: This advantage is shared among all kinds of locomotion modalities, either in the form of energy accumulation (accumulator), energy release (…), exploitation of resonant components, or recovery of fluidic energy.”
Source: CALISTI ET AL. (2017) Fundamentals of Soft Robot Locomotion. Journal of The Royal Society Interface. Available in: https://doi.org/10.1098/rsif.2017.0101
Equivalent in Spanish: Acumulador; contador. (Beigbeder, 2002)
Definition in Spanish: Dispositivo que permite la obtención y acumulación de energía. (Reyes, 2011)
Related terms: Accumulator battery; accumulator cell; accumulator metal/paste; accumulator plunger; etc. (Beigbeder, 2002)

ACCURACY

Definition: In robotics, the term 'accuracy' refers to the degree to which the actual position of a robot, especially a robot's arm or end-effector, corresponds to the desired or commanded position. (Angelo, 2007)

Context: "(…) reduction accuracy and motion range are the best results achieved by each type of robots."

Source: BAI ET AL. (2019) Medical Robotics in Bone Fracture Reduction Surgery: A Review. Sensors. Available in: https://doi.org/10.3390/s19163593

Equivalent in Spanish: Fidelidad; exactitud; precisión. (RAE, 2014)

Definition in Spanish: En robótica, precisión es un aparato o máquina, construido con singular esmero para obtener los mejores resultados posibles. (Reyes, 2011)

Related terms: Accuracy maintenance service; accuracy master; accuracy adjustment. (Beigbeder, 2002)

ACTIVE CONTROL

Definition: The automatic activation of various control function used to control the movement of the robot. (Angelo, 2007)

Context: “(…) active control of aquatic deformable bodies may pave the way to the design of new kinds of underwater soft robots.”

Source: CALISTI ET AL. (2017) Fundamentals of Soft Robot Locomotion. Journal of The Royal Society Interface. Available in: https://doi.org/10.1098/rsif.2017.0101

Equivalent in Spanish: Control activo. (Beigbeder, 2002)

Definition in Spanish: En el control active, la realimentación de la fuerza es utilizada para controlar el movimiento del robot. (Reyes, 2011)

ACTUATOR

Definition: An actuator is an electromechanical device that translates energy into physical motion and/or the application of a force. In an automated system, the actuator is responsible for a specific action or sequence of actions. Actuators are used to move a robot's manipulator joints. There are three basic types of actuators: pneumatic, hydraulic, and electrical. (Angelo, 2007)

Context: "These systems used pneumatic, hydraulic, or electromagnetic (via cams and Bowden cables) actuators for position servocontrol."

Source: GASSERT & DIETZ (2018) Rehabilitation Robots for the Treatment of Sensorimotor Deficits: A Neurophysiological Perspective. Journal of Neuro-engineering and Rehabilitation. Available in: https://doi.org/10.1186/s12984-018-0383-x

Equivalent in Spanish: Accionador; servomotor; biela de accionamiento; actuador. (Beigbeder, 2002)

Definition in Spanish: Los actuadores suministran las señales necesarias a las articulaciones robóticas para producir movimiento. En robótica, los actuadores pueden se servomotores, neumáticos, eléctricos o hidráulicos. (Reyes, 2011)

Related Terms: Actuator pendulum; actuator pole; actuator runtime; actuator switch; motor-driven actuator; etc. (Beigbeder, 2002)

ADAPTATION

Definition: Adaptation is the process of modification of an organism or its parts making it more fit for the required purpose under the conditions of its environment. (Angelo, 2007)

Context: "Such an approach would allow a better adaptation of the support to the individual patient, enable more dynamic motion, and prevent degenerative changes in the peripheral nervous system."

Source: GASSERT & DIETZ (2018) Rehabilitation Robots for the Treatment of Sensorimotor Deficits: A Neurophysiological Perspective. Journal of NeuroEngineering and Rehabilitation. Available in: https://doi.org/10.1186/s12984-018-0383-x

Equivalent in Spanish: Adaptación; ajuste. (RAE, 2014)

Definition in Spanish: Se trata del proceso de modificación de un organismo u objeto para ajustarse a las condiciones de su entorno. (RAE, 2014)

Related Terms: Adaptation matrix; adaptation to environment. (Beigbeder, 2002)

ADAPTATIVE CONTROL SYSTEM

Definition: A control system that continuously monitors the dynamic response of the system being controlled and then automatically adjusts critical system parameters to satisfy preassigned response criteria, thereby producing the same response over a wide range of environmental conditions. (Angelo, 2007)

Context: "The soft body structure has the advantage of an adaptative control system (…)."

Source: ZAN YUE ET AL. (2017) Hand Rehabilitation Robotics on Poststroke Motor Recovery. Behavioural Neurology. Available in: https://doi.org/10.1155/2017/3908135

Equivalent in Spanish: Sistema de control adaptativo. (Beigbeder, 2002)

Definition in Spanish: Un sistema d control adaptativo, es aquel capaz de recalcular y monitorizar sus parámetros en función de las señales obtenidas por los sensores y de ajustar dichos parámetros para producir una respuesta adecuada. (Reyes, 2011)

ADAPTER

Definition: Any device used or designed primarily to fit or adjust one component to another. For example, a fitting to join two pipes that have different threads or different diameters. (Angelo, 2007)

Context: "This structure is composed of two parts: a base and an adapter for the robotic arm UR3."

Source: TERRILE ET AL. (2021) Comparison of Different Technologies for Soft Robotics Grippers. Sensors. Available in: https://doi.org/10.3390/s21093253

Equivalent in Spanish: Adaptador; pieza de conexión; empalme. (Beigbeder, 2002)

Definition in Spanish: Dispositivo que permite el acoplamiento de un tipo específico de hardware con otro que de otro modo sería incompatible. (Reyes, 2011)

Related terms: Adapter plate; adapter ring; adapter-type ball bearing; adapter sleeve.

AMPLIFIER

Definition: A device capable of reproducing an electrical input or electromagnetic radiation signal with increased intensity or gain. The energy required to increase the intensity of the input signal is drawn from an external source. If the output signal is a linear function of the input signal, the device is called a linear amplifier; otherwise, it is called a nonlinear amplifier. (Angelo, 2007)
Context: "A prototype of index-finger PIP joint motion amplifier for assisting patients with impaired hand mobility (...)."
Source: ZAN YUE ET AL. (2017) Hand Rehabilitation Robotics on Poststroke Motor Recovery. Behavioural Neurology. Available in: https://doi.org/10.1155/2017/3908135
Equivalent in Spanish: Amplificador. (RAE, 2014)
Definition in Spanish: Dispositivo que aumenta la amplitud de una señal, por ejemplo, eléctrica o electromagnética. (Reyes, 2011)
Related terms: Amplifier chain; amplifier circuit; amplifier gain; amplifier grid resistor; amplifier pentode; etc. (Beigbeder, 2002)

AMPUTATE

Definition: To remove by or as if by cutting a limb from the body. (Merriam-Webster, 2021)
Context: “The main reason is that the weight of the device is carried by the soft tissue of the amputated stump (…) instead of by the skeletal structure as in natural hands.”
Source: MOHAMMADI ET AL. (2020) A Practical 3D-printed Soft Robotic Prosthetic Hand with Multi-articulating Capabilities. PLOS ONE. Available in: https://doi.org/10.1371/journal.pone.0232766
Equivalent in Spanish: Amputar. (RAE, 2014)
Definition in Spanish: Cortar y separar enteramente del cuerpo un miembro o una porción de él. (RAE, 2014)

AMPUTEE

Definition: Referring to a person or patient whose limb has been amputated. (Merriam-Webster, 2021)
Context: "(…) performance of both intact-limb and amputee people are quite satisfactory when their EMG signals collected only from six channels while they were performing individual finger movements."
Source: GÜNAY ET AL. (2017) Muscle Synergy-based Grasp Classification for Robotic Hand Prosthetics. Proceedings of the 10th International Conference on Pervasive Technologies Related to Assistive Environments. Available in: https://doi.org/10.1145/3056540.3076208
Equivalent in Spanish: Amputado; paciente con un miembro amputado. (RAE, 2014)
Definition in Spanish: Individuo o paciente a quien se le ha amputado un miembro del cuerpo o parte de él durante una operación quirúrgica o un accidente. (RAE, 2014)
Related Terms: Amputee rehabilitation. (Beigbeder, 2002)

GEARED ACTUATOR

Definition: Geared Mechanical Actuators are used as a mechanism to translate mechanical motion (often rotary) into rotary motion at a different combination of speed and force or change the direction of motion. (Zhang, 2010)
Context: "(…) the complex structure and geared actuators of such devices with their reflected inertia limit the interaction quality and the ability to adapt the level of support."
Source: GASSERT & DIETZ (2018) Rehabilitation Robots for the Treatment of Sensorimotor Deficits: A Neurophysiological Perspective. Journal of NeuroEngineering and Rehabilitation. Available in: https://doi.org/10.1186/s12984-018-0383-x
Equivalent in Spanish: Actuador o accionador rotativo. (Reyes, 2011)
Definition in Spanish: Los actuadores rotativos son dispositivos que transforman el movimiento rotativo a la entrada, en un movimiento lineal en la salida. Estos actuadores son aplicables para los campos donde se requiera movimientos lineales tales como: elevación, traslación y posicionamiento lineal. (Reyes, 2011)

PIEZOELECTRIC ACTUATOR

Definition: Piezoelectric actuators are devices that produce a small displacement with a high force capability when voltage is applied. There are many applications where a piezoelectric actuator may be used, such as ultra-precise positioning and in the generation and handling of high forces or pressures in static or dynamic situations. (Zhang, 2010)
Context: "(…) the wings of a dragonfly-inspired robot were designed to provide a torsional motion in response to the flapping driven by a piezoelectric actuator."
Source: CALISTI ET AL. (2017) Fundamentals of Soft Robot Locomotion. Journal of The Royal Society Interface. Available in: https://doi.org/10.1098/rsif.2017.0101
Equivalent in Spanish: Actuador o accionador piezoeléctrico. (Reyes, 2011)
Definition in Spanish: El actuador piezoeléctrico puede convertir la tensión mecánica en electricidad y la electricidad en vibraciones metálicas. (Reyes, 2011)

ANDROID

Definition: A term that describes a robot with near-human features or a synthetic human constructed with artificial materials that simulate natural biological materials. (Angelo, 2007)
Context: "The concept of robots has evolved from 'human-like' android machines to programmable, multifunctional specialized devices."
Source: DOULGERIS ET AL. (2015) Robotics in Neurosugery: Evolution, Current Challenges, and Compromises. Cancer Control. Available in: https://doi.org/10.1177/107327481502200314
Equivalent in Spanish: Androide, robot. (Beigbeder, 2002)
Definition in Spanish: Autómata de figura humana que imita movimientos y funciones propias del ser humano. (RAE, 2014)

ANTHROPOMORPHIC ROBOT

Definition: This is a robotic device described or thought of as having a near-human form or attributes, as well as ascribing human characteristics. (Angelo, 2007)
Context: “Previously developed anthropomorphic hands have been implemented in the form of typical 28 rigid body robotic linkages (…).”
Source: PARK ET AL. (2020) Wearable Robotic Glove Design Using Surface-Mounted Actuators. Frontiers in Bioengineering and Biotechnology. Available in: https://doi.org/10.3389/fbioe.2020.548947
Equivalent in Spanish: Robot antropomórfico / Robot humanoide. (Reyes, 2011)
Definition in Spanish: Un robot antropomórfico se caracteriza por estar construido imitando atributos humanos. Esta configuración a menudo tiene articulaciones de tipo rotacional. (Reyes, 2011)

ANTI-HUNT CIRCUIT / MECHANICAL STOPPER

Definition: Mechanical device used in rotating machinery to prevent rotation of one component relative to an adjacent component. (Zhang, 2010)

Context: "(…) the center of rotation of linkage structure should coincide with the rotational axis of the human joint or the antihunt mechanical stopper should be used for setting limits to the range of motion."

Source: DOULGERIS ET AL. (2015) Robotics in Neurosugery: Evolution, Current Challenges, and Compromises. Cancer Control. Available in: https://doi.org/10.1177/107327481502200314

Equivalent in Spanish: Circuito o dispositivo antioscilación. (Beigbeder, 2002)

Definition in Spanish: Dispositivo de prevención de oscilación configurado para ser utilizado en maquinaria con elementos oscilantes. (Reyes, 2011)

ARTICULATION

Definition: In robotics, this is a joint or a juncture between rotary joints or axes to allow movement. (Bowker, 2002)

Context: "Although a human hand can perform all these grasp types, thanks to the high articulation of human body, the degrees of freedom of current robotic hands is not enough to perform all these movements."

Source: GÜNAY ET AL. (2017) Muscle Synergy-based Grasp Classification for Robotic Hand Prosthetics. Proceedings of the 10th International Conference on PErvasive Technologies Related to Assistive Environments. Available in: https://doi.org/10.1145/3056540.3076208

Equivalent in Spanish: Articulación o unión. (Beigbeder, 2002)

Definition in Spanish: Son uniones formadas por servomotores que permiten la conexión y movimiento relativo entre dos eslabones consecutivos del robot. Dependiendo del movimiento que producen, pueden ser rotacionales o lineales, también conocidas como prismáticas. (Reyes, 2011)

ARTICULATED LIMB

Definition: In robotics, it refers to an artificial limb that has been segmented or jointed and thereby able to accommodate motion. (Angelo, 2007)
Context: "(...) surgical vision, tremor filtration, motion-scaling, and an internal articulated limb (...)."
Source: HANNA & IMBER (2018) Robotics in HPB Surgery. The Annals of The Royal College of Surgeons of England. Available in: https://doi.org/10.1308/rcsann.supp1.31
Equivalent in Spanish: Miembro articulado. (Hsu, 2008)
Definition in Spanish: Elemento estructural que puede girar libremente en torno a sus puntos de apoyo. (Reyes, 2011)

ARTIFICIAL INTELLIGENCE (AI)

Definition: The discipline within the fields of information technology and computer science in which scientists attempt to give smart machines and advanced computers reasoning powers that resemble and approach logical operations of the human brain. This term is often taken to mean the study of thinking and perceiving as general information processing functions by machines. Also called machine intelligence and heuristic programming. (Angelo, 2007)
Context: "Artificial intelligence-based rehabilitation systems (…)."
Source: MORALES ET AL. (2018) Rehabilitation Robotics and Systems. Journal of Healthcare Engineering. Available in: https://doi.org/10.1155/2018/5370127
Equivalent in Spanish: Inteligencia artificial. (Reyes, 2011)
Definition in Spanish: Disciplina científica que se ocupa de crear programas informáticos que ejecutan operaciones comparables a las que realiza la mente humana, como el aprendizaje o el razonamiento lógico. (RAE, 2014)

ATTITUDE

Definition: The attitude is the position of an object as defined by the inclination of its axes with respect to a frame of reference. In robotics, the term refers to the orientation of a robotic system that is either in motion or at rest, as established by the relationship between the system's axes and a reference line or plane. Attitude is often expressed in terms of pitch, roll, and yaw. (Angelo, 2007)

Context: "(…) the attitude motion in the sagittal plane, such as walking on the rough surface or the lawn, tripping, and so forth."

Source: ZAN YUE ET AL. (2017) Hand Rehabilitation Robotics on Poststroke Motor Recovery. Behavioural Neurology. Available in: https://doi.org/10.1155/2017/3908135

Equivalent in Spanish: Plano; posición u orientación con relación a tres ejes. (Beigbeder, 2002)

Definition in Spanish: Orientación del sistema robótico en relación con el plano y los ejes. (Reyes, 2011)

Related Terms: Attitude control; attitude control system; attitude determination; attitude gyro; attitude sensor; etc. (Beigbeder, 2002)

AUGMENTATION

Definition: The action or process of becoming greater. (Merriam-Webster, 2021) An augmentation device is intended to augment the ability of a patient or another device. (Angelo, 2007)

Context: "Novel soft bending actuator-based power augmentation hand exoskeleton controlled by human intention (…)."

Source: PARK ET AL. (2020) Wearable Robotic Glove Design Using Surface-Mounted Actuators. Frontiers in Bioengineering and Biotechnology. Available in: https://doi.org/10.3389/fbioe.2020.548947

Equivalent in Spanish: Aumento; acrecencia. (Beigbeder, 2002)

Definition in Spanish: Unidad de la potencia amplificadora de un sistema o acrecentamiento de un elemento. (RAE, 2014)

Related Terms: Augmentation correction; augmentation distance. (Beigbeder, 2002)

AUTOMATED / AUTONOMOUS ROBOT

Definition: An automated or autonomous robot is a pre-programmed robot capable of independent action without direct supervision from human beings. (IFR, 2021)
Context: "(…) the use of an automated robot for assisted fracture reduction (…)."
Source: BAI ET AL. (2019) Medical Robotics in Bone Fracture Reduction Surgery: A Review. Sensors. Available in: https://doi.org/10.3390/s19163593
Equivalent in Spanish: Robot autónomo. (Reyes, 2011)
Definition in Spanish: Se trata de un robot que tiene la aplicabilidad y capacidad de ejecutar tareas sin la necesidad de comandos o supervisión humana. (Reyes, 2011)

AUTONOMOUS ROBOTIC SYSTEM

Definition: A robot with an autonomous robotic system is capable of independent action. The system operates without pre-programmed behaviours and without direct supervision from human beings. (IFR, 2021)

Context: “Implementing autonomous robotic systems for rehabilitation are presented and discussed (…).”

Source: MORALES ET AL. (2018) Rehabilitation Robotics and Systems. Journal of Healthcare Engineering. Available in: https://doi.org/10.1155/2018/5370127

Equivalent in Spanish: Sistema autónomo robótico. (Reyes, 2011)

Definition in Spanish: El sistema autónomo robótico permite al robot operar con un alto grado de autonomía dentro de los límites preprogramados y sin supervisión humana. (Reyes, 2011)

AXIS

Definition: Straight line about which a body rotates (axis of rotation) or along which its centre of gravity moves (axis of translation). (Angelo, 2007)
Context: “The braided six-tube design could translate and rotate independently about the axis of the pipe.”
Source: RUNCIMAN ET AL. (2019) Soft Robotics in Minimally Invasive Surgery. Soft Robotics SORO. Available in: https://doi.org/10.1089/soro.2018.0136
Equivalent in Spanish: Eje; axis. (Beigbeder, 2002)
Definition in Spanish: Cada una de las líneas según las cuales se puede mover el robot o algún elemento de su estructura. Pueden ser ejes o líneas de desplazamiento longitudinal sobre sí mismo (articulación prismática) o ejes de giro (rotación). Cada eje define un grado de libertad del robot
Related Terms: Axis angle; axis finder; axis-plane; axis-traction; etc. (Beigbeder, 2002)

BATTERY

Definition: An electrochemical energy storage device that serves as a source of direct current or voltage, usually consisting of two or more electrolytic cells that are joined together and function as a single unit. (Angelo, 2007)

Context: "The usable energy, such as non-rechargeable battery, rechargeable battery, (…)."

Source: ZAN YUE ET AL. (2017) Hand Rehabilitation Robotics on Poststroke Motor Recovery. Behavioural Neurology. Available in: https://doi.org/10.1155/2017/3908135

Equivalent in Spanish: Batería; acumulador. (Beigbeder, 2002)

Definition in Spanish: Batería, acumulador o conjunto de acumuladores de energía eléctrica en forma química que libera dicha energía en forma de una corriente continua controlada. (RAE, 2014)

BIOCOMPATIBLE

Definition: Biocompatibility refers to the compatibility with living tissue or a living system by not being toxic, injurious, or physiologically reactive and not causing immunological rejection. (Hsu, 2008)

Context: “The robot is covered by biocompatible waterproof skin and is attached to tubular organ by two rings (…).”

Source: DAMIAN (2019) Regenerative Robotics. Birth Defects Research. Available in: https://doi.org/10.1002/bdr2.1533

Equivalent in Spanish: Biocompatible. (Hsu, 2008)

Definition in Spanish: La biocompatibilidad es la cualidad de un biomaterial de generar una respuesta biológica aceptable y evitar reacciones alérgicas o inmunitarias durante el contacto con tejidos del organismo. (Hsu, 2008)

BIOENGINEERING

Definition: Bioengineering is the application of engineering principles, practices, and technologies to the fields of medicine and biology especially in solving problems and improving care (as in the design of medical devices and diagnostic equipment or the creation of biomaterials and pharmaceuticals). (Merriam-Webster, 2021)

Context: “Robot-assisted therapy has been greatly developed over the past three decades with the advances in robotic technology such as the exoskeleton and bioengineering, which has become a significant supplement to traditional physical therapy.”

Source: ZAN YUE ET AL. (2017) Hand Rehabilitation Robotics on Poststroke Motor Recovery. Behavioural Neurology. Available in: https://doi.org/10.1155/2017/3908135

Equivalent in Spanish: Bioingeniería; biotecnología; ingeniería biológica; biotécnica. (Beigbeder, 2002)

Definition in Spanish: Esta disciplina aplica conceptos fisicomatemáticos para resolver problemas del ámbito de la medicina y de la biología utilizando las metodologías analíticas y sintéticas de la ingeniería. (Llorente, 2016)

BIOFEEDBACK

Definition: Biofeedback refers to the technique of making unconscious or involuntary bodily processes (such as heartbeats or brain waves) perceptible to the senses (as by the use of an oscilloscope) in order to manipulate them by conscious mental control. (Merriam-Webster, 2021)
Context: “A wearable system based on the reaction wheel is used to deliver light-touch-based balance biofeedback on the subject’s back.”
Source: MORALES ET AL. (2018) Rehabilitation Robotics and Systems. Journal of Healthcare Engineering. Available in: https://doi.org/10.1155/2018/5370127
Equivalent in Spanish: Biorretroacción; biorretroalimentación. (Beigbeder, 2002)
Definition in Spanish: Técnica que mide las funciones corporales y brinda información acerca de ellas con el fin de asistir en el entrenamiento para controlar los impulsos involuntarios.
Related Terms: Biofeedback training. (Beigbeder, 2002)

BIOINSPIRED SYSTEMS

Definition: The basis of a bioinspired system it the fact that it has been inspired by or based on biological structures or processes. (Merriam-Webster, 2021)

Context: "An octopus-bioinspired solution to movement and manipulation for soft robots."

Source: CALISTI ET AL. (2017) Fundamentals of Soft Robot Locomotion. Journal of The Royal Society Interface. Available in: https://doi.org/10.1098/rsif.2017.0101

Equivalent in Spanish: Sistema bioinspirado. (Reyes, 2011)

Definition in Spanish: Se trata del uso de fenómenos propios de la biología en sistemas electrónicos construidos por medio de hardware configurable que emulan estructuras o procesos biológicos. (Reyes, 2011)

BIOMECHANICS

Definition: The mechanics of biological and especially musculoskeletal activity, as in locomotion or exercise. (Merriam-Webster, 2021)

Context: "The lower-limb rehabilitation robot still faces numerous technological challenges, including the biomechanics, neurophysiology, human-computer interaction (HCI), and ergonomics."

Source: ZAN YUE ET AL. (2017) Hand Rehabilitation Robotics on Poststroke Motor Recovery. Behavioural Neurology. Available in: https://doi.org/10.1155/2017/3908135

Equivalent in Spanish: Biomecánica. (Beigbeder, 2002)

Definition in Spanish: La biomecánica se refiere al estudio de la mecánica aplicada al cuerpo humano. (Balthazard, 2015)

BIOMIMETIC SYSTEM

Definition: The biomimetic system is a human-made system that can mimic a natural biological system. (Angelo, 2007)
Context: “On the biomimetic design of the Berkeley Lower Extremity Exoskeleton (…).”
Source: ZAN YUE ET AL. (2017) Hand Rehabilitation Robotics on Poststroke Motor Recovery. Behavioural Neurology. Available in: https://doi.org/10.1155/2017/3908135
Equivalent in Spanish: Sistema biomimético. (Beigbeder, 2002)
Definition in Spanish: el Biomimetismo es una rama de la ingeniería biológica que trata de entender la forma en que los organismos vivos, como resultado de la evolución, han resuelto dificultades en el pasado. El sistema biomimético que imita modelos biológicos con el fin de imitarlos y estudiarlos para resolver problemas resueltos en modelos naturales. (Llorente, 2016)
Related terms: Biomimetics; biomimicry. (Angelo, 2007)

BIONICS

Definition: Bionics is a science concerned with the application of data about the functioning of biological systems to the solution of engineering problems. (Merriam-Webster, 2021)
Context: **"**From the perspective of bionics, it may be a good idea, in order to achieve a stable and non-invasive connection, to mimic the human hand holding the fracture segment to move (…)."
Source: BAI ET AL. (2019) Medical Robotics in Bone Fracture Reduction Surgery: A Review. Sensors. Available in: https://doi.org/10.3390/s19163593
Equivalent in Spanish: Biónica; electrónica biológica. (Beigbeder, 2002)
Definition in Spanish: Es la aplicación del estudio de los fenómenos biológicos a la técnica de los sistemas electrónicos y mecánicos. Además, hace referencia al desarrollo de órganos artificiales que recuerdan el funcionamiento natural por medios electromecánicos. (Miralles, 2008)

BOWDEN CABLE or BOWDEN WIRE

Definition: The Bowden Cable or Wire is a spring steel wire enclosed in a spiral wire casing for transmitting longitudinal motion at a distance especially around curves.

Context: “A more conventional approach to producing high forces and strains in soft, actuated structures is based on tendon- or Bowden-cable transmissions (…).”

Source: ZHU ET AL. (2019) Fluidic Fabric Muscle Sheets for Wearable and Soft Robotics. Soft Robotics SORO. Available in: https://doi.org/10.1089/soro.2019.0033

Equivalent in Spanish: Cable Bowden. (Reyes, 2011)

Definition in Spanish: Transmisor flexible de movimientos de tracción, presión y rotación adecuado también para puentea distancias prolongadas. (Reyes, 2011)

CABLE-DRIVEN MECHANISM

Definition A cable-driven mechanism refers to a motor that pulls a cable to move the links. (Hsu, 2008)

Context: “Cable-driven mechanisms are among the most common actuation methods for these underactuated soft flexure joints.”

Source: MOHAMMADI ET AL. (2020) A Practical 3D-printed Soft Robotic Prosthetic Hand with Multi-articulating Capabilities. PLOS ONE. Available in: https://doi.org/10.1371/journal.pone.0232766

Equivalent in Spanish: Mecanismo de accionamiento por cable. (Beigbeder, 2002)

Definition in Spanish: Mecanismo en el que un accionador genera movimiento a través de un cable. (Reyes, 2011)

CLOSED LOOP

Definition: 'Closed loop' is the term applied to an electrical or mechanical system in which the output is compared with the input (command) signal, and any discrepancy between the two, results in corrective action by the system elements. (Hsu, 2008)

Context: "How to optimize cell regeneration in a closed loop control (…)."

Source: DAMIAN (2019) Regenerative Robotics. Birth Defects Research. Available in: https://doi.org/10.1002/bdr2.1533

Equivalent in Spanish: Sistema de bucle cerrado. (Beigbeder, 2002)

Definition in Spanish: Un sistema de control de bucle cerrado es un dispositivo técnico diseñado para mantener automáticamente una variable controlada X en un valor definido, el valor de referencia W. (Reyes, 2011)

COMMAND

Definition: A command is a type of signal that initiates or triggers an action in the device that receives it. In the operation of robot systems, a command is also called an instruction. (Angelo, 2007)

Context: “It used voice-controlled commands to provide hands-free intraoperative manoeuvring.”

Source: GEORGE ET AL. (2018) Origins of Robotic Surgery: From Scepticism to Standard of Care. JSLS: Journal of the Society of Laparoendoscopic Surgeons. Available in: https://doi.org/10.4293/JSLS.2018.00039

Equivalent in Spanish: Comando; orden; instrucción. (Beigbeder, 2002)

Definition in Spanish: Instrucción que se da a una computadora o sistema para generar la activación o desactivación de un elemento de este. (Reyes, 2011)

COMPOSITE MATERIALS

Definition: These are structural materials of metals, ceramics, or plastics with built-in strengthening agents that may be in the form of filaments, foils, powders, or flakes of a different compatible material. (Hsu, 2008)

Context: "(…) robots featuring smart soft composite materials (…)."

Source: CALISTI ET AL. (2017) Fundamentals of Soft Robot Locomotion. Journal of The Royal Society Interface. Available in: https://doi.org/10.1098/rsif.2017.0101

Equivalent in Spanish: Material compuesto; material estructural. (Beigbeder, 2002)

Definition in Spanish: Se trata de un sistema material integrado por una combinación de dos o más micro- o macroestructuras que difieren en forma y composición química y que son esencialmente insolubles entre sí. (Reyes, 2011)

COMPUTERISED ROBOT / SERVO-CONTROLLED ROBOT

Definition: A computerised robot is a servo-controlled type of robot run by a computer. This type of robot is also called a smart robot because the controller for such machine devices can learn new instructions through electronic signal transmissions. (Angelo, 2007)

Context: “The impedance control based on position, is easier to realize in servo-controlled (computerized) robots (…).”

Source: ZAN YUE ET AL. (2017) Hand Rehabilitation Robotics on Poststroke Motor Recovery. Behavioural Neurology. Available in: https://doi.org/10.1155/2017/3908135

Equivalent in Spanish: Robot servo-controlado; robot manipulador preajustable; robot controlado por ordenador. (Reyes, 2011)

Definition in Spanish: Manipulador automático servo-controlado, reprogramable mediante señales eléctricas, polivalente, de tres o más ejes que puede posicionar y orientar materias, piezas, herramientas o dispositivos especiales s, siguiendo trayectorias variables reprogramables, para la ejecución de diversos trabajos. (Reyes, 2011)

CONSOLE / CONTROL CONSOLE

Definition: A desk-like array of controls, indicators, and video display devices for the monitoring and controlling of robot operations. (Angelo, 2017)

Context: "In comparison, one of the main advantages of ZEUS was that it had the experimental capacity for remote surgery (which the initial da Vinci did not, because it was only directly connected by cable to the surgeon's console (…)."

Source: GEORGE ET AL. (2018) Origins of Robotic Surgery: From Scepticism to Standard of Care. JSLS: Journal of the Society of Laparoendoscopic Surgeons. Available in: https://doi.org/10.4293/JSLS.2018.00039

Equivalent in Spanish: Consola o consola de control. (Beigbeder, 2002)

Definition in Spanish: Una consola es un sistema electrónico encargado de suministrar energía al robot para su movimiento a través de instrucciones de programación. Además, incluye los algoritmos de control programados en el sistema operativo para guiar al robot. (Reyes, 2011)

CONTINUOUS PATH ROBOT

Definition: One of the basic types of servo-controlled robots. The learning process of continuous path robots requires interaction with a human. A human physically moves the robot's manipulator arm through whatever series of motions it is expected to perform. These learned or rehearsed motions are then stored in the robot's computer for future recall. (Angelo, 2007)
Context: "The robot offers continuous path force to the hand during the motion."
Source: ZAN YUE ET AL. (2017) Hand Rehabilitation Robotics on Poststroke Motor Recovery. Behavioural Neurology. Available in: https://doi.org/10.1155/2017/3908135
Equivalent in Spanish: Robot de repetición o aprendizaje; robot de secuencia fija. (Reyes, 2011)
Definition in Spanish: Estos robots son manipuladores que se limitan a repetir una secuencia de movimientos previamente ejecutada por un operador humano. En este tipo de robots, el operario en la fase de enseñanza programa los movimientos que el robot deberá realizar y los almacena en su memoria. (Reyes, 2011)

CONTROLLER

Definition: A device that converts an input signal from a controlled variable (such as temperature, pressure, fluid level, or fluid flow rate) into a valve actuator (pneumatic, hydraulic, electrical, or mechanical) input signal to vary the valve position so as to provide the required correction of the controlled variable. In the case of some robots, the controller stores data and directs the movement of the robot's manipulator. (Angelo, 2007)

Context: "The robotic system consists of two control schemes: in the opening course, the robot is controlled by the PID position controller and in the closing course, the robot offers a resistive force that composed of a constant force and a damping component (…)."

Source: ZAN YUE ET AL. (2017) Hand Rehabilitation Robotics on Poststroke Motor Recovery. Behavioural Neurology. Available in: https://doi.org/10.1155/2017/3908135

Equivalent in Spanish: Controlador. (Beigbeder, 2002)

Definition in Spanish: El controlador es el componente del robot que procesa la información captada por los sensores, y según las instrucciones del programa que almacena y regula el movimiento de los motores u otros dispositivos de salida. (Reyes, 2011)

DEGREES OF FREEDOM (DOF)

Definition: A mode of motion, either angular or linear, with respect to a coordinate system, independent of any other mode. A body in motion has six possible degrees of freedom, three linear (sometimes called x-, y-, and z-motion with reference to linear [axial] movements in the Cartesian coordinate system) and three angular (sometimes called: pitch, yaw, and roll with reference to angular movements). For example, each joint in a serial robot represents a degree of freedom. (Angelo, 2007)

Context: “Yan et al. Proposed a robot formed by a 5-DOF industrial serial robotic arm combined with a 3-DOF parallel structure end.”

Source: BAI ET AL. (2019) Medical Robotics in Bone Fracture Reduction Surgery: A Review. Sensors. Available in: https://doi.org/10.3390/s19163593

Equivalent in Spanish: Grados de Libertad (GDL). (Beigbeder, 2002)

Definition in Spanish: En robótica, los grados de libertad hacen referencia a el número de movimientos independientes que el robot puede realizar. (Reyes, 2011)

DIRECT DRIVE MOTOR

Definition: A direct-drive motor is an actuator for a robot manipulator with high driving torque and accurate positioning abilities. (Angelo, 2007)
Context: "(…) the design principles for a direct-drive legged robot (…)."
Source: CALISTI ET AL. (2017) Fundamentals of Soft Robot Locomotion. Journal of The Royal Society Interface. Available in: https://doi.org/10.1098/rsif.2017.0101
Equivalent in Spanish: Motor de trasmisión directa. (Reyes, 2011)
Definition in Spanish: Un robot con un motor de transmisión directa es un manipulador multifuncional reprogramable de uso general para realizar una amplia variedad de tareas, formado por eslabones rígidos conectados en serie a través de articulaciones fabricadas con servomotores de transmisión directa. (Reyes, 2011)

END-EFFECTOR / ENDEFFECTOR

Definition: A robot's end-effector (hand or gripping device) generally is attached to the end of the manipulator arm. Typical functions of the end-effector include grasping, pushing, and pulling, twisting, using tools, or performing insertions. End-effectors can be mechanical, vacuum, or magnetically operated, can use a snare device or have some other unusual design feature. The final design of the end effector is determined by the shapes of the objects that the robot must grasp. Usually, most end-effectors are usually gripping or clamping devices. (Angelo, 2007)

Context: "To achieve more precise control, calibration of the robot is researched to study the exact position of end-effector in the camera space (…)."

Source: BAI ET AL. (2019) Medical Robotics in Bone Fracture Reduction Surgery: A Review. Sensors. Available in: https://doi.org/10.3390/s19163593

Equivalent in Spanish: Efector final, extremo final. (Reyes, 2011)

Definition in Spanish: Es la parte terminal o final del último eslabón, destinado a colocar la herramienta adecuada para una aplicación específica. (Reyes, 2011)

EXOMUSCULATURE

Definition: The synthetic exomusculature is the musculature attached to part of an exoskeleton, both inspired by the capabilities of a biological muscle or skeleton. (Hsu, 2008)
Context: "A soft robotic exomusculature glove with integrated sEMG sensing for hand rehabilitation, (…)."
Source: ZAN YUE ET AL. (2017) Hand Rehabilitation Robotics on Poststroke Motor Recovery. Behavioural Neurology. Available in: https://doi.org/10.1155/2017/3908135
Equivalent in Spanish: Exomusculatura. (Hsu, 2008)
Definition in Spanish: Musculatura sintética bioinspirada que forma parte de la estructura de un exoesqueleto. (Hsu, 2008)

EXOSKELETON

Definition: An artificial external supporting structure inspired by the capabilities of a biological skeleton, with the focus on augmenting the physical strength abilities while maintaining complete task awareness through feedback with the patient. (Angelo, 2007)

Context: "Designed an underactuation jointless exoskeleton that can be safe in motion and light in weight (…)."

Source: ZAN YUE ET AL. (2017) Hand Rehabilitation Robotics on Poststroke Motor Recovery. Behavioural Neurology. Available in: https://doi.org/10.1155/2017/3908135

Equivalent in Spanish: Exoesqueleto. (Hsu, 2008)

Definition in Spanish: Estructura externa artificial bioinspirada que sirve para asistir los movimientos o aumentar las capacidades del individuo. (Hsu, 2008)

FEEDBACK LOOP

Definition: A feedback loop is the part of a system in which some portion of that system's output is used as input for future behaviour. (Angelo, 2007)

Context: “The award of completing a motion presented by a computer program would reinforce the motor feedback loop and inspire more motivations in the next motion (…).”

Source: ZAN YUE ET AL. (2017) Hand Rehabilitation Robotics on Poststroke Motor Recovery. Behavioural Neurology. Available in: https://doi.org/10.1155/2017/3908135

Equivalent in Spanish: Bucle de retroalimentación o *feedback.* (Beigbeder, 2002)

Definition in Spanish: Realimentación o *feedback* se entiende al proceso del cual, cuando se actúa sobre un determinado sistema, se obtiene continuamente información sobre los resultados de las decisiones tomadas, información que servirá para tomar las decisiones sucesivas. (Reyes, 2011)

FIELD OF VIEW (FOV)

Definition: The area or solid angle than can be viewed through or scanned by a remote-sensing (optical) instrument. (Angelo, 2007)

Context: “The monitor allowed for a 120- degree field of view with a liquid-crystal shutter, (…).”

Source: GEORGE ET AL. (2018) Origins of Robotic Surgery: From Scepticism to Standard of Care. JSLS: Journal of the Society of Laparoendoscopic Surgeons. Available in: https://doi.org/10.4293/JSLS.2018.00039

Equivalent in Spanish: Campo visual. (Beigbeder, 2002)

Definition in Spanish: Se refiere al área total en la cual los objetos se pueden ver en la visión lateral (periférica). (Reyes, 2011)

GAIT

Definition: A manner of walking. Observation of gait can provide early diagnostic clues for a number of disorders, including cerebral palsy, Parkinson's disease, and Rett syndrome. (Hsu, 2008)
Context: “Functional gait training positively affects the recovery of locomotor function (...).”
Source: GASSERT & DIETZ (2018) Rehabilitation Robots for the Treatment of Sensorimotor Deficits: A Neurophysiological Perspective. Journal of NeuroEngineering and Rehabilitation. Available in: https://doi.org/10.1186/s12984-018-0383-x
Equivalent in Spanish: Forma o modo de caminar. (Beigbeder, 2002)
Definition in Spanish: Se refiere a la manera en la que un individuo camina. (Hsu, 2008)

HYDRAULIC ROBOT or LIMB

Definition: An industrial robot that uses hydraulic power to move its arm, wrist, and end effector. The hydraulic power supply is often located some distance away from the robot's work site and generally consists of a motor-driven pump, reservoir for the hydraulic fluid, a filter, heat exchanger, and pipes to deliver the pressurized hydraulic fluid to the robot. (Angelo, 2007)
Context: "Fully soft 3D-printed electroactive fluidic valve for soft hydraulic robots (…)."
Source: RUNCIMAN ET AL. (2019) Soft Robotics in Minimally Invasive Surgery. Soft Robotics SORO. Available in: https://doi.org/10.1089/soro.2018.0136
Equivalent in Spanish: Robot o extremidad hidráulica. (Hsu, 2008)
Definition in Spanish: Un robot o una extremidad hidráulica es aquella que emplea un fluido, normalmente aceite o agua, para el movimiento de los mecanismos del dispositivo. (Reyes, 2011)

MANIPULATOR / MECHANICAL MANIPULATOR

Definition: A manipulator is a mechanical device capable of for handling objects; frequently involving remote operations (i.e., teleoperation) and/or hazardous substances or environmental conditions. A robot's manipulator is often designed to mimic the movement of the human shoulder, arm, wrist, hand, and fingers. A manipulator generally has a versatile end effector that can respond to a variety of different handling requirements. (Angelo, 2007)

Context: "The dexterous five-finger/three-finger manipulator that simulates the rigid-flexible combination of human hands can be used in a reduction robot to achieve a non-invasive bone–robot connection by grasping."

Source: BAI ET AL. (2019) Medical Robotics in Bone Fracture Reduction Surgery: A Review. Sensors. Available in: https://doi.org/10.3390/s19163593

Equivalent in Spanish: Manipulador mecánico; telemanipulador. (Beigbeder, 2002)

Definition in Spanish: Un manipulador mecánico es esencialmente un brazo robótico articulado que le permite a un usuario mover, agarrar o actuar sobre diferentes objetos o dispositivos con el fin de optimizar tareas repetitivas, tareas que requieren alta precisión y flexibilidad o simplemente evitar el contacto del usuario con ciertas sustancias u objetos que le puedan causar algún daño físico. (Reyes, 2011)

MECHATRONICS

Definition: Mechatronics refers to the technology that combines both electronic and mechanical engineering. (Merriam-Webster, 2021)

Context: "(…) the robot was limited in the length of tissue it can grow due to the fixed mechatronics design."

Source: DAMIAN (2019) Regenerative Robotics. Birth Defects Research. Available in: https://doi.org/10.1002/bdr2.1533

Equivalent in Spanish: Mecatrónica. (Beigbeder, 2002)

Definition in Spanish: La mecatrónica es la integración de los sistemas mecánicos con la electrónica. (Reyes, 2011)

HUMAN-MACHINE INTERFACE

Definition: The boundary where human and machine characteristics and capabilities are joined in order to obtain optimum operating conditions and maximum efficiency of the combined human-machine system. A joystick and a control panel are examples of man-machine interfaces. (Angelo, 2007)

Context: "Use of unobtrusive human-machine interface for rehabilitation of stroke victims through robot assisted mirror therapy (…)."

Source: ZAN YUE ET AL. (2017) Hand Rehabilitation Robotics on Poststroke Motor Recovery. Behavioural Neurology. Available in: https://doi.org/10.1155/2017/3908135

Equivalent in Spanish: Interfaz Hombre-Máquina o Interfaz Humano-Máquina. (Reyes, 2011)

Definition in Spanish: Hace referencia a un panel que permite al usuario comunicarse con una máquina, software o sistema para controlar mediante un *joystick* los datos mostrados por la interfaz gráfica. (Reyes, 2011)

MASTER-SLAVE MANIPULATOR

Definition: A class of teleoperator that contains isomorphic "master and slave" arms. The master manipulator is held and positioned by a technician and the slave manipulator duplicates the motions, sometimes with a change in scale in displacement (providing either exaggerated or reduced movements) or force (providing either more fore than a human hand can exert or at other times being limited independent of the tactile force applied by the human operator). (Angelo, 2007)
Context: "A novel master-slave teleoperation robot was proposed (...)."
Source: BAI ET AL. (2019) Medical Robotics in Bone Fracture Reduction Surgery: A Review. Sensors. Available in: https://doi.org/10.3390/s19163593
Equivalent in Spanish: Sistema maestro-esclavo; control en cascada. (Reyes, 2011)
Definition in Spanish: El sistema maestro-esclavo permite el control simultáneo de múltiples receptores interconectados; éste consiste en conectar la señal de salida de un controlador al *setpoint* de otro controlador. El primer controlador (llamado primario o maestro) esencialmente 'da órdenes' al segundo controlador (llamado secundario o esclavo) a través de una señal de *setpoint* remoto. (Reyes, 2011)

NEURO ENGINEERING / NEUROENGINEERING

Definition: The application of engineering principles and techniques to the field of neuroscience especially to study, restore, or enhance nervous system function. The focus of neuro engineering includes neuroimaging, creation of neural tissue, establishment of direct pathways between the brain and a computer, and use of implantable devices to restore sensory, motor, or cognitive function. (Hsu, 2008)
Context: "(…) in the Journal of Neuroengineering and Rehabilitation."
Source: ZAN YUE ET AL. (2017) Hand Rehabilitation Robotics on Poststroke Motor Recovery. Behavioural Neurology. Available in: https://doi.org/10.1155/2017/3908135
Equivalent in Spanish: Neuroingeniería. (Hsu, 2008)
Definition in Spanish: La neuroingeniería es la disciplina que hace uso de principios y técnicas de ingeniería para estudiar, reparar, reemplazar, mejorar o tratar enfermedades de los sistemas neuronales. (Hsu, 2008)

NEUROFEEDBACK

Definition: The technique of making brain activity perceptible to the senses, as by recording brain waves with an electroencephalograph and presenting them visually or audibly, in order to consciously alter such activity. (Hsu, 2008)

Context: "Combined action observation and motor imagery neurofeedback for modulation of brain activity (…)."

Source: ZAN YUE ET AL. (2017) Hand Rehabilitation Robotics on Poststroke Motor Recovery. Behavioural Neurology. Available in: https://doi.org/10.1155/2017/3908135

Equivalent in Spanish: Neurofeedback; retroalimentación electroencefalográfica. (Hsu, 2008)

Definition in Spanish: Forma de entrenamiento en *biofeedback* que utiliza el registro de las ondas electroencefalográficas (EEG) cerebrales como la señal para lograr a través del proceso de *feedback* el control de la propia actividad cerebral. Además, sirve como un tratamiento neurocomportamental destinado a la adquisición de autocontrol sobre determinados patrones de actividad cerebral y la aplicación de estas habilidades en las actividades de la vida diaria. (Hsu, 2008)

NEUROPROSTHESIS

Definition: Devices that use electrodes to interface with the nervous system with the aim of restoring movement that has been lost due to spinal cord injury. Neuroprostheses assist on the rehabilitation of movement in paralyzed patients by bypassing damaged regions of the nervous system. (Hsu, 2008)
Context: "Proprioceptive feedback and brain computer interface (BCI) based neuroprostheses (…)."
Source: ZAN YUE ET AL. (2017) Hand Rehabilitation Robotics on Poststroke Motor Recovery. Behavioural Neurology. Available in: https://doi.org/10.1155/2017/3908135
Equivalent in Spanish: Neuroprótesis. (Hsu, 2008)
Definition in Spanish: Neuroprótesis son tecnologías de estimulación eléctrica que reemplazan o asisten a los sistemas y organismos neuromusculares dañados o funcionando mal, e intentan restaurar procesos corporales normales, creando o mejorando la función, y / o reduciendo el dolor. (Hsu, 2008)

OPTICAL ENCODER

Definition: An optical encoder is a type of motion sensing device that uses light shone through a coded disk to track the movement of a shaft. The encoder provides feedback based on the interruption of light. (Q. Mei, 2006)

Context: "An optical encoder was used to record the position for the distal end of FFMS."

Source: ZHU ET AL. (2019) Fluidic Fabric Muscle Sheets for Wearable and Soft Robotics. Soft Robotics SORO. Available in: https://doi.org/10.1089/soro.2019.0033

Equivalent in Spanish: *Encoder* óptico. (Reyes, 2011)

Definition in Spanish: Estos sensores digitales o *encoders* construidos con tecnología optoelectrónica, proporcionan información del desplazamiento articular. (Reyes, 2011)

ORTHOPAEDICS

Definition: A branch of medicine concerned with the correction or prevention of deformities, disorders, or injuries of the skeleton and associated structures, such as tendons and ligaments. (Merriam-Webster, 2021)

Context: “We have reviewed the literature on the efficacy, safety and current understanding of the use of robotics in orthopaedics.”

Source: KARTHIK ET AL. (2015) Robotic surgery in trauma and orthopaedics. The Bone & Joint Journal. Available in: https://doi.org/10.1302/0301-620x.97b3.35107

Equivalent in Spanish: Ortopedia. (Bowker, 2002)

Definition in Spanish: Ciencia dedicada a corregir o de evitar las deformidades del cuerpo humano, por medio de ciertos aparatos o de ejercicios corporales. (RAE, 2014)

ORTHOPAEDIC SURGERY

Definition: Branch of surgery concerned with disorders in locomotion of the spine and joints, as well as the repair of said disorders and deformities of these parts. (Bowker, 2002)

Context: "Orthopaedic surgery was one of the earlier surgical specialties to trial robotic surgery in clinical practice and its use is increasing, with promising short-term results."

Source: KARTHIK ET AL. (2015) Robotic surgery in trauma and orthopaedics. The Bone & Joint Journal. Available in: https://doi.org/10.1302/0301-620x.97b3.35107

Equivalent in Spanish: Cirugía ortopédica. (Bowker, 2002)

Definition in Spanish: La cirugía ortopédica es un campo de la cirugía centrado en los desórdenes del aparato locomotor y sus partes, cuyo objetivo es resolver diversos trastornos del aparato esquelético y locomotor (o disminuir sus síntomas). (Hsu, 2008)

ORTHOSIS

Definition: An orthosis is an external medical device, such as a brace or splint, for supporting, immobilizing, or treating muscles, joints, or skeletal parts which are weak, ineffective, deformed, or injured. (Merriam-Webster, 2021)
Context: "Developments of rehabilitations robots for the lower extremity began (…) combining body weight supported treadmill training with the assistance of a robotic gait orthosis."
Source: ZAN YUE ET AL. (2017) Hand Rehabilitation Robotics on Poststroke Motor Recovery. Behavioural Neurology. Available in: https://doi.org/10.1155/2017/3908135
Equivalent in Spanish: Órtesis. (Bowker, 2002)
Definition in Spanish: Dispositivos, soportes y apoyos elaborados con la finalidad de brindar asistencia al sistema neuromusculoesquelético, los cuales realizan trabajos de sujeción, estabilización, alineación o corrección. (RAE, 2014)

POTENTIOMETER

Definition: A potentiometer is a type of position sensor used to measure displacement in any direction. (Angelo, 2008)

Context: “A potentiometer is an electrical resistor attached to the shaft of each motor to measure the position of the shaft.”

Source: MOHAMMADI ET AL. (2020) A Practical 3D-printed Soft Robotic Prosthetic Hand with Multi-articulating Capabilities. PLOS ONE. Available in: https://doi.org/10.1371/journal.pone.0232766

Equivalent in Spanish: Potenciómetro. (Beigbeder, 2002)

Definition in Spanish: Un potenciómetro es un resistor eléctrico con un valor de resistencia variable y ajustable manualmente, que limita el paso de la corriente eléctrica. (Reyes, 2011)

Related Terms: Electronic potentiometer; pressure potentiometer; digital potentiometer; bias potentiometer; centring potentiometer; inductive potentiometer; etc. (Beigbeder, 2002)

PROSTHESIS

Definition: A prosthesis is an artificial device that serves to replace or augment a missing or impaired part of the body. (Merriam-Webster, 2021)

Context: "In recent years, the number of papers on rehabilitation robotics, service robotics, and smart home has shown a strong and sustained increase, with a small but noticeable growth in work on prosthesis."

Source: KREBS & VOLPE (2013) Rehabilitation Robotics. Neurological Rehabilitation. Available in: https://doi.org/10.1016/B978-0-444-52901-5.00023-X

Equivalent in Spanish: Prótesis. (Beigbeder, 2002)

Definition in Spanish: Pieza o aparato empleados para sustituir un órgano o un miembro del cuerpo. (RAE, 2014)

Related Terms: Electronic prosthesis; joint prosthesis; dental prosthesis. (Beigbeder, 2002)

PROSTHETICS

Definition: Prosthetics is the surgical or dental specialty concerned with the design, construction, and fitting of prostheses. (Merriam-Webster, 2021)

Context: “This, in essence, constitutes a paradigm shift moving the field of rehabilitation robotics beyond assistive technology (prosthetics and orthotics) that helps an individual cope with the environment to a new class of physically interactive, user-friendly robots that facilitate recovery.”

Source: KREBS & VOLPE (2013) Rehabilitation Robotics. Neurological Rehabilitation. Available in: https://doi.org/10.1016/B978-0-444-52901-5.00023-X

Equivalent in Spanish: Especialización en prótesis. (Beigbeder, 2002)

Definition in Spanish: Los especialistas protésicos diseñan y ajustan dispositivos quirúrgicos y extremidades artificiales. (Hsu, 2008)

REMOTE CONTROL

Definition: Remote control allows for control of an operation from a distance, especially by means of telemetry and electronics; it usually requires a controlling switch, level, or other device used in this type of control, as in remote-control arming switch. (Angelo, 2007)
Context: "The major advantage of the fracture reduction surgery robot is its effective reduction of radiation via the remote control and automatic control."
Source: BAI ET AL. (2019) Medical Robotics in Bone Fracture Reduction Surgery: A Review. Sensors. Available in: https://doi.org/10.3390/s19163593
Equivalent in Spanish: Control remoto; control a distancia. (Beigbeder, 2002)
Definition in Spanish: Un control remoto es un dispositivo electrónico capaz de administrar el funcionamiento de una máquina o sistema a distancia mediante señales telemétricas. (Reyes, 2011)

Definition: A smart machine that does routine, repetitive, sometimes hazardous mechanical tasks, or performs other operations either under direct human command and control or on its own, using a computer with embedded software (which contains previously loaded commands and instructions) or with an advanced level of machine (artificial) intelligence (which bases decisions and actions on data gathered by the robot about its current environment.) Robotic devices, or robots, are primarily smart machines with manipulators or other devices that can be programmed to do a variety of manual or human labour tasks automatically. (Angelo, 2007)

Context: "The robot supported the weight of the limb while offering negligible resistance to motion."

Source: KREBS & VOLPE (2013) Rehabilitation Robotics. Neurological Rehabilitation. Available in: https://doi.org/10.1016/B978-0-444-52901-5.00023-X

Equivalent in Spanish: Robot; autómata. (Beigbeder, 2002)

Definition in Spanish: Manipulador multifunctional reprogrammable diseñado para mover materiales, partes, herramientas o dispositivos especializados a través de movimientos programados para la ejecución de una variedad de tareas. (Reyes, 2011)

ROBOT TYPES (Reyes, 2011)

- MOBILE ROBOTS

Definition: Mobile robots are software-controlled machines that use sensors, as well as other technology, to identify its surroundings and move around. (IFR, 2021)

Equivalent in Spanish: Robot móvil.

Definition in Spanish: Los robots móviles pueden ser terrestres, marinos y aéreos, de acuerdo con el medio en el que se desplacen. A menudo, tienen aplicaciones en rastreo y traslado de objetos, evasión de obstáculos, traslado de instrumental quirúrgico, y demás.

- HUMANOID ROBOTS

Definition: A sophisticated robot system constructed with some resemblance to a human being, such as arms, legs, a torso, and a head, but which still retains sufficient mechanical characteristics so that the system is not an android (the fully autonomous human-like machine). (IFR, 2021)

Equivalent in Spanish: Robot humanoid o androide.

Definition in Spanish: Los robots humanoides son máquinas antropomórficas capaces de imitar las funciones básicas del ser humano.

- INDUSTRIAL ROBOTS

Definition: This type of robots is often used in production lines to manipulate products quickly and delicately, increasing productivity and relieving workers from repetitive tasks. (IFR, 2021)

Equivalent in Spanish: Robot industrial.

Definition in Spanish: Los robots industriales sirven para automatizar líneas de producción, aumentando así la competitividad, productividad, eficiencia y rentabilidad de las empresas.

ROBOTICS

Definition: Robotics is the science and technology of designing, building, and programming robots. (Merriam-Webster, 2021)

Context: “There is both a need and an opportunity to deploy technologies such as robotics to assist recovery.”

Source: KREBS & VOLPE (2013) Rehabilitation Robotics. Neurological Rehabilitation. Available in: https://doi.org/10.1016/B978-0-444-52901-5.00023-X

Equivalent in Spanish: Robótica. (Beigbeder, 2002)

Definition in Spanish: Técnica que aplica la informática y la ingeniería al diseño y empleo de aparatos que, en sustitución de personas, realizan operaciones o trabajos, por lo general en instalaciones industriales. (RAE, 2014)

SENSOR

Definition: In general, a sensor is a device that detects and/or measures certain types of physically observable phenomena. More specifically, it refers to that part of an electronic instrument that detects characteristic emissions from a target or object at some distance away and then converts these incident emissions into a quantity that is amplified, measured (quantified), displayed, and/or recorded by another part of the instrument. A passive sensor uses characteristic emissions from the object or target as its input signal. In contrast, an active sensor (like a radar) places a burst of electromagnetic energy on the object or target being observed and then uses the reflected signal as its input. (Angelo, 2007)
Context: "Sensor networks for precise motion control and visual serving (…)."
Source: MORALES ET AL. (2018) Rehabilitation Robotics and Systems. Journal of Healthcare Engineering. Available in: https://doi.org/10.1155/2018/5370127
Equivalent in Spanish: Sensor. (Beigbeder, 2002)
Definition in Spanish: Dispositivo que detecta una determinada acción externa, temperatura, presión, etc., y la transmite adecuadamente. (RAE, 2014) Los sensores proporcionan información sobre el estado interno del robot.
Related Terms: Microelectronic sensor; temperature sensor; position sensor; etc. (Beigbeder, 2002)

SENSOR TYPES (Reyes, 2011)

- RESOLVER

Definition: Resolvers are angular accuracy position sensors that consist of a stationary stator and a movable rotor, often used for position and speed feedback in servomotors (Zhang, 2010)

Equivalent in Spanish: Resolver.

Definition in Spanish: Dispositivo que mide el desplazamiento integrado en los servomotores; formado por un estator, rotor y transformador giratorio sin escobillas (*brushless resolver*).

- POTENCIOMETER

Definition: The potentiometer sensors measure the distance and displacement of objects in a linear or rotary motion, to then convert it into an electrical signal. (Zhang, 2010)

Equivalent in Spanish: Potenciómetro.

Definition in Spanish: Es un dispositivo eléctrico que se emplea como diversor de voltaje para medir la posición o desplazamiento articular de los servomotores.

- TACHOMETER

Definition: This type of device is used to measure the rotation speed of an object, for example the engine shaft. (Zhang, 2010)

Equivalent in Spanish: Tacómetro.

Definition in Spanish: Se trata de un dispositivo acoplado mecánicamente al servomotor y proporciona un voltaje proporcional a la velocidad de giro del rotor.

SENSORY ROBOT

Definition: A sensory robot is one that has been computerized with one or more artificial senses to observe and record its environment and to feed information back to the controller. The artificial senses most frequently employed are sight (robot or computer vision) and touch (tactile sensors). (Angelo, 2007)
Context: "(…) the development of intrinsically-actuated multisensory robot (…)."
Source: MOHAMMADI ET AL. (2020) A Practical 3D-printed Soft Robotic Prosthetic Hand with Multi-articulating Capabilities. PLOS ONE. Available in: https://doi.org/10.1371/journal.pone.0232766
Equivalent in Spanish: Robot de control sensorizado; robot de tercera generación. (Reyes, 2011)
Definition in Spanish: Un tipo de robot que dispone de un controlador o computadora que ejecuta las órdenes de un programa y las envía al manipulador para que realice los movimientos necesarios guiados por visión artificial u otro sentido. (Reyes, 2011)

SERVOMECHANISM / SERVO

Definition: A device that helps control, usually by hydraulic means, a large moment of inertia by the application of a relatively small moment of inertia. (Angelo, 2007)
Context: "Positional servo-mechanism activated by artificial muscles (…)."
Source: ZHU ET AL. (2019) Fluidic Fabric Muscle Sheets for Wearable and Soft Robotics. Soft Robotics SORO. Available in: https://doi.org/10.1089/soro.2019.0033
Equivalent in Spanish: Servomecanismo. (Beigbeder, 2002)
Definition in Spanish: El servomecanismo está constituido por un tipo de motor, que hace posible la rotación y el desplazamiento rectilíneo, que posee sensores de posición y/o velocidad, un mecanismo de realimentación y un controlador que permite controlar la posición o la velocidad del motor. (Reyes, 2011)
Related Terms: Positional servomechanism; limiting servomechanism; on-off servomechanism; digital servomechanism; linear servomechanism; etc. (Beigbeder, 2002)

SERVO MOTOR

Definition: A servo motor is an electromechanical rotary or linear actuator that produces torque and velocity based on the supplied current and voltage and allows for precise control of angular or linear position. (Zhang, 2010)
Context: **“**The servo motor is used to actuate the finger which consists of only one flexure joint.”
Source: MOHAMMADI ET AL. (2020) A Practical 3D-printed Soft Robotic Prosthetic Hand with Multi-articulating Capabilities. PLOS ONE. Available in: https://doi.org/10.1371/journal.pone.0232766
Equivalent in Spanish: Servomotor. (Reyes, 2011)
Definition in Spanish: El servomotor es un sistema electromecánico fundamental para el diseño y construcción de un robot; éste, pertenece a un tipo específico de actuador eléctrico encargado de transmitir energía para producir movimiento en el robot. Además, forma las uniones o articulaciones del robot. (Reyes, 2011)

SHAFT / LINK

Definition: A bar or rod, almost always cylindrical, used to support rotating pieces or to transmit power or motion by rotation. (Angelo, 2007)
Context: "The typical representative is the intelligent minimally invasive surgical robotic system for the femoral shaft fracture (…)."
Source: BAI ET AL. (2019) Medical Robotics in Bone Fracture Reduction Surgery: A Review. Sensors. Available in: https://doi.org/10.3390/s19163593
Equivalent in Spanish: Eje; cilindro; eslabón. (Beigbeder, 2002)
Definition in Spanish: Es una barra metálica acoplada mecánicamente al rotor y al estator de la siguiente articulación utilizada para transmitir movimiento. (Reyes, 2011)

SIGNAL

Definition: A signal in robotics can be the information to be transmitted over a communications system; a visible, audible, or other indication used to convey information; any carrier of information as opposed to noise; in electronics, any transmitted electrical impulse, where the variation of amplitude, frequency, and waveform are used to convey information. (Angelo, 2007)

Context: "The hardware system is the foundation of hand rehabilitation robots. It decides the possible types of motion the robots can offer to the patients and the possible signals the robots can obtain from patients."

Source: ZAN YUE ET AL. (2017) Hand Rehabilitation Robotics on Poststroke Motor Recovery. Behavioural Neurology. Available in: https://doi.org/10.1155/2017/3908135

Equivalent in Spanish: Señal **–** Puede ser acústica, legible, informative, visual, automática, electrónica, luminosa, etc. (Beigbeder, 2002)

Definition in Spanish: Información que se transmite mediante un sistema de comunicación acústica, visual u otro medio. (Reyes, 2011)

Related Terms: Audible signal; readable signal; intelligence signal; automatic signal; electric signal; luminous signal; attention signal; etc. (Beigbeder, 2002)

SIMULATION

Definition: The art of replicating relevant portions of the real-world environment to test equipment, train personnel, and prepare for emergencies. Simulations can involve the use of physical mass and energy replicants, high-fidelity hardware, and supporting software. (Angelo, 2007)
Context: "Modelling and simulation for robotic rehabilitation system (…)."
Source: MORALES ET AL. (2018) Rehabilitation Robotics and Systems. Journal of Healthcare Engineering. Available in: https://doi.org/10.1155/2018/5370127
Equivalent in Spanish: Simulación. (Beigbeder, 2002)
Definition in Spanish: Representar o replicar algo mediante la imitación, que sirve como herramienta para evaluar y analizar sistemas, para anticipar y entrenar personal para emergencias u otros procesos reales, de esta forma validándolos y obteniendo una mejor configuración. (RAE, 2014)
Related Terms: Digital simulation; Computer visual simulation system. (Beigbeder, 2002)

SOFT ROBOT

Definition: Soft robots are systems built from materials with mechanical properties similar to those of living tissues, that possess high-level behavioural diversity, high level of bio-inspiration, can tolerate low accuracy, low speed, and force applications and is of low weight. (Calisti, 2017)
Context: "Soft robotics is an emerging field which has shown great potential in addressing these issues with current hand prostheses, i.e., non-compliant structure, heavy weight and complex system."
Source: MOHAMMADI ET AL. (2020) A Practical 3D-printed Soft Robotic Prosthetic Hand with Multi-articulating Capabilities. PLOS ONE. Available in: https://doi.org/10.1371/journal.pone.0232766
Equivalent in Spanish: Robot suave; robot blando; robot de estructura orgánica. (Medina, 2014)
Definition in Spanish: Los robots blandos, suaves o *softrobots* permiten la interacción y adaptación de éstos a cualquier superficie. Los robots blandos tienen una estructura suave, deformable y flexible; sin embargo, son más difíciles de analizar la cinemático y la dinámico. (Medina, 2014)

TELEOPERATION

Definition: The technique by which a human controller operates a versatile robot system that is at a distant, sometimes hazardous, location. High-resolution vision and tactile sensors on the robot, reliable telecommunications links, and computer-generated virtual reality displays enable the human worker to experience telepresence. (Angelo, 2007)
Context: "The teleoperation in which mainly includes the joystick-based and the master structure-based control methods."
Source: BAI ET AL. (2019) Medical Robotics in Bone Fracture Reduction Surgery: A Review. Sensors. Available in: https://doi.org/10.3390/s19163593
Equivalent in Spanish: Teleoperación. (Reyes, 2011)
Definition in Spanish: Se entiende por teleoperación el proceso en el que un controlador humano manipula los movimientos de un robot ubicado a cierta distancia. En este tipo de manipulación, se utilizan brazos y manos antropomórficas con controladores automáticos que reproducen los movimientos del operador, mientras éste los visualiza en una pantalla. (Reyes, 2011)

TELEPRESENCE

Definition: The use of virtual reality technology, especially for remote control of machinery or for apparent participation in distant events. (Angelo, 2007)

Context: "Telepresence surgery offered a possible solution by removing distance as a factor in providing immediate and intensive treatment (…)."

Source: GEORGE ET AL. (2018) Origins of Robotic Surgery: From Scepticism to Standard of Care. JSLS: Journal of the Society of Laparoendoscopic Surgeons. Available in: https://doi.org/10.4293/JSLS.2018.00039

Equivalent in Spanish: Telepresencia. (Reyes, 2011)

Definition in Spanish: La telepresencia es la tecnología de realidad virtual que permite transportar virtualmente a un individuo de un espacio físico a otro. (Reyes, 2011)

ABBREVIATIONS

ORTHOSES or PROSTHESES

An interesting aspect found during the analysis of the articles, was the differences between prostheses and orthoses, however used to refer both to robotic ones and pure orthoses. The main difference lies in their original purpose, where prostheses are artificial appliances that substitute an anatomically missing component, orthoses are artificial appliances that support a body a body part for the purpose of stabilisation, support, or movement reminder. (Hsu, 2008)

LLO – LOWER LIMB ORTHOSES			ÓRTESIS DE MIEMBRO INFERIOR		
ABBREVIATION	**MEANING**	**ENTRY**	**ABREVIATURA**	**SIGNIFICADO**	**ENTRADA**
FO	Foot Orthosis	Foot orthoses are devices that are confined to the foot only and they are most commonly placed inside a closed shoe; this form of support primarily covers the plantar surface and benefits the foot only upon weight bearing.	FO	Órtesis de pie	Las órtesis de pie (FO) son los dispositivos que se limitan exclusivamente al pie y que no incluyen el tobillo. Esta forma de soporte cubre principalmente la superficie plantar y beneficia al pie sólo cuando soporta carga.
KO	Knee-Orthosis	Knee orthoses are limited or isolated knee pathologies; they are often used to unload the painful condyle as well as to resist further progression of deformity or for support. They have been widely accepted for sport applications for nonoperative applications in which surgery has been refused or is not feasible.	KO	Órtesis de rodilla	Las órtesis de rodilla están diseñadas para patologías de la rodilla como, por ejemplo, afecciones relacionadas con la desviación en varo o en valgo secundaria al a destrucción avanzada por artritis del área condílea. También se utilizan en actividades deportivas cuando no es posible realizar una operación quirúrgica.
HpO / HO	Hip Orthosis	Hip orthoses are often prescribed for isolated problems in the acetabular region, as a result of dysplastic disorders, traumatic injury or surgical procedures involving the hip. The most common application of the HO or HpO in adults is for postoperative protection of total hip replacement; they include an extensive hemishell at the hip, decreasing the risk of dislocation and providing he most effective biomechanical control.	HpO	Órtesis de cadera	La HpO se prescribe para problemas aislados como displasias, traumatismo o procedimientos quirúrgicos, en la región acetabular. La indicación más frecuente de la órtesis de cadera en adultos es la protección posquirúrgica tras el recambio total de cadera.
AFO	Ankle-Foot Orthosis	This device compensates for weakness by the creation of an ankle dorsiflexion force, correction of flexible deformities to a neutral or balanced position and correction of more rigid deformities of the ankle joins. On some occasions, these orthoses are prescribed to offer partial axial unweighing of more distal limb segments.	AFO	Órtesis de tobillo y pie	La órtesis de tobillo y pie influye indirectamente en la articulación de rodilla, lo cual ayuda obtener un mejor control del movimiento, corrección de la deformidad y compensación de la debilidad.
KAFO	Knee-Ankle-Foot Orthosis	The KAFOs are used when direct control of the knee complex is needed, in addition to a need for suspension or for ankle/foot control. The stance control KAFOs permit many individuals with significant knee paresis or paralysis to walk safely because the knee is mechanically stabilized during weight bearing but is free to flex during swing phase.	KAFO	Órtesis de rodilla, tobillo y pie	Las órtesis KAFO proporcionan un control directo del complejo de la rodilla, además de la suspensión del tobillo o control del pie. Se utilizan para estabilizar la rodilla y el tobillo, lo que afecta de forma directa a la estabilidad de la cadera a través de las fuerzas de reacción del suelo. Se prescribe generalmente n individuos que tienen escas o nula fuerza de cuádriceps.
HKAFO	Hip-Knee-Ankle-Foot Orthosis	Hip-knee-ankle-foot orthoses are most commonly prescribed for paediatric patients and adults with bilateral paralysis from spinal cord injuries. The most common HKAFOs uses a mechanical linkage to couple flexion of one hip with extension of the other, which permits a reciprocal step-over-step gait.	HKAFO	Órtesis de cadera, rodilla, tobillo y pie	La órtesis de cadera-rodilla-pie (HKAFO) se utiliza sobre todo en la población pediátrica y en adultos en caso de parálisis bilateral por lesiones de la médula espinal. Estas HKAFO se utilizan en una gran variedad de afecciones asociadas con paraplejia. En una de las HKAFO más frecuentes se utiliza una unión mecánica para adaptar la flexión de una cadera con la extensión del a otra, lo que permite un recíproco paso-sobre-paso.
SMO	Supramalleolar Orthosis	This orthosis provides hindfoot control, an arch mould, and media/lateral borders for forefoot motion control. It is often used to improve foot progression angle and shorten excessive stance phase times.	SMO	Dinámico supramaleolar	Sirve para controlar la posición del mediopie y retropie, para proporcionar una base estable de soporte. A menudo se utiliza para mejorar el ángulo de progresión del pie y acortar los tiempos de fase de apoyo excesivos.

ULO - UPPER LIMB ORTHOSES			ÓRTESIS DE MIEMBRO SUPERIOR		
HO/HdO	Hand Orthosis	The static HdO maintains the functional position of the hand and prevents development of deformities. They are often used by patients with weakness or paralysis of the hand intrinsic musculature and strong wrist extensors.	HO/HdO	Órtesis de mano	La órtesis de mano (HdO) mantiene la posición funcional de la mano y previene el desarrollo de deformidades. Los pacientes con debilidad o parálisis de la musculatura intrínseca de la mano y fuertes extensores de la muñeca son candidatos para la HdO.
WO	Wrist Orthosis	The static WO maintains the functional position of the wrist and prevents development of deformities.	WO	Órtesis de muñeca	La órtesis de muñeca mantiene la posición funcional de la muñeca y previene el desarrollo de deformidades.
EO	Elbow Orthosis	EOs are used for reduction of soft tissue contractures of the elbow that result in functional limitations or immediately after trauma or surgery. They are often utilised by individuals with spinal cord injury who depend on full range motion of the elbow for alleviating ischial sitting pressure, propelling a manual wheelchair, or bringing the hand to the face.	EO	Órtesis de codo	La órtesis de codo está diseñada par a reducir las contracturas de tejidos blandos del codo que dan lugar a limitaciones funcionales. La mayoría de los pacientes que utilizan esta órtesis tienen lesiones de la médula espinal que dependen de la presión isquiática en sedestación, propulsar una silla de ruedas manual, o llevarse la mano a la cara.
SEO	Shoulder Orthosis	These orthoses serve to support a painful shoulder or a traumatized brachial plexus-injured limb. The patient population consist of those who are brachial plexus injured.	SEO	Órtesis de hombro y codo	La órtesis de hombro sirve como soporte de un hombro doloroso o de la extremidad superior con lesión del plexo braquial.
WHO	Wrist-Hand Orthosis	The WHO supports the wrist joint, maintains the functional architecture of the hand and prevents writs-hand deformities. Often utilised by patients with severe weakness or paralysis of the wrist and hand musculature.	WHO	Órtesis de mano y muñeca	La órtesis de mano y muñeca estática soporta la articulación de la muñeca, mantiene la arquitectura funcional de la mano y previene deformidades de la muñeca-mano. A menudo se prescribe como órtesis posicional para pacientes tetrapléjicos.
EWHO	Elbow-Wrist-Hand Orthosis	The EWHO serves as support for both the elbow joint and the wrist joint, maintaining the functional structure of the arm and hand, as well as preventing deformities.	EWHO	Órtesis de mano, muñeca y codo	La órtesis de mano, muñeca y codo sirve prevención de deformidades y como soporte para el codo y la muñeca, a la vez que mantiene la estructura funcional del brazo y de la mano.
SEWHO	Shoulder-Elbow-Wrist-Hand Orthosis	SEWHOs are frequently used to protect soft tissues or prevent contractures of soft tissues. Occasionally, these orthoses are used to correct an existing deformity. The objective of these orthoses is to provide as much contact as possible while keeping the glenohumeral joint in maximum abduction.	SEWHO	Órtesis de mano, muñeca, codo y hombro	Las órtesis de mano, muñeca, codo y hombro e utilizan frecuentemente para proteger los tejidos blandos, para prevenir contracturas de los tejidos blandos o para corregir una deformidad existente. El objetivo es proporcionar el menor contacto posible, a la vez que se mantiene la articulación glenohumeral en abducción máxima.

SO – SPINAL ORTHOSES			ÓRTESIS DE COLUMNA		
CO	Cervical Orthosis	Cervical orthoses can be generally categorized as soft, semirigid, and hard. (…) The soft cervical orthosis [*foam collar*] acts as a kinaesthetic reminder to reduce excessive motion. Semirigid and hard COs reduce cervical motion in the sagittal plane still providing little control of the lateral flexion and rotation	CO	Órtesis cervical	Las órtesis cervicales se prescriben para el tratamiento del dolor y control del movimiento de la columna cervical. Las CO prefabricadas pueden clasificarse en blandas, semirrígidas y duras. Las órtesis cervicales blandas (collarines de espuma), actúan principalmente como recordatorios cinestésicos para el individuo con el fin de limitar un movimiento excesivo. Las semirrígidas y duras reducen el movimiento cervical en el plano sagital, sin proporcionar un control adecuado de la flexión lateral y de la rotación.
CTO	Cervicothoracic Orthosis	The cervicothoracic orthosis consists of a sternal plate with shoulder components, mandibular pad and a bar, and occipital pad and bars. It provides good motion control of flexion, and it allows some extension motion because of a swivel-type occipital pad	CTO	Órtesis cervicotorácica	La órtesis cervicotorácica se emplea con frecuencia para controlar el movimiento, actúa como un inmovilizador externo-occipito-mandibular. La CTO consta de una placa esternal con componentes para el hombro, una almohadilla y una barra mandibular, y una almohadilla y barras occipitales.
TO	Toracic Orthosis	TOs consist of a soft, semirigid or hard material in the shape of a band with two paraspinal bars or more. These orthoses provide support and correction of form in patients with scoliosis, and they are often used in patients with a spinal injury that require to be immobilised.	TO	Órtesis torácica o de tronco	La órtesis torácica u órtesis de tronco está compuesta por un material flexible, semirrígido o rígido y, por lo menos, dos barras paraespinales. Esta órtesis proporciona soporte y corrección de la postura en pacientes con escoliosis y pacientes con una lesión medular que deben estar inmovilizados.
LO	Lumbar Orthosis	LOs consist of a pelvic band, flexible or rigid, often used for treatment of low-back pain and lumbar support.	LO	Órtesis lumbar	La órtesis lumbar está compuesta por una banda pélvica, flexible o rígida, que se utiliza para el tratamiento del dolor lumbar o como soporte lumbar.
SIO	Sacroiliac Orthosis	Sacroiliac orthosis often come in the shape of a corset and are meant to provide assistance to the pelvis only by encompassing the pelvis with endpoints inferior to the waist and superior to the pubis.	SIO	Órtesis sacroilíaca	La órtesis sacroilíaca sirve para proporcionar soporte a la pelvis desde los puntos inferiores de ésta a la cintura. Por lo general, se producen en forma de corset.
LSO	Lumbrosacral Orthosis	This orthosis consists of a thoracic band, pelvic band and two paraspinal bars. This device is indicated for reduction of gross motion in the sagittal plane, including both flexion and extension.	LSO	Órtesis lumbosacra	La órtesis lumbosacra consiste en una banda torácica, una banda pélvica y dos barras paraespinales. A menudo, se utiliza para reducir el movimiento flexor y extensor en el plano sagital,
TLSO	Thoracolumbosacral Orthosis	Often utilised as a nonoperative alternative to spinal fusion and as a postoperative adjunct to protect the surgical constructs used for stabilising a macro-instability in the thoracolumbar spine, the TLSO provides different degrees of restriction of trunk motion in flexion-extension, intervertebral motion in the lumbar spine, lateral bending, and axial rotation.	TLSO	Órtesis toracolumbosacra	La órtesis toracolumbosacra está indicada para el tratamiento de curvas ápex con vértices en o hasta la D8, de hecho, es la órtesis más utilizada para el tratamiento de la escoliosis
CTLSO	Cervicothoracolumbosacral	The device extends from the pelvis to the occiput, it provides longitudinal distraction along the lateral pad against the most displaced ribs on the convex side of the deformity with the aim of reducing sway of the vertebral column, keeping the upper thoracic spine constrained over the sacrum.	CTLSO	Órtesis cervicocolumbosacra	La órtesis cervicocolumbosacra original proporcionaba tracción longitudinal junto con una almohadilla lateral sobre las costillas más desplazadas sobre el lado convexo de la deformidad.

ENDOPROSTHESES		ENDOPRÓTESIS	
Endoprostheses are composed of synthetic tubular, metallic, elastic, or plastic material, that is introduced at specific point in the vascular system (arteries or veins), digestive tract (oesophagus, colon, and rectum), common bile duct, pancreatic duct or trachea and bronchi. It is often used for the palliative treatment of obstructions due to tumours of the bronchial, biliary, or digestive tract. There are two fundamental types of endoprostheses: self-expanding metallic that serve any of the aforementioned locations; and made of plastic or rubber, used for obstructions of the oesophagus or common bile duct.		Se trata de un material sintético tubular, metálico, de goma o de plástico, que se introduce en algún punto del sistema vascular (arterias o venas), del tubo digestivo (esófago, colon y recto), del colédoco, del conducto pancreático o de la tráquea y los bronquios. Se emplea para el tratamiento paliativo de obstrucciones por tumores del árbol bronquial, biliar o del tubo digestivo. Existen dos tipos fundamentales de endoprótesis: metálicas auto expandibles que sirven para cualquiera de las localizaciones referidas; y de plástico o de goma, empleadas para las obstrucciones del esófago o del colédoco.	
EXOPROSTHESES		**EXOPRÓTESIS**	
Exoprostheses are devices that totally or partially replace a member of the musculoskeletal apparatus after an amputation. Their placement or removal does not require surgical means and they are used to obtain a biomechanical rehabilitation or anatomical restitution that allows an adequate integration into the work and social environment.		Es un dispositivo que sustituye total o parcialmente un miembro del aparato musculoesquelético, tras una amputación. Su colocación o remoción no requiere medios quirúrgicos y que son utilizados para obtener una rehabilitación biomecánica o la restitución anatómica que permita una adecuada integración al medio laboral y social.	
POSTOPERATIVE PROSTHESES		**PRÓTESIS POSTOPERATIVA**	
Postoperative prostheses are those provided within 24 hours of amputation. Postoperative fittings are prescribed for the patient undergoing amputation due to tumour, trauma, or infection. (AAOS, 2002)		Las prótesis posoperatorias son las que se proporcionan dentro de las 24 horas posteriores a la amputación. Se prescriben adaptaciones posoperatorias para el paciente que se somete a una amputación debido a un tumor, un traumatismo o una infección. (AAOS, 2002)	
IPOP	Immediate Postoperative Prosthesis	IPOP	Prótesis inmediatas postquirúrgicas
INITIAL PROSTHESES		**PRÓTESIS INICIAL**	
The initial prosthesis is sometimes used in lieu of a postsurgical fitting and is provided as soon as the sutures are removed. Due to the usual rapid atrophy of the residual limb, the initial prosthesis is generally directly moulded on the residual limb by using plaster or fiberglass bandages. Such devices are used during the acute phase of healing, generally from 1 to 4 weeks after amputation, until the suture line is stable, and the skin can tolerate the stresses of more intimate fitting. (AAOS, 2002)		La prótesis inicial a veces se usa en lugar de un ajuste posquirúrgico y se proporciona tan pronto como se retiran las suturas. Debido a la rápida atrofia habitual del muñón, la prótesis inicial generalmente se moldea directamente sobre el muñón utilizando yeso o vendajes de fibra de vidrio. Dichos dispositivos se utilizan durante la fase aguda de cicatrización, generalmente de 1 a 4 semanas después de la amputación, hasta que la línea de sutura es estable y la piel puede tolerar las tensiones de un ajuste más íntimo.	
EPOP	Early Postoperative Prosthesis	EPOP	Prótesis tempranas postquirúrgicas
PREPARATORY PROSTHESES		**PRÓTESIS PREPARATORIA**	
Preparatory prostheses are used during the first few months of the patient's rehabilitation to ease the transition into a definitive device. The preparatory prosthesis accelerates rehabilitation by allowing ambulation before the residual limb has completely matured. Preparatory prostheses may be applied within a few days following suture or staple removal, and limited gait training is started at that point. The modern preparatory limb, however, usually incorporates definitive quality endoskeletal componentry but lacks the protective and cosmetic outer finishing.		Las prótesis preparatorias se utilizan durante los primeros meses de la rehabilitación del paciente para facilitar la transición a un dispositivo definitivo. Esta prótesis acelera la rehabilitación al permitir la deambulación antes de que el muñón haya madurado por completo. Se pueden aplicar unos días después de la extracción de la sutura o la grapa, y en ese momento se inicia un entrenamiento de la marcha limitado. Sin embargo, el miembro preparatorio moderno generalmente incorpora componentes endoesqueléticos de calidad definitiva, pero carece del acabado externo protector y cosmético.	
DEFINITIVE PROSTHESES		**PRÓTESIS DEFINITIVA**	
The definitive prosthesis is not prescribed until the patient's residual limb has stabilized to ensure that the fit of the new prosthesis will last as long as possible. A definitive prosthesis is, however, not a permanent prosthesis, the average life span for a definitive prosthesis varies from 3 to 5 years. Most are replaced due to changes in the amputee's residual limb or their overall physical condition.		La prótesis definitiva no se prescribe hasta que el muñón del paciente se haya estabilizado para garantizar que el ajuste de la nueva prótesis dure el mayor tiempo posible. Sin embargo, una prótesis definitiva no es una prótesis permanente, la vida media de una prótesis definitiva varía de 3 a 5 años. La mayoría se reemplaza debido a cambios en el muñón del amputado o en su condición física general.	
SPECIAL-USE PROSTHESES – SPORT PROSTHESES		**PRÓTESIS DEPORTIVAS**	
A certain number of patients will require special-use prostheses designed specifically for sports and other activities; most of them require specialized alignment, such as plantar-flexed foot, increase in dorsiflexion at the ankle, additional knee support or auxiliary suspension		Algunos pacientes desean tener prótesis diseñadas específicamente para deportes y demás actividades fuera del uso diario; la mayoría de estas prótesis requieren una alineación específica, como, por ejemplo, flexión plantar en el pie, aumento de la dorsiflexión en el tobillo, soporte adicional para la rodilla o suspensión auxiliar	

MATERIALS

ABBREVIATION	MEANING	ABREVIATURA	SIGNIFICADO
DAC	Defensive Antibacterial Coating	DAC	Revestimiento Antibacteriano Defensivo
EPS	Extracellular Polymeric Substance	SPE	Sustancia Polimérica Extracelular
MBEC	Minimum Biofilm Eradication Concentration	CMEB	Concentración Mínima De Erradicación De La Biopelícula
PCL	Polycaprolactone	PCL	Policaprolactona
PMMA	Polymethyl Methacrylate	PMMA	Polimetilmetacrilato
PU/PUR	Polyurethane	PU/PUR	Poliuretano
SMA	Shape Memory Alloy	SMA	Alineación Con Memoria De Forma
TPU	Thermoplastic Polyurethane	TPU	Poliuretano Termoplástico

BIOMEDICAL ENGINEERING AND MEDICINE

ABBREVIATION	MEANING	ABREVIATURA	SIGNIFICADO
ALEX	Active Leg Exoskeleton	ALEX	Exoesqueleto de Pierna Activa
ANN	Artificial Neural Network	RNA	Red Neuronal Artificial
ARAT	Action Research Arm Test	ARAT	Prueba de Brazo de Investigación de Acción
ASM	Active Surface Modification	ASM	Modificación de la Superficie Activa
BCI	Brain-Computer Interface	ICC/ICO/BCI	Interfaz Cerebro Computadora/Interfaz Cerebro Ordenador
BIOROB	Biomedical Robotics and Biomechatronics	NOT USED	Robótica Biomédica y Biomecatrónica
BME	Biomedical Engineering	IBM	Ingeniería Biomédica
BWSTT	Body Weight Supported Treadmill-Training	BWSTT	Terapia en Cinta Rodante con Soporte de Peso Corporal
CM	Corticomotoneuronal	NOT USED	Corticomotoneuronal
CNS	Central Nervous System	SNC	Sistema Nervioso Central
CP	Cerebral Palsy	PC	Parálisis Cerebral
CPC	Cerebral Palsy on Children	PCI	Parálisis Cerebral Infantil
CPM	Continuous Passive Motion	MPC	Movimiento Pasivo Continuo/Movilización Pasiva Continua
CST	Corticospinal Tract	TCE	Tracto Corticoespinal
CVA	Cerebrovascular Accident	ACV	Accidente Cerebrovascular
DNI	Direct Neural Interface	IND	Interfaz Neuronal Directa
EEG	Electroencephalogram	EEG	Electroencefalograma
EEGS	Electroencephalograph Signals	NOT USED	Señal EEG
EMG	Electromyogram	EMG	Electromiograma/Electromiografía
EMGDR	Electromyography Driven Robot	NOT USED	Robot Controlado por Electromiografía
FES	Functional Electrical Stimulation	EEF	Electroestimulación Funcional
FMA	Fugl-Meyer Assessment	FMA/FM	Evaluación Fugl Meyer
FMRI	Functional Magnetic Resonance Imaging	IRMf	Imagen Por Resonancia Magnética Funcional
GFMCS	Gross Motor Function Classification System	GFMCS	Sistema de Clasificación de la Función Motora Gruesa
GMFM	Gross Motor Function Measure	GMFM	Medida de la Funcionalidad del Movimiento Grueso
HAL	Hybrid Assistive Limb	HAL	Prótesis Asistida Híbrida/Extremidad de Asistencia Híbrida
HCI	Human Computer Interaction (Empirical Studies in Hci)	IHC/IPO	Interacción Humano-Computadora / Interacción Persona-Ordenador
HCI	Human-Centered Computing (Theory, Concepts and Models)	NOT FOUND	Not Found
HMI	Human-Machine Interface	IHM	Interfaz Humano-Máquina
HRI	Human-Robot Interaction	IHR	Interacción Humano-Robot
LESS	Laparoendoscopic Single Site Surgery	LESS	Laparo-endoscopia por Puerto Único
MAL	Motor Activity Log	MAL	Motor Activity Log (Registro de la Actividad Motora)
MMI	Machine-Mind Interface	ICC/ICO	Interfaz Cerebro Computadora/Interfaz Cerebro Ordenador
NCI	Neural Control Interface	NCI	Interfaz de Control Neuronal
NCS	Nerve Conduction Study	ECN	Estudio de Conducción Nerviosa
pHRi	Physical Human Robot Interaction	pHRi	Interacción Física Humano-Robot
PIJ	Prosthetic Joint Infection	IP	Infección de Prótesis Articular
PMC	Programmable Machine Control	PMC	Control Programable de la Máquina
RG	Rehabilitation Engineering	NOT USED	Ingeniería de Rehabilitación
RGD	Arginine-Glycine-Aspartic Acid	RGD	Arginina-Glicina-Ácido Aspártico
RGO	Reciprocating Gait Orthosis	RGO/OMR	Órtesis de Marcha Recíproca
SCI	Spinal Cord Injury	SCI/LME	Lesión de la Médula Espinal
sEMG	Surface Electromyogram	sEMG	Electromiografía de Superficie
THA	Total Hip Arthroplasty	ATC	Artroplastia Total de Cadera
TKA	Total Knee Arthroplasties	ATR	Artroplastia Total de Rodilla
TURP	Transurethral Resection of the Prostate	RTUP	Resección Transuretral de la Próstata
UKA	Unicompartmental Knee Arthroplasty	AUR	Artroplastia Unicompartimental de Rodilla

MISCELLANEOUS

ABBREVIATION	MEANING	ABREVIATURA	SIGNIFICADO
AA	Active Assistive/Assisted	AA	Activo Asistido
AAN	Assist-As-Needed	-	-
ADL	Activities of Daily Living	AVD	Actividades de la Vida Diaria
AP	Anterior/Posterior	AP	Anterior-Posterior
ASIS	Anterior Superior Iliac Spine	EIAS	Espinas Iliacas Anterosuperiores
BMI	Body-Mass Index	IMC	Índice de Masa Corporal
CAOS	Computer-Assisted Orthopaedic Surgery	CAOS	Cirugía Ortopédica Asistida por Ordenador
COS	Computer-Assisted Surgery	CAS	Cirugía Asistida por Ordenador
DOF	Degrees of Freedom	GDL	Grados de Libertad
EBM	Evidence-Based Medicine	MBE	Medicina Basada en la Evidencia
EKF	Extended Kalman Filter	FKE	Filtro de Kalman Extendido
EPKF	Enhanced/Extended Particle Kalman Filter	FPKE	Filtro de Partículas de Kalman Extendido
ICA	Independent Component Analysis	ICA	Análisis de Componentes Independientes
ICF	International Classification of Functioning, Disability and Health	CIF	Clasificación Internacional del Funcionamiento, de la Discapacidad y de la Salud
IMU	Inertial Movement Unit		Unidad de Movimiento Inercial
ML	Medial/Lateral	ML	Medio-Lateral
NMF/NNMF	Non-Negative Matrix Factorization (Algorithm)	NMF/NNMF/FMN	Factorización Matricial No Negativa
PA	Posterior/Anterior	PA	Posterior-Anterior
PCA	Principal Component Analysis	ACP	Análisis de Componentes Principales
PCB	Printed Circuit Board	PCI	Placa de Circuito Impreso
PEDI	Paediatric Evaluation of Disability Inventory	PEDI	Evaluación Pediátrica del Inventario de Discapacidad
RCT	Randomized Controlled Trials	ETC/ECA	Ensayo Controlado Aleatorio
RMSD	Root-Mean-Square Deviation	RDCM	Raíz de la Desviación Cuadrática Media
RMSE	Root-Mean-Square Error	RECM	Raíz del Error Cuadrático Medio
SAS	Statistical Analysis System	SAS	Sistema de Análisis Estadístico
SCV	Small-Colony Variant	VCP	Variante de Colonia Pequeña

ROBOTS

ENGLISH	TYPE	SPANISH	TIPO
NEUROSURGICAL		**NEUROQUIRÚRGICOS**	
Neurosurgery robots for image-guided tool positioning and orientation.		Robots neuroquirúrgicos para el posicionamiento y orientación de herramientas guiados por imágenes.	
NEUROMATE	Neuromate (developed by ReniShaw) is a stereotactic robot that can perform biopsies, deep brain stimulation, stereotactic electroencephalography, transcranial magnetic stimulation, radiosurgery, and neuroendoscopy.	NEUROMATE	El robot estereotáctico Neuromate de ReniShaw ofrece una plataforma de soluciones para una amplia gama de procedimientos de neurocirugía funcional, como la implantación de electrodos para estimulación cerebral profunda (ECP) y estéreo-electroencefalografía (SEEG), o aplicaciones estereotácticas en neuroendoscopia, biopsia y otras aplicaciones de investigación.
PATHFINDER	The system developed by Prosurgics allows the surgeon to specify a target and trajectory on a pre-operative medical image and guides the instrument into position with a submillimetre accuracy. In addition, the system includes needle guiding for biopsy and drill guiding to make burr holes.	PATHFINDER	Pathfinder es un asistente robótico con un sistema estereotáctico utilizado como posicionador para herramientas quirúrgicas que localiza puntos en el cráneo a través de un sistema de coordenadas con precisión submilimétrica.
RENAISANCE	Mazor Robotics built the Renaisance device that mounts directly onto the spine and provides tool guidance based on planning software for various procedures including deformity corrections, biopsies, minimally invasive surgeries, and electrode placement procedures.	RENAISSANCE	Renaissance es un Sistema guiado robóticamente y de alta precisión para cirugías d la columna vertebral. El sistema permite realizar operaciones de estenosis canal, fracturas vertebrales, escoliosis y demás.

PERCUTANEOUS		**PERCUTANEOS**	
Assistive robots for non-catheter percutaneous procedures.		Robots de asistencia para procedimientos percutáneos sin catéter.	
INNOMOTION	InnoMotion, from Synthes Inc., is a robot arm designed to operate within a CT or magnetic resonance imaging (MRI) machine for non-catheter percutaneous procedures that employ needles, cannulae, and probes for biopsy, drainage, drug delivery, and tumour destruction.	INNOMOTION	Innomotion fue diseñado para trabajar dentro de un tomógrafo computarizado (TC) o durante una resonancia magnética. Está constituido por un brazo robótico que se acciona neumáticamente para procedimientos percutáneos.

EMERGENCY RESPONSE		**EMERGENCIAS**	
Robots used during emergencies.		Robots utilizados durante emergencias.	
AUTOPULSE	AutPulse is an automated, portable device that combines the cardiopulmonary resuscitation device and the E Series monitor/defibrillator. It functions as a load-distributing band chest compression device Consisting of a half-backboard containing a battery-powered motor that actuates a chest band, the AutoPulse rhythmically tightens the band to perform chest compressions, while the E Series monitor/defibrillator measures the rate and depth of chest compressions in real time and filters cardiopulmonary resuscitation artifacts from the electrocardiogram signal. This device was engineered by Zoll Medical Corp.	AUTOPULSE	AutoPulse es un cardiocompresor automático diseñado para mejorar la reanimación cardiopulmonar y utilizado en maniobras de resucitación. Se trata de un vendaje para compresión automática que genera flujo anterógrado constriñendo circunferencialmente la pared anterior del tórax contra un tablero rígido.
LS-1	LS-1, from Integrated Medical Systems Inc., is a portable life support system that contains a ventilator with oxygen and carbon dioxide monitoring, electrocardiogram, invasive and non-invasive blood pressure monitoring, fluid/drug infusion pumps, temperature sensing, and blood oxygen level measurement.	LS-1	LS-1 es un sistema portátil de soporte vital equipado con un ventilador de oxígeno motorizado, electrocardiograma, monitorización de la presión arterial, sensor de temperatura y medidor del nivel de oxígeno en sangre.
LUCAS	LUCAS is a new gas-driven CPR device providing automatic chest compression and active decompression mounted above a backboard which gives compressions at a set rate and depth.	LUCAS	Este dispositivo es un cardiocompresor mecánico que utiliza un pistón desplazado por aire comprimido que actúa comprimiendo el tórax en forma similar a la compresión manual. El pistón también tiene adherida una copa de succión, también por aire comprimido, que permite activamente elevar la pared anterior del tórax, con lo que se expande la cavidad torácica antes de la compresión siguiente.

ORTHOPAEDIC		ORTOPEDICOS	
Orthopaedic robots for accurate and precise bone resection.		Robots ortopédicos para una resección ósea precisa.	
ACROBOT	Acrobot is the acronym for Active Constraint Robot, this system provides tooling for soft tissue management and enables a minimally invasive surgical approach.	ACROBOT	Acrobot es un robot médico utilizado para intervenciones quirúrgicas de la rodilla, que utiliza control con realimentación de fuerza, aumentando gradualmente la rigidez del movimiento del robot, para restringir su posicionamiento dentro de una región predefinida por el cirujano.
ANKLEBOT	Anklebot is a rehabilitation tool designed to train and strengthen lower-extremity muscles, sensing the patient's ankle strength and adjusting its force accordingly.	ANKLEBOT/ TOBIBOT	Anklebot o Tobibot son robots para la rehabilitación asistida en la recuperación de la función motriz en las articulaciones de las extremidades inferiores. El dispositivo Tobibot es un dispositivo de funcionamiento similar al Anklebot desarrollado en Méjico caracterizado por su diseño mecatrónico e interfaz gráfica del usuario.
ARBOT	The Ankle Rehabilitation Robot functions as a assisted training and rehabilitation of the ankle joint system for musculoskeletal injuries.	ARBOT	Sistema Robótico para la rehabilitación de lesiones de tobillo
CASPAR	Computer Assisted Surgical Planning and Robotics, from Ortomaquet, is a system for knee and hip surgery, that automatically performed bone drilling from a preoperative plan based on CT data, now discontinued.	CASPAR	Caspar es un robot industrial de efector semiautónomo, que se ha adaptado para llevar a cabo cirugía asistida por ordenador en entornos quirúrgicos; en concreto, se ha utilizado como un robot médico en cirugía ortopédica de rodilla y cadera, para lograr mayor precisión y calidad en la colocación de prótesis sobre los huesos.
iBLOCK	iBlock from Praxim Inc. is an automated cutting guide for total knee replacement. It is mounted directly to the bone, preventing any relative motion between the robot and the bone, and aligns a cutting guide that the surgeon uses to manually perform planar cuts based on a preoperative plan.	IBLOCK	iBlock es un robot que se emplea para realizar cortes planos con alta precisión sobre la base de un plan preoperatorio, para asistir al cirujano con la resección ósea. iBlock se coloca directamente encima del hueso, para así impedir cualquier movimiento.
NAVIO PFS	Navio PFS, currently under development by Blue Belt Tech., uses an intraoperative planning during unicondylar knee replacements. The drill tool is tracked during the procedure, and the drill bit is retracted when it would leave the planned cutting volume.	NAVIO PFS	Navio PFS hace uso de la planificación intraoperatoria para llevar a cabo el reemplazo del cóndilo en la rodilla. Durante el procedimiento, el robot realiza un seguimiento de la herramienta perforadora y retrae la broca cuando barrena el volumen del corte previsto.
RIO	This robot is a Mako Surgical Corp. creation that is used for implantation of medial and lateral unicondylar knee components, as well as for patellofemoral arthroplasty. The surgeon and RIO simultaneously hold the surgical tool, the robot's arm is designed to be low friction and low inertia, so that the surgeon can easily move the tool, back driving the arm's joint motors in the process. The am acts as a haptic device during the milling procedure resisting motions outside of the planned cutting envelope by pushing back on the surgeon's hand.	RIO	El brazo robótico RIO se utiliza para la implantación de componentes en la rodilla y para las operaciones de artroplastia femoral. El brazo está diseñado con baja fricción y poca inercia, haciendo que el movimiento de la herramienta sea fácil para el cirujano. RIO no es un robot autónomo, en cambio, ambos el brazo y el cirujano sostienen la herramienta quirúrgica sobre el plano operatorio.
ROBODOC & ORTHODOC	Curexo Technology Corp. developed the ArBot, which is used in conjunction with OrthoDoc, a surgical planner, with which the surgeon plans bone milling is based on preoperative CT. Robodoc has force sensing on all axes, as well as a six-axis force sensor at the wrist, which is used for safety monitoring, to allow the surgeon to manually direct the robot arm and to vary the velocity of tool motion as a function of the forces experienced during the milling operation.	ROBODOC	El sistema robótico Robodoc se usa en conjunto con OrthoDoc, un planificador quirúrgico con el cual se planea el fresado y la compresión de hueso basado en el TC preoperatorio. Robodoc incorpora un sistema de detección de fuerzas y un sensor de fuerza de seis ejes en la muñeca. El sistema realiza movimientos autónomos y asiste en las operaciones de reemplazo de cadera.
STANMORE SCULPTOR	The Stanmore, from Stanmore Implants, is part of the Acrobot Sculptor generation. It is a synergistic system with active constraints to keep the surgeon in the planned workspace, in a similar way to RIO's functioning.	STANMORE SCULPTOR	Este Sistema sinérgico es similar al brazo robótico RIO, funciona como un asistente limitador de espacio de trabajo para el cirujano e incorpora un modelo 3D en la interfaz de planificación de implante.

GENERAL LAPAROSCOPY		LAPAROSCOPIA GENERAL	
Assistive robots for general laparoscopy.		Robots de asistencia para laparoscopia general.	
AESOP	Automated Endoscopic System for Optimal Positioning, now discontinued.	AESOP	Sistema endoscópico automático para posicionamiento óptimo
DA VINCI SI PATIENT SIDE CART & DA VINCI ENDOWRIST	Intuitive Surgical Inc. engineered the da Vinci teleoperated system, wherein the surgeon manipulates instrument controls at the console and the robot arms follow the surgeon's movements with motion scaling and tremor reduction.	DA VINCI	Da Vinci, desarrollado por Intuitive Surgical Inc., es un robot utilizado para la cirugía telerrobótica con funciones similares a las de Zeus. Da Vinci consiste en un sistema teleoperado que incluye una consola con controles y brazos robóticos manipulados por el cirujano. Se utiliza para la prostatectomía radical y para procedimientos de laparoscopia general.
FREEHAND	This robot is a next-generation endoscope holder developed by FreeHand 2010 Ltd. The more compact arm allows for endoscope motion control through gentle head motions by the surgeon, which are tracked with an optical system.	FREEHAND	FreeHand es un soporte d endoscopio desarrollado por Freehand 2010 Ltd., que permite el control del movimiento del endoscopio e incluye un sistema de rastreo óptico.
TELELAP ALF-X	Telelap ALF-X (SOFAR S.p.A) is a four-armed surgical robotic system that uses eye tracking to control the endoscopic view and enable activation of various instruments. This system moves the base of the manipulators away from the bed and has a realistic tactile-sensing capability.	TELELAP ALF-X	Este sistema robótico quirúrgico de cuatro brazos no se ha utilizado en humanos todavía. El robot facilita el movimiento de la base de los manipuladores y permite la activación de distintos instrumentos, al mismo tiempo que utiliza un sistema de seguimiento óptico para proporcionar control en la vista endoscópica.
ZEUS	Now discontinued, Zeus was the combination of tool-holding robot arms and a previous robotic system named Aesop. The tool arms were teleoperated, following motions the surgeon made with instrument controls at the surgeon console; it filters hand tremor, and can scale large hand motions down to short and precise ones. Zeus is in fact a remote computer-assisted telemanipulator with interactive robotic arms, rather than a robot.	ZEUS	Zeus, ahora interrumpido, se ha utilizado en telerrobótica y cirugía telepresencial. Zeus funciona como un telemanipulador remoto asistido por ordenador con brazos robóticos interactivos. Los filtros programados en Zeus eliminan l temblor de mano y permiten la escalación de los movimientos del cirujano.

STEERABLE CATHETERS		CATÉTERES DIRECCIONABLES	
Assistive robots for steerable catheter procedures.		Robots de asistencia para procedimientos de catéter direccionable.	
NIOBE	Niobe is a remote magnetic navigation system, in which a magnetic field generated by two permanent magnets contained in housings, is used to guide the catheter tip. The surgeon manipulates a joystick to specify the desired orientation of the catheter tip, causing the orientations of the magnets to vary under computer-control, and thereby controlling the magnetic field. A second joystick controls advancement/retraction of the catheter. This system was developed by Stereotaxis.	NIOBE	Niobe es un sistema de navegación magnética robótica remota que utiliza dos imanes permanentes de Neodimio instalados en paralelo a la mesa operatoria, que generan un campo magnético para mover la punta del catéter controlado por el cirujano.
SENSEI X	Sensei X, from Hansen Medical, uses IntelliSense force to constantly estimate the contact forces by gently pulsing the catheter a short distance in and out of the steerable inner sheath and measuring forces at the proximal end of the catheter. The forces are communicated visually and through vibratory feedback to the surgeon's hand on the "3D joystick".	SENSEI X	Sensei X es un sistema robótico operado remotamente que utiliza IntelliSense para estimar constantemente la fuerza de contacto del catéter. El sensor IntelliSense produce retroalimentación visual y vibratoria para el cirujano.
SPINEASSIST	This surgical robot is used to guide implant and wires to predefined locations in the spine. It offers enhanced performance during spinal surgery by increasing placement accuracy and reducing neurological risk.	SPINEASSIST	SpineAssist ofrece una solución menos invasiva para la cirugía de columna vertebral, reducción de complicaciones y tiempo operatorio. El robot se monta sobre el paciente y funciona de forma paralela para operar en la colocación de fijaciones mecánicas de prótesis en la columna vertebral.

RADIOSURGERY		RADIOCIRUGÍA	
Assistive robots for radiosurgery.		Robots de asistencia para radiocirugía.	
CYBERKNIFE	The CyberKnife, engineered by Accuray Inc., is a frameless radiosurgery system consisting of a robotic arm holding a linear accelerator, a six degree of freedom robotic patient table called the RoboCouch, and an X-ray imaging system that can take real-time images in two orthogonal orientations simultaneously.	CYBERKNIFE	CyberKinfe es un Sistema de radiocirugía de fuente externa para la radioterapia no invasiva, para tratar tumores benignos y malignos. Consiste en un emisor gamma montado en un brazo robótico capaz de desplazarse alrededor del paciente y sincronizarse con su respiración.
NOVALIS WITH TRUEBEAM STx	The Novalis, contrived by Brainlab Inc. & Varian Medical Systems, with TrueBeam STx is a frameless system with a linear accelerator, but with micro-multileaf collimators for beam shaping. Novalis can shape the radiation beam and claim reduced out-of-field dosage.	NOVALIS TRUEBEAM STx	Novalis TrueBeam STx es un acelerador lineal que consiste en un sistema con colimadores micro-multilaminados para modelar el haz de radiación y reducir la dosis fuera del campo radiado.

PROSTHETICS AND EXOSKELETONS		PRÓTESIS Y EXOESQUELETOS	
Robotic prosthesis and exoskeletons.		Prótesis y exoesqueletos robóticos.	
C-LEG	This prosthesis by BOCK is designed to automatically adjust the swing phase dynamics and improve stability during the stance phase by controlling knee flexion.	C-LEG	C-Leg es una prótesis externa de rodilla diseñada especialmente para amputados con miembros residuales transfemorales cortos, que ajusta automáticamente la fase de balanceo durante la marcha. La prótesis utiliza un mecanismo de control hidráulico en base a microprocesador.
FINGERBOT	FingerBot is an actuated exoskeleton for the index finger, the FingerBot, was developed to permit the study of finger kinetics and kinematics under a variety of condition, including stroke or chronic motor impairments.	FINGERBOT	FingerBot es un exoesqueleto para el dedo índice desarrollado para estudiar los movimientos en pacientes con deficiencias motoras crónicas o post infarto. Actualmente no está en uso.
i-LIMB ULTRAHAND	Touch Bionics developed the first commercially available hand prosthesis with five individually powered digits, controlled via myoelectric signals generated by muscles in the remaining portion of the patient's limb.	i-LIMB ULTRAHAND	i-Limb UltraHand es una prótesis de mano equipada con cinco dígitos pulsados, que permite la rotación del pulgar en distintos patrones de agarre, y varias posiciones de muñeca.
RBO HAND	RBO Hand is a dexterous multi-fingered robotic hand in development that exhibits robust grasping performance and fine manipulation behaviours infeasible with simple robotic grippers. It uses the pneumatic actuator called PneuFlex.	RBO HAND	RBO es una mano robótica y biomimética fabricada con materiales flexibles que tiene el propósito de reducir la complejidad del control en la funcionalidad de las manos. Los sensores instalados miden la deformación a través de la resistencia eléctrica, y los dispositivos acústicos integrados, detectan los puntos de contacto entre los dedos y los objetos, además de la cantidad de fuerza utilizada.
REWALK	ReWalk is a walking assistance exoskeleton that allows users to stand, walk, and climb stairs and is controlled with a wrist-mounted remote and a posture detection sensor. It was designed by Argo Medical Technologies.	REWALK	ReWalk es una órtesis motorizada de marcha alternante o exoesqueleto para pacientes parapléjicos usuarios de sillas de ruedas. Este sistema se utiliza para restaurar la bipedestación y deambulación de pacientes con lesión medular completa.
SMART HAND TRANSRADIAL PROSTHESIS	SmartHand is a five fingered self-contained robotic hand, with 16 degrees of freedom, actuated by 4 motors. Its design was bio-inspired but includes a multilevel control system.	SMART HAND TRANSRADIAL PROSTHESIS	SmartHand es una prótesis antropomórfica que utiliza un actuador para movilizar las articulaciones de uno o más dedos. La prótesis incluye un mecanismo autobloqueante conducido d baja fricción, el cual permite desactivar los motores cuando se alcanza la posición deseada.

ASSISTIVE AND REHABILITATION SYSTEMS		SISTEMAS DE REHABILITACIÓN Y ASISTENCIA	
Systems that assist patients with ADL and serve as rehabilitation devices.		Sistemas para la rehabilitación del movimiento y asistencia.	
HANDY 1	Rehab Robotics built the first commercial assistive robot, it interacted with different trays for tasks such as eating, shaving, and painting, and it was controlled by a single switch input to select the desired action.	HANDY 1	Handy 1 es un manipulador robótico estático diseñado para la asistencia y el cuidado personal de pacientes con discapacidades severas.
iARM	Exact Dynamics designed iARM, a robotic arm with a two-fingered grasper, that attaches to electric wheelchairs and can be controlled via keypad, joystick, or single button.	iARM	iARM es un brazo robótico articulado para la asistencia y compensación funcional de personas con discapacidades motoras. El sistema dispone de una pinza al final del brazo articulado para agarrar objetos.
INMOTION	InMotion, engineered by Interactive Motion Technologies, is a robotic arm that moves, guides, or perturbs the patient's arm within a planar workspace, while recording motions, velocities, and forces to evaluate progress.	INMOTION	InMotion es un sistema servo-mecánico para la rehabilitación de hombro, codo y muñeca. Está compuesto por una plataforma plana que estudia el proceso de rehabilitación del paciente mediante la recolección de datos de los movimientos realizados por el paciente.
KAIST	Kaist is a cycling simulator of 1 DOF (degrees of freedom) that functions as a rehabilitation device for stroke patients training to perform activities of daily living (ADL).	KAIST	KAIST es un sistema que actúa como un simulador de bicicleta utilizado para la rehabilitación médica en pacientes post infarto.
LOKOHELP	This is an electromechanical gait trainer developed to guide the patients during treadmill therapy.	LOKOHELP	LokoHelp es un andador electromecánico desarrollado para guiar las piernas del paciente durante la terapia de locomoción.
MOBILITY SYSTEM	This is a wearable robotic device developed by Myomo Inc., that moves the patient's arm in response to his/her muscle signals, thus creating feedback to facilitate muscle re-education.	MOBILITY SYSTEM	Mobility System es un dispositivo robótico que asiste en el movimiento de las extremidades superiores del paciente mediante la respuesta a señales musculares.
NEATER EATER	Neater Eater, from Neater Solutions, is a modular device that scoops food from a plate to a person's mouth and can be controlled manually or via head or foot switches.	NEATER EATER	Éste es un dispositivo para la alimentación autónoma diseñado para personas con disfunciones en las extremidades superiores. Mediante la aplicación de cargas de amortiguación disipadoras, permite realizar la función de alimentación sin dificultades.

EXOSKELETON-BASED REHABILITATION		PARA REHABILITACIÓN BASADA EN EXOESQUELETOS	
Exoskeletons for motion rehabilitation.		Exoesqueletos utilizados para la rehabilitación motora de pacientes.	
HANDEXOS	Handexos (hand exoskeleton) is an exoskeleton device for the rehabilitation of the hand in post-stroke patients. The exoskeleton has a mechanical design, and its goal is to train a safe extension motion from the typical closed position of the impaired hand.	HANDEXOS	HANDEXOS es un exoesqueleto que asiste en la rehabilitación motora de la mano, basado en un sensor electromiográfico.
HANDSOME	HandSOME or Handspring Operated Movement Enhancer is a portable, passive hand exoskeleton for stroke rehabilitation.	HANDSOME	HandSOME es un exoesqueleto robótico para la rehabilitación motriz de la mano mediante fibras musculares.
HEXORR	The HEXORR (Hand Exoskeleton Rehabilitation Robot). Exoskeletal prototype for the rehabilitation of fingers.	HEXORR	HEXORR es el prototipo de un exoesqueleto desarrollado para la rehabilitación de los dedos. El dispositivo dispone de dos actuadores neumáticos que proporcionan control directo del movimiento de los dedos.
HWARD	HWARD (Hand-Wrist Assisting Robotic Device). Light exoskeleton developed for wrist rehabilitation.	HWARD	HWARD es un exoesqueleto fabricado con materiales ligeros y actuado por SMA para asistir en la movilización de la muñeca. Este dispositivo está diseñado para desviaciones radial, cubital y flexo-extensión de la muñeca.
KITECH-HAND	A highly dexterous and modularized anthropomorphic robotic hand. The KITECH-Hand has a metacarpophalangeal (MCP) structure that replaces the conventional structures, this way benefiting enhanced kinematic performance.	KITECH-HAND	Kitech-Hand es una mano robótica antropomórfica modularizada. Su estructura metacarpofalángica mejora el rendimiento cinético y reemplaza las estructuras convencionales
LOKOMAT	Lokomat is a gait training robotic exoskeleton developed to automate treadmill training rehabilitation of locomotion for spinal cord injured and stroke patients.	LOKOMAT	Lokomat es un exoesqueleto con un sistema actuado mediante motores eléctricos que introduce realidad virtual tanto gráfica como auditiva, utilizado para la rehabilitación de miembros inferiores.
LOPES (GAIT TRAINER)	This is a robotic exoskeleton is often used as a gait trainer that is combined with a treadmill and a body weight support system. It has eight actuated DOF and is impedance controlled, meaning it applies assistive forces to the deviation of the actual movement to a reference movement. LOPES stands for Lower-extremity Powered ExoSkeleton.	LOPES	LOPES es un exoesqueleto robótico desarrollado para la rehabilitación de la marcha y evaluación de la función motora en pacientes tras accidentes cerebrovasculares. El exoesqueleto dispone de 8GDL y se combina con una cinta de caminar y un soporte para el paciente.
MASTER II	This is a system that uses a rail-mounted robotic arm to make manually controlled, remote-controlled, or pre-programmed motions for various domestic and office tasks	MASTER II	MASTER II es un exoesqueleto utilizado para potenciar las capacidades humanas y apoyar la rehabilitación controlado manual o remotamente, que asiste en la realización de tareas doméstica.
RUTGERS ANKLE	This rehabilitation haptic interface is aimed at ankle strengthening and improvement of locomotion control for post-stroke rehabilitation.	RUTGERS ANKLE	El dispositivo rehabilitador para tobillo llamado RUTGERS ANKLE, es un robot paralelo de 6 GDL controlado por actuadores con una interfaz háptica.

OTHER		OTROS	
PROBOT	The Probot was a computer integrated prostatectomy system that provided the surgeon with on-line imaging and three-dimensional prostate model construction, as well as a counterbalanced mounting frame and a computer-controlled robot. It was developed to aid in the resection of prostatic tissue.	PROBOT	PROBOT era un sistema para la realización de una RTU de próstata preprogramada. Este dispositivo utilizaba una estructura robótica, que guiaba un asa de diatermia para completar una resección transuretral de próstata.

The above information has been extracted from the ‘Other websites and resources for the thesaurus’ sub-section of the 6. Sources and Bibliography.