Innovative Processes in Computer Assisted Language Learning

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Abstract—**Reading ability of an individual is believed to be one of the major sections in language competency. From this perspective, determination of topical writings for second language learners is considered tough exam for language instructor. This mixed i.e. qualitative and quantitative research study aims to address the innovative processes in computer-assisted language learning through surveying the reading level and streamline content of the ESL students in the classrooms designed for students. This study is based on empirical research to measure the reading level among the ESL students. The findings of this study have revealed that using the procedures of language preparing such as shortened text as well as assessed component tools used for automatic text simplification is profitable for both the ESL students and the teachers.**

Keywords—*Natural Language Processing; Computer Assisted Language Learning; Syntactic Simplification Tools*

OUTLINE

This paper will encompass various sections such as introduction to the topic, materials and methods, results, discussion, conclusions, and future work. In the first part named as "introduction," it will describe the different levels of English as Second language (ESL) learners in the United States as well as their specific needs to be successful immigrant students. The second part of this paper will encompass the prior researches conducted relevant to the topic of interest. The subsequent part i.e. results and discussion will focus upon the provision of results of the data gathered through primary sources. The final part of this paper will conclude the study along with the provision of future work.

I. INTRODUCTION

The Educational system of the United States is confronted with the testing assignment of instructing developing quantities of understudies for whom English is a second language. Washington had 72,215 understudies (7.2% of all understudies) between the school year 2001 and 2002. These understudies were related to the LEP, known as Limited English Proficient. From a year, 2003 onwards more than 2.9 million understudies got English language learner (ELL) administrations, including 19% of all government funded school understudies in California and 20% of all understudies in Texas [1]. In any case, in 2001-2002, 21% of LEP understudies had been in the project for more than three years.

On the other hand, reading is considered to be the basic piece of language and educational advancement, yet discovering appropriate reading material for LEP understudies is considered frequent upsetting. To help the learners who lie below the evaluation level, the educators with bilingual instruction search out "high investment level" writings at "low reading levels." For example, writings at a first or 2nd grade level back the 5th grade science educational program. Evaluated course readings and different materials are accessible, yet these do not meet the high investment/low reading level model.

In addition, learners also need to be engaged in supplemental reading outside of evaluated reading material for class ventures. Educators additionally require finding material, which consists of a blend of levels, since understudies need distinctive writings to peruse autonomously vs. with assistance from the instructor. This study address the issue by creating computerized instruments to help instructors and understudies discover reading-level fitting writings matched to a specific point to assist furnish these understudies with more intelligible reading material [1].

The term "Natural Language Processing" (NLP) refers to the innovation that is a perfect asset for computerizing the errand of selecting fitting material for reading understudies for bilingual. Data recovery systems effectively find "topical materials" and many of them answers complex questions in content databases on the World Wide Web. A compelling mechanized approach used for evaluating the reading level of the recovered content is still required [2]. Notwithstanding understudies in bilingual instruction, these devices will likewise be valuable for individuals with inabilitiy for learning and education understudies for adults. In both of these circumstances, the understudy's level of reading does not match their educated level as well as investments.

A. BILLINGUAL EDUCAITON

The term "Bilingual education" refers to the different approaches of teaching to the students who have the ability to communicate in multiple languages. From this perspective, "English as a Second Language" (ESL) programs are designed to prepare immigrant students for English-speaking classrooms. Some schools also offer bilingual programs recognized as "dual language immersion" in which throughout the school day two languages are used. In various ESL classrooms, students are ranging from various levels. They require various text levels to review with the assistance and individually involving instructors to locate or generate a great text variety. It would not be wrong to state that teachers working for dual language programs have to face the

challenge. This is mainly due to that, students may learn a few subjects in either of the language.

B. COMPUTER ASSISTED LANGUAGE LEARNING

Combined with advanced information technologies (IT), communication systems are considered key to the information society. IT is a baked information revolution, as it gives new human intelligence and vast capabilities. It would not be wrong to state that IT provides resources, and change the way people work and live. It is a new way of living and working together, a new means for communication and interaction in 21st century. The training needs of citizens extend beyond the first studies leading to a degree and extend throughout their lives. The introduction of computers and ICT in the classrooms is mainly due to three perspectives. These perspectives may include initially that students learn about computers because they focus their interest on the technological components. Secondly, they learn computers to employ a range of tailored programs for teaching. Finally, learning with computers and using them as tools give the students benefits of all their applications and connectivity [3].

The computer-assisted language learning is described as incorporation of unit CPU or process and peripherals (monitor, keyboard, mouse, microphone, speaker, video camera, and printer). In the same way, it is also described as a series of texts-processor software, browsers, and educational games. It is an educational application of Information and Communications Technology (ICT). These new technologies help the student to learn more effectively, by allowing them to learn or practice the target language at any time and communicate with the teacher remote, enabling e-learning [3]. Modern multimedia programs often offer an attractive presentation to the user/student to combine text with animated sequences of images and sound. Today the computer is already part of the service of instrumental ELE student at the University, in language schools in self-learning centers [4].

The language learning and computer-assisted instruction (computer-assisted language) are the two complementary facets of the same phenomenon, one from the perspective of the learner and the other from the perspective of the teacher. Computer programs and materials designed for ALAO have some drawbacks. By its very nature, it can hardly pick up all the nuances of human language and the negotiation of meaning that occurs in verbal interaction, such as gestures and intonation [4]. Moreover, these programs do not always cover the various language skills as naturally happens in the human language. Yet, ALAO offers the students a number of advantages, such as:

1) The student chooses a menu among various options for the item, the level of language difficulty, etc.

2) Each student chooses their study schedule; work at their pace, repeating a difficult activity and overlooking another who is not interested

3) The student is frequently the center of the learning process; this helps the student to take responsibility for his or her learning, while contributing to the formation as an independent learner

4) Students get help and correction. A machine usually afflicts to correct the error except when an individual edits it. The computer encourages self-evaluation

C. IMPACT OF TECHNOLOGY ON LEARNING PROCESS

Technology has positively affected the learning process of students in today's society. It has shown that there are many benefits of education in our society. The application of information technology is a feasible and necessary activity. These new technologies are affecting the educational world, particularly the students in the field of training. It is particularly because the media plays a powerful role in the learning process of educational training in term of multiplication. On the other hand, the notion known as "natural language processing" serves as an essential tool to teach the students, specifically the ones with special needs [4].

In a world where distance shrinks and borders disappear, growing mobility of people has a great significance, as they provide an opportunity to work together and to solve problems. The field of education enjoys this scenario with new forms. It appears that the inclusive schools try to solve and address the educational needs of different social groups or sectors of informal education. They find the ICT as a general contributor to the solution of such problems [5].

D. NLP TOOLS FOR LANGUAGE LEARNERS

Currently, there exist few Natural Language Processing (NLP) tools to support teachers as well as language learners. In this way, the existing systems concentrate mainly on constructing vocabulary and involve a large amount of human intervention. The observation of Horst et.al reveals that whereas the reading is a useful technique for vocabulary building, it also helps the readers to recognize new words in accordance to the context. Text Ladder system of Ghadirian classifies selected articles by teachers for the optimum arrangement of vocabulary. At the same time as functional, it is a requisite for the teacher to locate all the stories physically; the tool mainly sorts them [5].
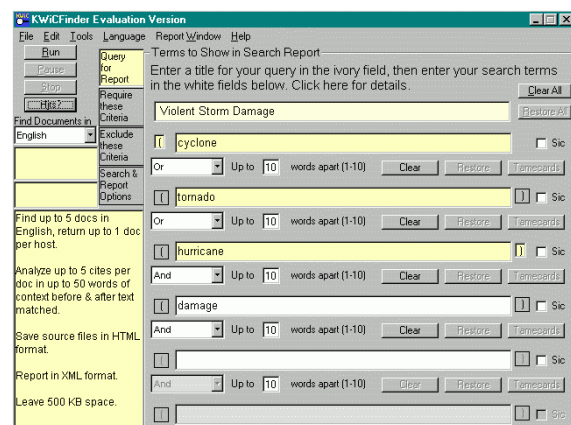

Fig. 1. Fletcher`s KWiC Finder

Fletcher has successfully developed a concordance tool to be used for "foreign language teaching" (FLT). He often makes use of web in the EFL classes in order to find examples related to the FLT.

In this way, he easily checks the questionable usage of various words. On the other hand, he also finds new words, particularly, which have not yet made it into dictionaries. His tool named as "KWiCFinder" finds examples of "keywords in context" (KWiC) and routinely constructs synopsis documents. It was intended mainly as a filter to pace up the job of locating examples of particular words. The research conducted at the "Carnegie Mellon University" contributed in the development of REAP. It is an intelligent system meant for tutoring and constructing to identify online reading material particularly for ESL students. It is particularly based on grade level unigram models, curriculum, and the level of reading of students individually with the incorporation of grammar rules. For example, the rule known as handcrafted is present in the most up-to-date version of the system [6].

For the adult ESL students at grade 6-8, REAP is mainly targeted. A pre-processed database of articles is constructed by the system that entails several words from the Academic World List (570 words). It is a fact that the exact choice of word list is not a primary element of the system. The approach of REAP mainly focuses on students acquisition at an individual level, facilitated through a gram model usage. Our Study considering the same context believes that it would be useful to revisit the complex syntactic structure within the test as well as the short phrases.

In contrast, acquisition for vocabulary remains the vital part of language learning, the content material however needs to be learned by the students. Brunelle & Boonthum-Denecke (2012) explain how their work differentiates from previous studies where they have focused on more features. These features are structural in nature of reading level used particularly to permit the specification for the users regarding the topic discretely from the level [20].

1) Goals and Contribution

This study underlines two main objectives. Firstly, the application of natural language processing and its existing technology to the issues faced in bilingual education. These issues can be related to either teachers or students. Secondly, enabling and enhancing the modern approaches in the area of NLP [18].

The mentioned purpose is also used for the development of the tool that would prove to be helpful in assisting instructors and teachers to locate appropriate level. This assessment can also be done through the development of new techniques of assessment at the reading level and simplification of text to make significant contributions. Such contributions would be mentioned further in this study [7].

2) Reading level detection

Reading level detection is the primary example that would be constructed for corpus of articles that are clean text. It thereafter extends these detectors to be applied to web retrieved pages by the use of a standard search engine. That is how the developing such reading level detectors that are trainable for plain text [7]. These detectors act as SVM classifiers (Support vector machine. They include the usual grade level features including "parser" functions, "n gram" language model scores, and so on.

3) Extension of Read in Level Detectors for Web Pagesdetection

The static group of excellent quality test to the dynamic recourses of test was found to enable to produce additional challenges. It was eventually found that those "web pages" returned inclusive of several pages that trained through detectors on "clean text" merely are not constructed to hold [8]. To discriminate the "web pages" along with text, narrative in nature from those that chiefly have advertisements, links, or other unnecessary content, that would substantially reduce the amount of discarded pages by approximately 50% [8].

4) Investigation of Extension of Algorithm for adjustment Detectors for Individuals

The assessment at the reading level is a variable and subjective issue. Various annotators have diverse insights of the suitability of "articles for a particular grade level." This is partially due to the inconsistency between the students while working. One of the major aims is to develop the detectors that may be modified in the active learning style or in the significance feedback. In this way, one can learn the application of existing processes of SVM to this task. In order to meet the requirements of each user, it is necessary to adapt the reading level detectors via observations from each instructor [9]. It was impossible to attain developments using existing techniques what were known as SVM adaptation. Nevertheless, these were created on non-text-based tasks.

5) Theory/Calculation

The main purpose of the study was to present an investigation of corpus of manual and original news articles that are simplified. The main goal of the analysis is to gain an insight about the practices of people to simplify text to frame enhanced development tools. Burstein et.al approached to choose synonyms for the words they saw challenging. They had the opinion that the use of synonyms could be used to simplify the vocabulary [7]. Instead of the concept of synonym, this section aims to be presenting the analysis of corpus that is related to the manually simplified and original news-articles. The research focused on gaining answer to following questions:

- Suggest the differences in usage of phrase types and POS, found in simplified in comparison to original sentences?

- Identify the traits of the dropped sentences, in resultant of simplified article?

- Identify the traits of split sentences, in resultant of simplified article?

Unlike other studies, our study laid emphasis on corpus of manual and original sentences that are simplified. This study incorporated corpus of paired articles, however it is to be noted that each sentence selected may not have resultant simplified sentence. The corpus of this study makes it possible to discover where the sentences have been dropped and simplified by the rewriters.

6) Aligned Corpus of News Articles

This study took 108 authentic news articles that had parallel-abridged editions framed by literacy works. These

literacy works consists of websites for instructors and learners. The target audience selected for articles was native speakers accompanied with poor reading skills.

TABLE I. CORPUS OF 108 PAIRS(ARIBDGED/ORIGNAL)

	Original	Abridged
# of Sentences(Total)	2439	2359
Words (Total)	40282	28584
Length of Sentence (Avg. Words)	15.5	13.0

7) Corpus Statistics

Upon analysis, it was deduced that number of abridged sentences was nearly equal to original sentences. It was also deduced that there were 29% fewer words in the abridged article set, and the average length of the sentences was 16% shorter in the used set as shown in table 1. In order to explore the differences among abridged and original sentence the study made use of automatic parser. The main purpose of the automatic parser was to acquire tags for parts of speech and parses for sentences.

Table 2 signifies the average length of abridged sentences was 16% shorter; therefore, fewer POS tags and words per sentence were fewer. It was noticed that there was a percentage decrease in the average frequency for adjectives, coordinating conjunctions, and adverbs. There was a 31% decrease for nouns, and 45% for pronouns, which denoted that nouns are unlikely to be replaced with pronouns and deleted less often.

TABLE II. AVERAGE FREQUENCY, SELECTED POS TAGS (ORIGNAL/ABRIDGED/DIFFERENCE)

Tag	Original	Abridged	Difference (%)
Adjective	1.3	0.8	38%
Adverb	1.1	0.5	55%
CC	0.6	0.4	33%
Determiner	1.8	1.3	27%
IN	1.7	1.4	18%
Noun	3.2	2.2	31%
Proper Noun	1.4	1.0	28%
Pronoun	1.1	0.6	45%
Verb	2.1	1.5	28%

8) Original and Aligned Sentences

The original sentences were distributed in categories based on alignment explained in the above section. This categorization allowed us to drop or align sentences to "one or more abridged sentences". The sentences, that were aligned to precisely the other sentence. In this way, the study calculated the length of the abridged sentence. The study calculated whether the abridged sentence is 19.5% shorter, longer, or roughly equal to the length of the original sentence.

The Sentence is hypothesized to be split that is associated to more than single sentence that is abridged [10]. Similarly, sentences that are aligned to a single and a shorter sentence are assumed as split with one part of the sentence that is dropped. However, it is to note that the average length of these sentences is longer than that of sentences in other categories. Nevertheless, the standard sentence length in such categories is comparatively longer [22].

TABLE III. ALIGNMENT (ORIGINAL TO ABR. SENTENCES)

Category	# of Sentences (%)	Avg. length
Total	2439 (100%)	16.5
1 - 0 (dropped)	663 (30%)	14.1
1 - >=2 (split)	370 (19%)	24.6
1 - 1 (total)	988 (47%)	15.8
1 - 1 (shorter abr.)	320 (14%)	21.0
1 - 1 (same length abr.)	525 (29%)	14.4
1 - 1 (longer abr.)	103 (4%)	9.1
2 - 1 (merged)	127 (7%)	14.6

9) Annotating True Split Sentences

In this study, around 20% original sentences are adjusted to more than single abridged sentence. The study also assumed that sentences with one part dropped that are aligned to the shorter abridged sentences could be split. On the other hand, sentences having no split points were categorized as "edited," and the sentences conveying same information were marked as "different" [11]. As shown in Table 4, the original sentences were spread among 3 categories i.e. the hypothesized, one-to one splits, and one-to-many splits. In addition, it is not surprising that making a new sentence that is somewhat shorter seems more plausible as compared to the sentence that is changed into two new sentences having no obvious split points [12].

TABLE IV. HYPOTHESIZED SPLIT- SENTENCE, (DISTRIBUTION)

Category	# of Sentences	
	1 to Many (%)	1 to 1 (%)
Total	441 (100%)	365 (100%)
True split	356 (80%)	198 (54%)
Edited	16 (4%)	162 (45%)
Different	69 (16%)	5 (1%)

10) Analysis of Split vs. Unsplit Sentences

The first and foremost step in simplification that is automatically done via sentence selection to split. The study selected long sentences to be split, incorporating other characteristics as well. For the purpose of in-depth analysis, 1675 sentences were used. The can be identified as 356 "true splits" to 1319 un split sentences mentioned in Table 4. For this study, the different sentences as well as the edited sentences are assumed split sentences as they are measured unsplit. As a matter of fact, the average amount of phrases

"identified by the parser S, NP, etc." as well as the average length of the phrases is longer. Therefore, it is assumed that the split of sentence depends upon the syntactic features in addition to the length of a particular sentence. [13]
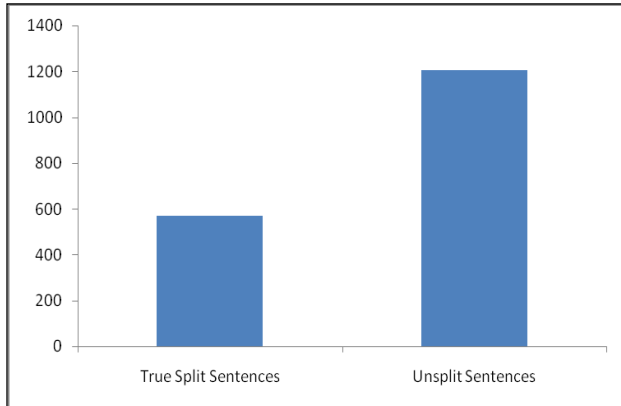

Fig. 2.   True Split Sentences vs Unsplit Sentences

In order to examine the most important feature for splitting sentence the study made use of "C4.5 decision tree learner" to build a classifier for unsplit and split sentences. From this perspective, the rule generators of C4.5 were selected for this study considering the easiness in the emerging results. This can be described in other words that in this section the major focus was on analysis instead of classification. From this perspective, the study incorporated a few features of sentence. The features, on the other hand, may include "Sentence length in words," "POS", and "Phrase." In other words, POS include number of adverbs, adjectives, CC, determiners, IN, nouns, pronouns, proper nouns, and verbs. On the other hand, the term "Phrase" may include average length and number of SBAR, S, PP, NP, and VP.

11) Analysis of Dropped Sentences

The researcher tends to attempt, in this section, to evaluate the "dropped sentences" in the comparison with the other original sentences. As "C4.5 rule generator" was used in the previous section in order to see the most important feature of sentence, "the basis for analyze the sentences to drop" seems more credible to see the dropped sentences. On the other hand, it is more credible to be content-based as compared to the syntactic. In this way, content-based is considered to be a quite different group of feature in the present section. It is forecasted instinctively that the replicated sentences can be dropped as well.

II.   RESULTS AND DISCUSSION

Based on the prior work above, the study decomposed the problem, what is known as simplification, into the following four component problems: sentence selection, sentence splitting, sentence compression, and lexical replacement.

The decoupling of such processes is useful for recognition their role in simplification, and for leveraging existing text processing tools. The key aspect is Sentence selection, furthermore, component of summarization systems and major research addresses this problem. Summarization systems targets to extract the most vital information from an article but majority select longer and more complicated sentences since those sentences convey major information [14]. By the same token, the articles that are simplified in the Literacy works corpus analyzed in paper above are seventy percent as long as the original articles.

In this study, the Literacy works corpus hand-aligned was studied to train the models for the selection of sentence and then splitting. The use of selected set developed from "Literacy works corpus" as well as "two test sets selected from two sources on the web" were used to evaluate the mentioned models as well as the processing tools of the existing language. The assessment of "automatic simplification" is considered to be quite similar to the compression tasks and closely-related summarization, as it generally involves the evaluation that is to be handwritten. This way is also associated with the human decision-making or gold standard as it is related to the "quality of the results." On the other hand, a huge variety of articles "from the Literacy works corpus" has been selected for the present study in order to use the development set as well as for the experiments.

The study created two additional test sets. The initial consists of usage of 5 articles from the online Principles of Aeronautics textbook written by Cislunar Aerospace, Inc.

These articles selected were about the same length as the Literacy works articles, and pointed out the factor that the "average sentence length" is longer for the corpus comparatively. Nevertheless, the "average sentence length" that is longer will represent the different challenge for the purpose of simplification though the mentioned articles are included in the similar "news domain" as the Literacy works corpus are.

Several of other systems do not use the quotation feature, rather than that it appears to be useful for the mentioned corpus. It is believed that it is helpful in general for such application. The content features represent the related purpose of the "tf-idf features used by Nobata and Sekine". Nevertheless, such features are to offer "information about content at the level of a single document instead of requiring a corpus of related documents." On the other hand, some features are mainly used in the extractive summarization. Nevertheless, these features are not quite relevant to the unimpeded domain.

Using the IND "decision tree package", the instructor may train "the classifier" with the mentioned features that are mainly based on dropped and not dropped sentences in the interpreted corpus. The IND usage in the place of "C4.5" is thus because of the package that provides probability to estimate the classifications. Eventually, to apply the classifier to the new feature known as "vector x for a sentence", all of the B trees 7) may be applied to "the vector and the resulting posterior probabilities" that are initially averaged and then regularized to the account for "re-sampling", i.e.

$$p(drop|x) = \frac{q_d}{0.5B} \sum_{i=1}^{B} p_i(drop|T_i(x))$$

where B = 48 and = 0.28 is the previous prospect of the "dropped" class. The application of the classifier to developing the set gives way performance, which is not much better than probability. From this perspective, the present paper did not follow any additional evaluation of the classifier on the set test. As a matter of fact, the present study is intended to compare to the set results of the development along with the "summarizer results" occurring in the subsequent section. The manual review related to the "various decision trees" identify that "all of the types of feature used, with the "quote" feature that often occur near to the top of tree [15]. The both feature categories i.e. redundancy and position emerge significant. It is unclear that what category is used consistently than the other one. The presence of complexity in using commands a language that is more rewarding than GUI [17]. However, they are still being used in various applications, typically without the users' intentions. People, however, do not notice simple control line interfaces that have been integrated into systems, which include a search box on the Web and page range box in Microsoft Word's printing options. Unnoticeable interface is a sign of a good interface. An extensive variety of functions can be fluently provided by a text interface in comparison to GUI, which lack scalability. The major cause is that the text is so much lighter than graphics [16]. The aptitude for pure texts to be effortlessly view, copy, paste, edit, stored, and share is accessible in almost every user interface and application

III. CONCLUSIONS

The purpose of the present research was to apply as well as to extend the existing "NLP technology" to be used for the problems faced by students as well as teachers within the context where bilingual education takes place. In this way, the study advanced "the state of the art in the relevant NLP areas". The paper has discussed in detail about the tools that support the instructors in order to choose appropriate-level and topical texts to be used for their students by the use of innovations and techniques of reading assessment. This study also explored the "characteristics of abridged text" as well as it "assessed component tools for automatic text simplification". It would not be wrong to state that this study contributed to the area where "reading level assessment" takes place and includes the "development of reading level detectors for clean text and extending them to a most varied text found on the World Wide Web". The researcher found that the combining "SVM classifiers" within the traditional grade-level, the scores of the models named as n-gram language, and the features that are parser-based are based on the LMs alone in form of n-gram.

Through the study, it was established that various methods of SVM adaptation have been developed for the "non-text-based tasks with well-separable components do not essentially apply to this task". Nevertheless, the study finds that "other classifier/adaptation combinations will provide better results in the future". With the use of Literacy works as well as "news article corpus", it was suggested that the further studies will characterizes the texts to expand insight into what people generally do when performing the type of text-adaptation. The study concluded that the hand-aligned sentences were to illustrate that how sentences in the original description and abridged description relate to one another other. From this perspective, the "split points" were marked at the places where an original sentence is mapping to two "abridged sentences". The resulting corpus in such observations will be the contributing factor to the "field of NLP research." Therefore, it could be used for the purpose of research on the topic that includes sentence alignment, simplification, and summarization [19].

IV. FUTURE WORK

There are various possible paths for the work that will be conducted in the future that might be based on this research. In this section, the author discusses the four most important directions such as future work for simplification, future work for adaptation, creating the system that can be used for interaction between teachers and students, and application to languages that are other than target language. The basic focus of the author was to develop the tools that can be used for English language. Nevertheless, the research would be equally helpful for students as well as teachers to find as well as simplify the texts available in the target language. On the other hand, the other then English languages English may have advantage from "the use of additional features" as well. For example, it can be used to capture the richer morphology. In the same way, extending and modifying the tools that have been developed in the research is the additional area for future work, as it is to create a system that may work in real-time.

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