The design of sign language electronic dictionaries for children with hearing impairments

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Abstract. Communication is difficult for people with hearing impairments due to the limitations of their hearing senses. In addition to communicating using natural cues they can also use the Indonesian Language System Dictionary (Dictionary SIBI) published by the Ministry of Education in the form of print. Dictionary Electronic sign language is starting to be used a lot, of course electronic dictionaries are more effective and flexible compared to dictionaries in general (print). A more effective electronic dictionary is used in searching for the signals sought and because they are efficient and easy to use. The methodology that used for this article are qualitative descriptive methods. The design method of sign language electronic dictionaries used some phase in Unified Process. Use case, activity, class, and ER diagram are used to design sign language electronic dictionaries. This article discusses how to design the electronic sign language dictionary application for people with hearing impairments.

1. Introduction
Language is an arbitrary and conventional articulated sound symbol system that is used as a communication tool to give birth to feelings and thoughts [1]. The languages in the world vary, one of which is sign language. Sign language is one of the individual problems that helps communication among people with hearing impairments in the wider community. Sign language is a language that prioritizes manual communication through body language or lip movements. Sign language usually combines the shape of the hands, gestures of the hands, arms, lips or gestures and facial expressions to express something that is in their mind, to symbolize Indonesian vocabulary.

Language is also the basis for communication. Communication generally divided into two different kind, namely verbal communication and non-verbal communication. Verbal communication is the process of communication through spoken words. While non-verbal communication is the delivery of meaning (message) without words that are reflected in body language and verbal intonation. Examples of non-verbal communication are using gestures, body language, facial expressions and eye contact.

Verbal communication is often found in society daily communication. However, not everyone is able to use verbal communication. Some of them are only able to use non-verbal communication, they are people with hearing impairment. Hearing impairment is defined as a degree of loss such that a person is unable to understand speech even in the presence of amplification [2]. Hearing impairment can be interpreted as a state of hearing loss which results in a person unable to capture various stimulants,
especially through the sense of hearing. Sign language is one of the languages of individuals who help communicate within people with hearing impairment or between normal people and those who have hearing impairment problem in the wider community.

The vast majority of children with hearing impairment (over 90%) are born to hearing non-signing parents [3]. People with hearing impairment often find it difficult to understand messages because there is still a rare sign language learning that is only found in special school, and teaching sign language in special schools still uses the conventional method, which is directly demonstrated by the instructor and looking at the book, so it is less efficient when the learning process takes place only depends on the instructor and a thick manual dictionary.

Nesi states that "electronic dictionaries are dictionaries whose data is in digital form and can be accessed through a number of different media" [4]. Electronic dictionaries are more effective in learning because they are efficient and easy to use. Winkler states that "Dictionary in the form of computerization is one of the latest developments in the field of lexicography [5]. This dictionary offers many advantages of modern technology, consisting of more information than the printed version of the dictionary, this dictionary can also use multimedia, such as sound or animation, and search for words that are more complicated and faster than we search for word by sheet in the dictionary print version ". Therefore it is not surprising that electronic dictionaries are widely used, of course because they are more efficient and flexible compared to dictionaries in general (print).

From the results of interviews and observations, it is known that in the special school (SLB), sign language used to communicate only covers general skills. Many people do not understand the vocabulary in sign language in detail because there are so many vocabulary and books or dictionaries that are large and thick that are difficult to carry everywhere and use quite a long time by opening letters from A-Z for each vocabulary used. From the results of the questionnaire that conducted on teachers in special school a total of 14 people, got the results of 8 teachers filled in strongly agree to make media other than sign language dictionary books, 4 teachers filled in agreed to make sign language electronic dictionary application, 2 teachers filled in doubts. From the results of the questionnaire, it was concluded that the school needed media other than sign language books to learn sign language. Electronic dictionaries can be used as one of the media to support sign language learning.

Based on this background, the main problem which is the focus of this research is the design of an electronic dictionary application of sign language that can be used efficiently both on the system of devices used or in design activities. Therefore, research and design is needed on the application of the electronic language sign language that can be used as a medium of information and learning sign language for teachers, students with hearing impairments, and also the general public. From the background above, a study was carried out with the title "The design of electronic dictionary applications for children with hearing impairments".

2. Methods
The methodology that used for this article are qualitative descriptive methods. The design method of sign language electronic dictionaries used phase and 3 workflows in Unified Process, which consist of requirement workflow, analysis workflow, and design workflow [6]. In analysis workflow, use case diagram and activity diagrams are used. Class diagram, ER diagram, and user interface are used in design workflow to design sign language electronic dictionaries.

2.1. Qualitative descriptive methods
According to F.L. Whitney, the descriptive method of research is fact-finding with interpretation. The purpose of this method is to reveal events or facts, circumstances, phenomena, variables and circumstances that occur when the research takes place by presenting what actually happened. This method interprets and describes the data concerned with the current situation, attitudes and views that occur in society. The research activity includes collecting data, analysing data, interpreting data, and finally formulating a conclusion that refers to the analysis of the data. For this article, we will discuss
all the facts found during the design the electronic sign language dictionary application for people with hearing impairments.

2.2. The design method of sign language electronic dictionaries
Phases of unified process system development are used to design the sign language electronic dictionaries which consist of inception phase, elaboration phase, construction phase, and transition phase. From each phase, this article only using 3 workflow that are requirements workflow, analysis workflow, and design workflow.

3. Result and discussion
The main problem faced by people with hearing impairment is to communicate verbally among them and the general public due to lack or loss of ability either partially or completely caused by not functioning entirely hearing aids, so that the people with hearing impairment cannot use hearing aids in everyday life. As a result, the people with hearing impairment when communicating with fellow people the general public does not understand what is being said or miss communication between the two parties who communicate. With that problems, then an electronic dictionary is needed.

3.1. The requirements workflow
The facts that we find from the results of interviews, observations and based on Indonesian Language System Dictionary (Dictionary SIBI) published by The Ministry of Education, it is known that in the special school (SLB), sign language used to communicate only covers general skills which is number sign, alphabetical letters sign, and vocabulary sign. Besides that, there are only books or dictionaries that are large and thick that are difficult to carry everywhere and use quite a long time by opening letters from A-Z for each vocabulary. So, the requirements of electronic dictionary of sign language are:

- The electronic dictionary of sign language must contain: number sign, alphabetical letters sign, and vocabulary sign. Based on Indonesian Language System Dictionary (Dictionary SIBI) published by The Ministry of Education.
- The minimum electronic dictionary of sign language must have a search utility to perform complex searches that much faster than we can turn pages in printed dictionary.
- The minimum electronic dictionary of sign language must have the addition of vocabulary sign language. This is necessary because based on observations and interviews on the field, it was found that a lot of new sign languages are made, because they are not found in SIBI dictionaries.
- This also creates new problems, namely there are some non-standard words.

3.2. The analysis workflow

Use case diagram are used in electronic dictionary of sign language’s analysis workflow. Use case diagram are used to describe communicating sign language electronic dictionary in the user’s terms by specifying all externally visible system behaviour [7].

![Figure 2. Use case diagram of sign language electronic dictionary.](image)

Use case diagram of sign language electronic dictionary has one actor, namely user. As we can see in figure 2, the sign language management process can only be done by the user who has gone through the sign language login process in several parts or categories, namely sign language numbers, alphabets, vocabulary, prefixes and endings. In the sign language management processes, user can add, delete, or update the sign language numbers, alphabets, vocabulary, etc. Addition to that, there are sign language search process that can be used for user to search and see sign language numbers, alphabets, vocabulary by entering the word sign language that is searched for without having to do the login process first. The process of searching for sign language is the process of students looking for sign language numbers, alphabets, and vocabulary by entering the words sought by students.

3.3. The design workflow

Class diagram, ER Diagram, and user interface design are used in the design workflow of sign language electronic dictionaries. Class diagram describes the attributes and operations of a class and also the constraints imposed on the sign language electronic dictionary. ER Diagram are used for the needs of the process storing the data needed by the sign language electronic dictionary [8]. There are 4 (four) entity that are used in the design process of this Sign Language dictionary, namely User, Type of sign language, Dictionary, and Pictures. User interface design of Sign language electronic dictionaries consists of 3 display designs, namely main page, management dictionaries, and searching. The main page of the user's sign language dictionary application is the first page that will appear in the sign language dictionary application after the user opens the sign language dictionary application there are several menus, namely management and search. Management dictionaries page is used to perform create, read, update, and delete (CRUD) operation of sign language electronic dictionaries. CRUD operation can be done to several parts or categories namely sign language numbers, alphabets, vocabulary, prefixes and endings.
4. Conclusion

- An integrated sign language electronic dictionary is needed to help people with hearing impairments or normal people learn sign language so they can communicate with each other.
- There’s a need for comprehensive cooperation from all relevant parties to collect and define all new vocabulary of sign language, given the increasing number of new vocabulary word that are made differently based on needs.

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