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1. INTRODUCTION

Nowadays, human society is living the information age, where innumerable technologies have been easing society tasks. Likewise, data load evolves as the use of electronic devices and data traffic increases. And this is due to the use of Internet as a worldwide phenomenon, bringing the opportunity to build and spread knowledge in a collaborative, fast and efficient way [1].

Due to the large amount of data accumulated by the use of these devices and made available on the network, searching, sorting, organizing and structuring algorithms of this data are created in order to help an individual find the data he/she is looking for in the world wide web.

Thus, the techniques of Natural-language Processing (NLP) emerge, where are used to prepare the textual data, in which some type of knowledge is sought, and whose main goal is to provide a higher level of understanding of the natural language through the use of computational resources [2], and the usage of techniques, obtaining fast text processing [3].

In this way, the seek for information transcended the bonds, once only physical, with the reading of books, magazines and articles found in scattered libraries, passing now with the aid of technology and the new era the ease of obtaining this information in quick and effective time.

Thus, integrating NLP to Systematic Review concepts, it is intended to perform a Systematic Literature

Review (SLR), a scientific method that is intended to be agile, consistent and fast, promoting the development of quality academic papers. Following and when necessary adapting the guidelines [4]. According to him, a Systematic Literature Review or SLR is a process of search and evaluation in available literature related to issues of particular interest. An important reason for conducting such study is to identify the fields of greatest investigation/ research.

So, this article intends, using SLR, to survey the existent databases in literature, between the years of 2009 and 2012, for the construction of multimedia learning objects applied to Stewart platforms, using software engineering methods.

2. LITERATURE REVIEW

With the emergence of new Information and Communication Technologies (ICT), its use is increasingly an imperative model in today's society, since technology brings with it the improvement and effectiveness of procedures that were previously carried out with a greater demand for time, such as performing calculations and building well-defined and formatted documents [5].

With this, the advancement of ICT has led the information society the ease to adapt traditional procedures and transpose them into the electronic media [6]. In this way, academic procedures such as the use of bibliographic research in books, magazines, articles and other periodicals will no longer be restricted to the physical environment.

However, electronic media including Internet, produces a large amount of data, largely stored unstructured, and without formatting. In addition, another relevant feature for this media is that this collection can be accessed from anywhere in the world.

However, the problem is the large amount of data, currently called Big Data, which is data that exceeds the processing capacity of conventional database systems. Dumbill [7] brings a problem when searching for information on this data volume.

As an example, search engines were built to help find what the user wants, within the greatest possible relevance, according to their wishes. For this, an entry, which here will be called "search expression" or "search key" is required, and through it the website algorithm performs the search.

Among these websites, some have specialized in areas, such as: video, image, and text website engines, etc. In the academic area these web portals store or reference periodicals, theses, dissertations, books, etc. As an example in Brazil, the portal for the Coordination for the Improvement of Higher Education Personnel (CAPES), which has the portal called Periodicals CAPES, which stores periodicals from many magazines, bodies and conferences, having a collection of 193 bodies and digital libraries, including SciELO, IEEE, Scopus, Springer and ProQuest.

In this way, this article aims to verify, using SLR in the existing literature (between the years of 2009 and 2012), multimedia learning objects construction techniques applied to Stewart platforms, using software engineering methods. The chosen subject represents a research problem that is exposed below.

3. RESEARCH PROBLEM

For a long time, fields of knowledge have been building methodologies to aid teaching and learning. Teaching and knowledge retention methods have already been tested and many have been approved by the academic society [8].

While there are many ways to convey knowledge, there are still fields that need to be explored in order to seek improvements for learning.

An example of this is medicine, with a large number of surgical procedures already known and many new ones appearing every day. One particular area, orthopedics, has a medical procedure that helps a patient correct poor bone modeling.

As a result, problems of society with poor bone modeling, whether due to genetic problems or accidents have special attention and have been treated with the Ilizarov method [9].

However, new methods and technologies are in a multidisciplinary way, contributing to the correction of these problems. One of the recent techniques is known as: Stewart's Platform. One of the devices built to work on this platform is the Ilizarov Hexapod System (IHS).

However, society awareness and the teaching to the professionals of this field, are difficult, due to the visual formation of IHS, many patients fear and do not know how the process works from the implantation to the recovery. On the other hand, professionals who need improvement to handle it also find it difficult to structure it in 3D (three dimensions).

To tackle this dysfunction it is necessary, through the Multimedia Learning Objects (MLO), to use MLO in 3D. Regardless of the perspective or focus of analysis, with an impact on more technical or pedagogical aspects, the production and use of MLO seem like an expanding scenario in a context of growing integration of e-learning practices in higher education institutions, involving in its grant and implementation, researchers and professionals associated to the field of multimedia development and teaching fields [10].

However, since the process of developing 3D MLO involves software and processes for computational development, it is necessary to use techniques or models of software engineering used for the process of developing traditional software, for desktop or enterprise systems. Thus, the final object will be built with quality through the use of software development methodologies already known as Scrum, XP (Extreme Programming) and TDD.

4. METHODOLOGY – SYSTEMATIC LITERATURE REVIEW

The systematic review protocol for SLR performance was adapted to use as a model. The model developed in Figure 1 represents this adaptation originally presented by Biolchini [11].

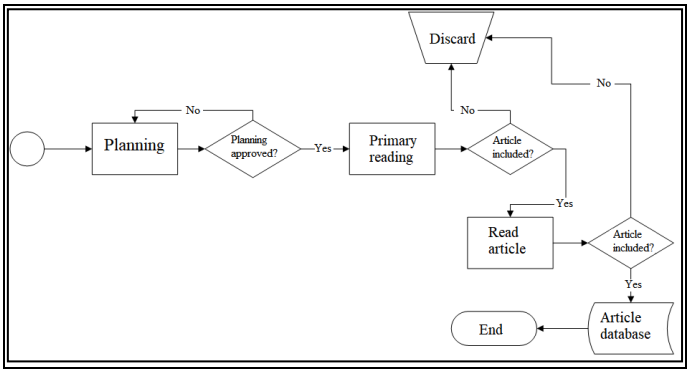


Fig. 1. SLR protocol. Source: [11].

The first step is planning. In this phase, the criteria that determine what one wants to find when carrying out the systematic literature research, as well as the problem situation, the research sources, and the amplitude of the results will be discussed and chosen. Planning goes through an approval process with the study's advisers or mentors, and if rejected, it needs to be reworked until its approval is agreed upon.

After the approval of the planning, the primary reading of the articles is performed, that the reading criteria are defined in the planning phase, so if the article is chosen as selected it goes to the full reading phase of the article, otherwise it will be discarded.

In the reading phase of the articles the selection process is useful in formulating the questions that, if the articles respond to some of them, it is classified as included in the article base, if the article is not classified by the criteria and questions planned it is discarded.

With the adapted model, three fields that involve the research problem will be used: Learning Objects, Stewart Platform and Software Engineering, these fields can be defined according to the work proposal that one wishes to research.

2.1 Criteria formulation

The SLR protocol was developed to verify if there are techniques in the literature for the construction of multimedia learning objects applied to Stewart platforms, using software engineering methods. For this, the following criteria were prepared by field in Tables 1, 2 and 3.

Table 1. Learning Objects Criteria

Field: Learning Objects
Criteria:
1 Techniques used to build Multimedia Learning Objects; 2 Works that use 2D or 3D learning objects; 3 Works that use 2D or 3D learning objects in the health field.

Table 2. Stewart Platform Criteria

Field: Stewart Platform
Criteria:
1 Existing applications that use hexapod platforms; 2 Existing applications that use Stewart Platform; 3 Existing applications that use Stewart Platform in the health field.

Table 3. Software Engineering Criteria

Field: Software Engineering
Criteria:
1 Techniques used for the software development process applied to 3D modeling;

2.2 Criteria amplitude

The criteria amplitude defines and limits the found results, and they are divided into:

- Intervention: application of Multimedia Learning Objects techniques, Stewart Platform and Software Engineering;
- Effect: identification of the used techniques;
- Publication period: publications of the last decade;
- Results: analyze articles, verifying those that meet the search criteria;
- Applications: the research will work as a basis for the preparation of a bibliographic basis for studies in the mentioned fields.

2.3 Source selection criteria

In order to carry out this study, digital libraries that bring together impact factor journals measured by the Journal of Citation Reports (JCR) will be accessed as search sources, such as IEEE Xplorer (IEEE) and the periodical library of Capes (Coordination for the Improvement of Higher Education Personnel - CAPES). The works were selected using the textual search expression presented in Table 4.

Table 4. Construction of the SLR search textual expression

Keyword	Generic search/technique textual expression
Learning Objects	AND (“Multimedia” OR “2D” OR “3D” OR “in Health”)
Stewart platform	“Stewart Platform” OR “Stewart Platform Manipulator” OR SPM AND “Flight simulation” OR “Flight path” OR “Orthopedic Procedure”
Software Engineering	“Software Engineering” AND “Gathering requirements” OR “Monitoring processes” OR “Monitoring of processes modeling 3D” OR “ 3D”

In CAPES periodicals portal, the ordering of periodicals was given in order of relevance to the search criteria inserted.

2.4 Studies inclusion criteria

Studies returned by textual expression of search that reported techniques application experiences related to the fields of item A.

- The first inclusion criterion is to select the fifty most relevant periodicals for each search criterion;
- The second periodical inclusion criterion was the reading of the title and abstract, where the relevant articles were collected;
- The third criterion is the reading of articles for final selection, classification and use in the desired academic work.

2.5 Selection process

The selection process was carried out based on the criteria established in response to some pre-formulated questions for classifying or discarding the work.

In addition, the articles were selected in the sources mentioned previously, following the reading order: title and abstract. At this stage it was possible to identify articles that could be discarded because they had no relation with the topic being studied. In case of doubt, the work was classified as included or excluded in meetings with the advisors.

The selected papers were then read and a selection was made by level of importance, according to the established criteria and publication date. At this stage some articles may also be discarded.

Some of the questions that make part of the analysis of the results and that classify as choice or disposal the articles for each field are:

a. Field: Learning Objects

Questions:

- In what ways are the techniques applied?
- What are the advantages and disadvantages observed in the techniques?

- What are the learning objects applied in the health field?

b. Field: Stewart Platform

Questions:

- In what ways are the techniques applied?
- What are the advantages and disadvantages observed in the techniques?
- Is there experience with using Stewart Platform in the health field?
- Field: Software Engineering

Questions:

- Is there experience with using Software Engineering techniques in the 3D Computing field?
- What are the possible candidate techniques to adaptation for using with 3D modeling?

5. RESULTS

For this study, the sources mentioned in section 4.3 were accessed. It is worth noting that the fifty first articles were selected for each search criterion, the most relevant ones were chosen and then the final articles were selected for using as the bibliographic base of the subject field.

It is worth mentioning that all the references of the selected papers presented below are available at the electronic address "http://www.citeulike.org/user/sbie2013" referenced by numbering.

The results from the SLR were divided by the fields that involve the research problem in order to detail the criteria and results for each search expression used in the chosen data selection sources (SHASHANK, 2010).

Thus, 44 articles classified as Learning Objects were identified, where 32 were found in CAPES periodical portal and 12 in IEEE Xplorer, of which 11 were selected from CAPES and 6 from IEEE, with publication predominance in 2010, a summary can be seen in Figures 2, 3 and Table 5.

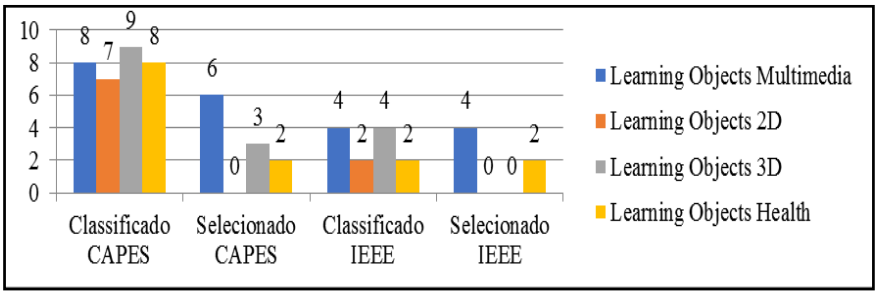


Figure 2. Results of applying search criteria to Learning Objects.

Table 5. Selected articles by technique: Learning Objects

Techniques	Reference (s)	Year (s)
Learning Objects Multimedia	[12], [13], [14], [15], [16], [17], [18], [19], [30], [21]	2007, 2010, 2010, 2013, 2005, 2005, 2003, 2010, 2010, 2010
Learning Objects 2D	--	--
Learning Objects 3D	[22], [23], [24]	2011, 2010, 2009
Learning Objects Health	[25], [26], [27], [28]	2010, 2011, 2010, 2010

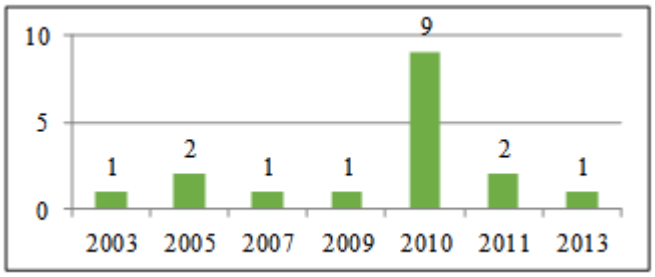


Figure 3. Chronological evolution for Learning Objects.

For the Stewart Platform field, 45 classified articles were identified, where 32 were found in CAPES periodical portal and 13 in IEEE Xplorer, of which 15 were selected from CAPES and 11 from IEEE, with publication predominance in 2009 and 2012, a summary can be seen in Figures 4, 5 and Table 6.

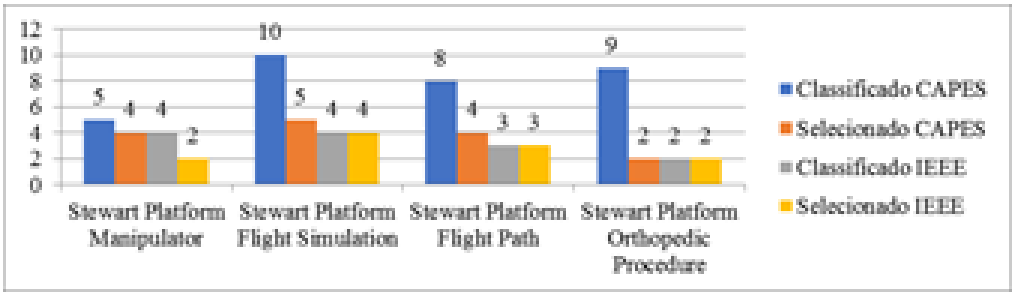
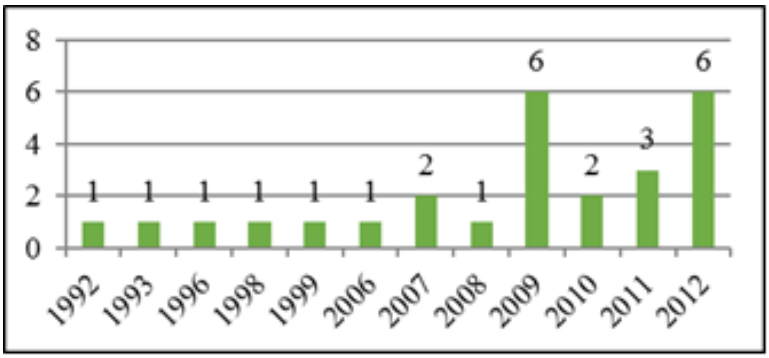


Figure 4. Results of applying search criteria to Stewart Platform.

Table 7. Selected articles by technique: Stewart Platform

Techniques	Reference (s)	Year (s)
Stewart Platform Manipulator	[29], [30], [31], [32], [33], [34]	2011, 2012, 2010, 2012, 2010, 1993
Stewart Platform Flight Simulation	[35], [36], [37], [38], [39], [40], [41], [42], [43]	2012, 2012, 2009, 2012, 2012, 2009, 2009, 1999, 2011
Stewart Platform Flight Path	[44], [45], [46], [47], [48], [49], [50]	2011, 1998, 2007, 1992, 2007, 2009, 2008

Stewart Platform Orthopedic Procedure	[51], [52], [53], [54]	2006, 2009, 1996, 2009



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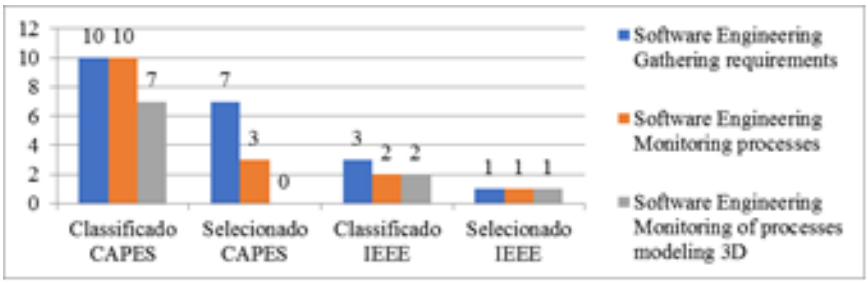

Figure 6. Results of applying search criteria to Software Engineering.

Table 8. Selected articles by technique: Software Engineering

Techniques	Reference (s)	Year (s)
Software Engineering Gathering requirements	[55], [56], [57], [58], [59], [60], [61], [62]	2011, 2011, 2012, 2012, 2012, 2012, 2012, 2010
Software Engineering Monitoring processes	[63], [64], [65], [66]	2011, 2011, 2012, 1999
Software Engineering Monitoring of processes modeling 3D	[67]	2009

The classified periodicals come from the primary reading established in the model, the selected ones are those that meet the criteria and the questions of the planning, of which the full reading was done.

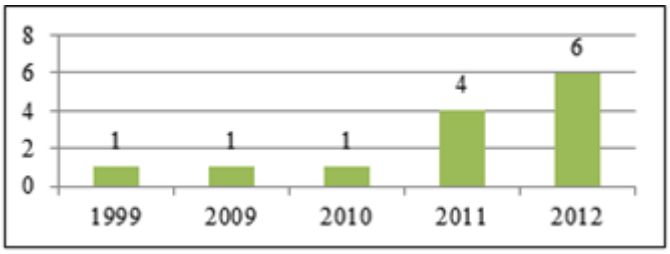

Figure 7. Results of applying search criteria to Software Engineering.

6. FINAL REMARKS

Therefore, according to the presented results, it is noticed that the use of the Systematic Literarure Review assisted in the process of bibliographic survey for the presented research problem [68], with satisfactory results and recent publications with relevance and impact factor, thus making a solid foundation for many works in the research fields.

In addition, it can be seen that in the Learning Objects field with regard to 2D technique (two dimensions) there were no classified results in the last decade; simply the search criterion was not satisfactory for research of this type of technique.

However, Stewart Platform field showed classified results for publications of the last decade using the search keys to find the desired techniques, including old articles, but important for the selected term, from the 26 selected articles about 65.38% of them are between 2009 and 2012.

Finally, Software Engineering field presented only 1 classified article for the monitoring of the 3D modeling process, showing that a greater attention by the academy is needed in this field, considering that there is a great diversity of games and applications which use 3D models, and according to the results it is noticed that there is no development management model that allows to follow specifically 3D projects that involve software or modeling.

Thus, SLR shows that there is relevance in the selected periodicals for each field of the research problem, proving that it is possible to obtain a good study basis to develop academic works by using it.

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