# Objective Reviewer for Student Projects

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**Abstract.** In this paper, we present a web-based system to provide student aid in structuring research projects, specifically in the drafting of the objective. We use MOODLE as platform to present course material and to evaluate the student objective, we establish a dictionary of verbs, articles and tools for structural analysis of the objective with the implementation of a finite-state machine. This information is presented to students to receive acustomized feedback of their objective with an example of a well structured objective from the objectives repository. Finally we carried out an experiment with students´ final projects and applied a satisfaction survey of the objective reviewer system.

**Keywords:** Web-based learning systems, natural language processing, course management systems, Moodle.

## 1 Introduction

The use of natural language processing technologies applied to the study of texts for information analysis is widely used, as presented in the article by Muñoz [1] which performs the extraction of information in the domain of notary texts. Also Rose [2] shows a framework for retrieving text documents through natural language processing; this approach is based on the application of different techniques and rules that explicitly encode linguistic knowledge. Documents are analyzed on different linguistic levels by linguistic tools which incorporate text annotations within each level [3].

This paper aims to create a computer tool to provide student aid in structuring a researchproject, specifically in the drafting of the objective. This tool provides a theoretical framework for the drafting of objectives, analysisof the objective after the student has written it, and provides feedback to improve the objective. The tool uses dictionaries which, combined with a transition matrix, provide feedback based on certain pre-established parameters. Finally, the student, after using the tool, has a more refined objective, which will help the faculty adviser.

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The use of natural language when considering the formation of higher education students cannot be ignored. One of these stages of formation is related to the generation and application of knowledge through research, which is usually placed in the last semesters of the academic program. According to the institution, various mechanisms are adopted that allow students to enter in the field of research, either through business internships, professional practice or in the various forms of professional qualification, all presenting the possibility of doing a research project. However, the process of drafting the research projects is usually not an easy task for students. Therefore, the system described in this paper intends to assist the work of the teacher and to facilitate and guide students through this process, specifically in the objective setting. This part in particular is important because it is the objective which shows the expected end result, besides being the guide that directs and allows monitoring the investigation in order to maintain a course leading to the goal initially proposed [4].

The analysis of natural language requires a lexical and grammatical analysis as we can see in the work of Dominguez[5] which implements an application for grammatical analysis to the Spanish language for database queries. Firstly performing a lexical analysis to check the input sentence, identify words and proceed to tag them using a lexical dictionary; in that dictionary are stored all the words that userspredominantly use, then a grammatical analysis is performed using a finite state machine to determine whether a sentence is grammatically valid. In this article we propose the use of a tool that integrates the analysis of a research objective in natural language to the structure of a course management system Moodle; we establish a dictionary of verbs which analyzes the number of verbs in the objective, and also analyzes the number of words used, finally a basic grammatical analysis of the objective is performed using a finite state machine.This information is presented to students to receiveimmediate feedback ontheir objective. Finally we carried out an experiment with students´ final projects.

## 2　The model

The model consists in a Moodle course online, in which we present several resources to write objectives, these resources must be reviewed by the student. After that the student answers a test and if his score is higher than 70, the option access to the objective reviewer is enabled in order to begin the redaction.

The student writes his objective and requests the analysis, the objective reviewer performs the following process: a lexical analysis and labeling, a count of words, verbs, articles and tools found in the objective, the word count is compared with the maximum number of 43 words and minimum of 13 words found in the repository of written objectives which has 100 sample objectives, the verb count is compared with the maximum number of verbs found in objective repository 5, the minimum value for verbs is one, which should be in the infinitive form as indicated by the drafting guide for the university.

Simultaneously, basic grammatical analysis of the objective is performed using a finite state machine with 4 states: Figure 1 presents the model used to analyze the

objective, with the automaton we ensure that the first element of the objective is a verbor anarticle in state 0 and subsequently a tool is used to achieve the objective in state 2 to finish the sentence. In case of finding any mistakes in the objective, the objective reviewer suggests how to improve the redaction. Once the student corrected all errors an option is enabled to answer the satisfaction survey instrument.
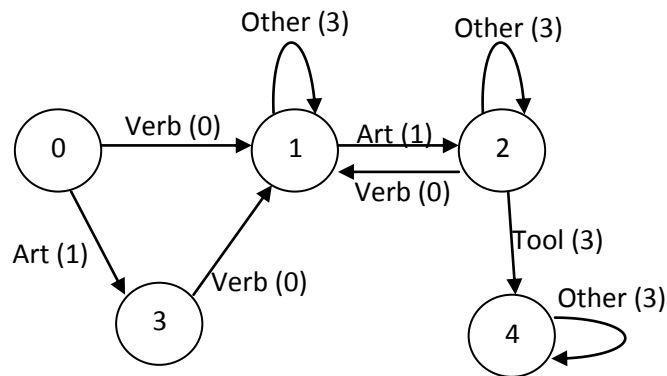


**Fig. 1.** Automaton used to analyze the objective.

The fourth state is the final one of state machine, where a verb and tool has been found successfully in the analyzed objective. When the process ends, the objective reviewer sends a success message to the student, if the fourth state in the automaton is not achieved, the objective reviewer indicatesa recommendation to improve the objective, in the absence of a verb the use of at least one verb in the infinitive form is recommended in order to define the action.In the case exceptions words are found, it isrecommended they are deleted, if the state machine is not successfully finish a message is send depending on the position which has failed.

For example, if the state in the automaton is 1 or 2, this indicates that it is necessary to include a tool in the objective, if thestate is 0 or 3, it indicates that it is necessary to start the objective with a verb in the infinitive form, finally, the objective reviewer shows an optimal objective which uses the same verb in the objective analyzed or a random objective.

## 3 Case Study

The experiment to test the tool was applied to a group of 42 students from three different Mexican Universities in the State of Sonora. Some of the students are doing research work whileothers are in advanced semesters in courses of research methodology. For this experiment we used the online course in Moodle. (http://moodle.moctezumavirtual.com). It starts by inviting all students to participate via email using the course "Intelligent Tutor for Research Projects" with access key "sonora", here we indicate the importance of reading the material for writing adequate objectives. In Figure 2 we can see the content of the Moodle Course usedas first

material to teach students how to write an objective, and in the second block we have the test and the student satisfaction survey.
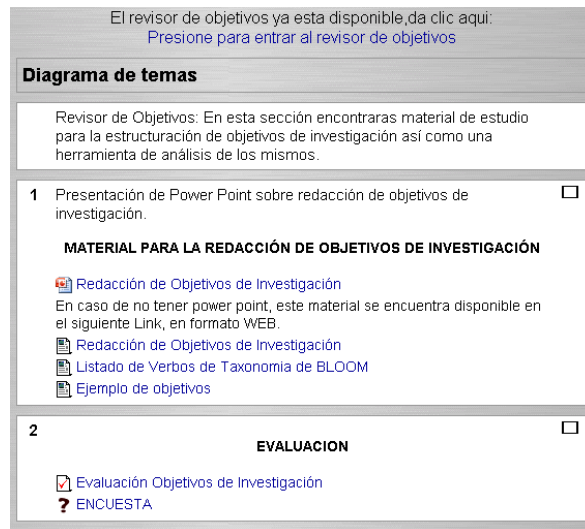


**Fig. 2.** Moodle Course "Intelligent Tutor for Research Projects".

After that, we ask students to answer a five question quiz to confirm they have read the material. When the student receives a positive score on the quiz, anoption is enabled touse the objective reviewer, and then the student can perform a preliminary analysis of his objective, before it is sent to the University's academic advisor.
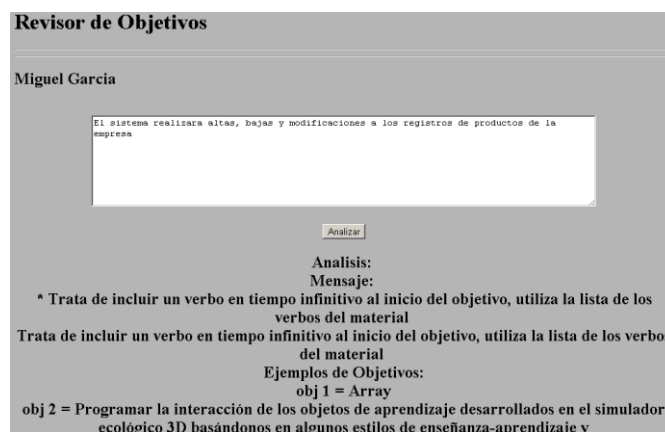


**Fig. 3.** Objective reviewer interface.

The interface of the objective reviewer is shown in Figure 3, where feedback to the students is shown. In this case the objective analyzed in spanish was: "El sistema

realizara altas, bajas y modificaciones a los registros de productos de la empresa" ("The system will perform additions, deletions and modifications to the records of the company's products"). The parser takes the first word "El" ("The") and identifies if it as an article. In the automaton this leads to state 3 in which a verb is expected but the second word is "sistema" ("system") category labeled "other" in this case the systems sends to user a feedback indicating that they must use a verb in infinitive form at the beginning of the objective. Once the students' achievement complies with all recommendations and they obtain a successful analysis, the student will answer a satisfaction survey to determine the objective reviewer utility.

## 4   Results

As a result of the 42 students who used the objective reviewer, there were 150 different types of feedback, the students made 186 attempts and the average usage time was 5:10 minutes. Figure 4 shows the numbers of attempts for each student to use the analyzer, the number of attempts were taken from the amount of feedbacks presented to the students.
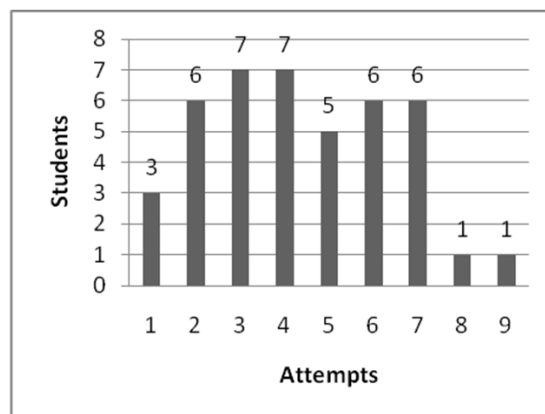


**Fig. 4.** Number of attempts per student.

By analyzing the types of messages sent to students it was found that 45% of the time the objective reviewer provided feedback to students such as include a tool, 22% were of the type include infinitive verb, 20% were suggestions to reduce the number of words in the objective and finally 13%" recommended they add words to the objective.

With this data we can concludethat most students did not include a tool in their objective, which refers to "how" the objective will be achieved, such a tool couldbe "web technology" or "Database."

The results of the satisfaction survey indicated 84% of the group rated the objective reviewer as of "great use", 13% of students indicated that it was moderately helpful and only 2% of students indicated that it was not useful.

We performed a statistical test to the results of objectives, hypothesis testing of a sample: applied under the t-student distribution, assuming that the data behaved in a continuous distribution.

Attempts were analyzed in the objective reviewer. One attempt meant that the student used it once and did not receive suggestions from the objective reviewer, 2 attempts or more, the student received feedback to improve its overall objective. We have the followings hypothesis:

**Null hypothesis:** The objective reviewer provides feedback to the student to formulate the overall objective.
**Alternative hypothesis:** The objective reviewer doesn't provide feedback to the student to formulate the overall objective.

The Interval found is (3.754, 5.045), where with 95% reliability, the average can take any value in the interval for our experiment we take 4.

Hypothesis Testing: H0 = 4 and H1 ≠ 4.

We chose the statistical test "t-student" because of the small amount of unknown data as the deviation of the population:

Data: $Xn=4.4$, $Sn=2.07$, $u=4$, $n=42$.

$$T = (Xn - u) / (Sn/\sqrt{n}) = 0.4 / 0.3194$$

$$\therefore T = 1.2524 .$$

(1)

The rejection area is located above t= –2.02 and t= 2.02, so the result of T= 1.2524 falls in the area of non-rejection. So we can conclude that the null hypothesis is not rejected and the instrument helped students receive feedback to improve the wording of their overall objective.

## 5   Conclusions and Future Works

The use of the objective reviewer in developing research projects is very useful for students who are often inexperienced in the correct wording of objectives and regularly require the teacher's personal advice; the parser proposed in this paper helps guide the student in the correct wording to directly analyze the text, recommending specific actions to improve the objectives was analyzed.

Using the objective reviewer we serve a large number of students and developed their objectives for the final review by the teacher. From the results of the satisfaction survey we can see that the use of the objective reviewer was useful for 84% of students. In future works, we shall attemptto analyze objectives written in English and we will optimize the system to work with mobile devices.

The objective reviewer is available to try in the follow internet address http://moodle.moctezumavirtual.com to use the system just sign in and enter to the course "Intelligent Tutor for Research Projects" with access key "sonora".

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