KADARING SIBI (Indonesian Sign System Online Dictionary): Web-based Indonesian Sign System Learning App

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Abstract. Deaf people (Teman Tuli) in Indonesia currently use the Indonesian Sign Languages (Bisindo). Nevertheless, it has numerous versions geographically. To smooth communication between them, the Indonesian government has standardized the Indonesian Sign System (SIBI) for the learning process at special schools (SLB/B) as a printed dictionary. The dictionary contains pictures to represent every sign. As it is in printed 2D format, Teman Tuli and normal people (Teman Dengar) cannot understand the exact hand movements. Teman Dengar also do not get enough access to the SIBI learning information. Moreover, it is difficult to understand the rules to build sentences in Bahasa In-donesia. Technology is growing, and the number of electronic dictionary users is increasing. We developed a web-based application Indonesian Sign System Online Dictionary (KADARING SIBI). The dictionary implements a stemming algorithm to find each root word of the text. Then, each Sign is rendered with a GIF animation. Users easier load and understand a picture or an animation re-vealing a word. Fifty respondents with different backgrounds participated in several methods tested on the application. The Black Box Testing method pro-duces an average success value of 95%. The acceptance testing with the Mean Opinion Score method has a MOS value of 8.72, which is a good category.

Keywords: Deaf · Indonesian Sign System · Online Dictionary · Stemming Algorithm

1 Introduction

Hitherto, we do not know much about sign language, which is the mother tongue of deaf people (Teman Tuli). Based on [1, 2], the similarity percentage in the lexicon is only 65% for the sign language used in Jakarta and Yogyakarta. Based on an interview conducted by the author with teachers at SLB Negeri 1 Mataram, the sign language on the island of Lombok tends to be different for each district. It makes it quite difficult for Teman Tuli to communicate with Teman Tuli from other regions if they communicate using their respective Indonesian Sign Language (Bisindo).

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Therefore, the government has standardized the SIBI dictionary through the decree of the Minister of Education and Culture No. 0161/U/2994 dated June 30, 1994, concerning the Standardization of the Indonesian Sign System. The SIBI dictionary has also been published by the government and provided in various schools, especially SLB/B, since 2001. Since then, SIBI learning is still dependent on the dictionary.

In addition, Teman Tuli is constrained to communicate verbally, both speaking and understanding speech, according to [3]. In addition, the author's observations of ten deaf friends from SLB Negeri 1 Mataram showed that their understanding of the structure of Bahasa Indonesia did not match the rules. According to [4], the shortcomings of Teman Tuli tend to cause social rejection by Teman Dengar. This communication problem causes symptoms of a social gap toward Teman Tuli.

Therefore, new media is needed for easy access to SIBI learning. One of the most popular in the community is the web. Based on Bucy's notes in [5], web-based communication has rapidly increased. In this case, the author initiated a web-based SIBI learning application.

Hence, the author initiated KADARING SIBI (Indonesian Sign System Online Dictionary), a web-based SIBI learning application. The author hopes this "easy access" learning media can be used by all Teman Dengar and Tuli. Limitless translation can handle larger amounts of data. It can translate signs with multiple meanings by looking for their synonyms. With the stemming algorithm, it can operate the translation through structural translation such as root words and their affixes. Thus, helping Teman Tuli to understand the structure of Bahasa Indonesia and helping Teman Dengar to understand the SIBI structure. GIFs make it easier to convey signs and make them easier to understand and load.

2 Literature Review

2.1 Related Research

Hearing impairment or deafness is medically said if in the hearing mechanism for one reason or another because one or more organs are impaired or damaged. As a result, the organ cannot carry out its function of transmitting and perceiving sound stimuli that are captured to be converted into acoustic responses [6].

The first step to solving communication problems experienced by Teman Tuli and Teman Dengar is to determine the right communication tool. Teman Dengar generally communicates in spoken languages, while Teman Tuli communicate in sign language.

In general, Teman Tuli use Bisindo as the main communication tool. However, it is not easy to carry out a national-scale settlement because the variation of Bisindo is very high in each region. Not to mention Bisindo and SIBI have different structures. The research on how Teman Tuli responds to SIBI and Bisindo was conducted by interviewing Teman Tuli. Many of Teman Tuli found it difficult to learn SIBI. The structure is complicated, and the SIBI dictionary is thick [10]. Teman Dengar is also difficult to understand Bisindo because the grammar is not aligned with the Indonesian grammar. (1) is an example of Bisindo in Makasar. It builds a sentence differently from the Indonesian grammar that

will be spoken as ‘already eat’. (2) also express its oppositeness as the sentence will be spoken as ‘not new’ in Bahasa Indonesia.

already [Makassar]
EAT ALREADY (1)
‘[We] have eaten…’ [7].

shakehead| [Solo]
new | used
NEW NO | USED (2)
‘It's not new, it's used.’ [2].

SIBI is a standardized Indonesian Sign System, one media that helps communication among the deaf or within the wider community [3]. The meaning system in SIBI, according to [3], is: (1) words that have the same meaning/synonyms are indicated with the same direction and frequency but with different performers, and (2) the same words with different meanings (which have different meanings).classified as polysemy) is symbolized by the same Sign, (3) several words with opposite meanings (classified as antonyms) are indicated by the same performer and place. However, the direction of movement is different.

Furthermore, teaching SIBI at Teman Tuli and Teman Dengar requires effective and efficient learning media. Several studies have been conducted. Research on SIBI learning using a tablet device to design a Communication Board application shows that Teman Tuli and Teman Dengar do not understand SIBI due to the complexity of its structure. Not to mention that thick and difficult-to-understand dictionaries for beginners become an obstacle to learning, so the idea of application design arises,which is categorized into two main types of menus: education and communication.This study seeks to introduce basic learning and is expected to help teaching and learning activities in Special Schools [8].

Research on initiating the SIBI electronic dictionary provides video speeds up and minimizes the use of printed dictionaries. The SIBI dictionary is more efficiently learned. However, video loading still takes time to see the conversion results of each sign [9].

Based on the author’s observations, SIBI has been implemented as a media communication on television. In addition, SIBI can also be learned as a digital game to provide fun learning [10]. It can be concluded that a learning application may improve the learning proses according to the target language structure (SIBI). It can be delivered externally by utilizing an efficient media, an online dictionary. The author wants to increase user-friendliness by providing flexible text input as a sentence or even a complete article. The use of text is useful to avoid inaccuracies in input.

2.2 Theoretical Basis

Nazief-Adriani Algorithm. The system utilizes the steaming process with the Nazief-Adriani algorithm to process input according to the SIBI structure. This algorithm is based on general morphological rules of Bahasa Indonesia, collected into one group and encapsulated in allowed and disallowed affixes. This algorithm uses a basic word dictionary and supports recording, namely the rearrangement of words with an excessive stemming process. The steps of the Nazief Adriani algorithm are [11]:

1. Unstemming words are searched in the dictionary; if found, they are considered correct root words, and the algorithm is terminated.
2. Eliminate inflectional suffixes, namely by removing particle ("-lah", "-kah", "-tah" or "-pun"), then removing inflectional possessive pronoun suffixes ("-ku", "-mu" or" -his"). Check the word in the base word dictionary; if found, the algorithm is stopped; otherwise, go to step 3.
3. Remove the Derivational Suffix ("-i" or "-an","). The algorithm stops if the word is found in the base word dictionary. If not, then go to step 3a.

    a. If the suffix "-an" has been removed and the last letter of the word is "-k", Then "-k" is also removed. If the word is found, then the algorithm stops. If not found, then do step 3b.
    b. The deleted suffix ("-i", "-an" or "-kan") is returned, go to step 4.

4. Remove the Derivational Prefix ("be-"," di-"," ke-", me-"," pe-"," se-" and "te-"). If the word obtained is found in the base word database, then the process is stopped; if not, then do the recording. This stage is terminated if the following conditions are met:

    a. There are combinations of prefixes and suffixes that are not permitted.
    b. The detected prefix is the same as the previously omitted prefix.
    c. Three prefixes have been omitted.

5. The root word is not found in the dictionary; this algorithm returns the original dish before stemming.

Graphic Interchange Format. After that, the system will display the entire process in a Graphics Interchange Format (GIF), which is lighter loading so that translation runs faster even for many paragraphs. The GIF file format uses 8 bits of color (28 = 256 colors). This image uses LZW compression, a lossless compression; no data is lost [12].

3 Methodology

Starting with data collection, the author conducted a literature study to assess various written sources relevant to the studied problem. Next is observation. On February 16th, 2019, starting at 15.00 WITA at the ACIBARA COFFEE, the author met people. Teman Dengar, who is interested in learning sign language, some special school students, Teman Tuli from the Harapan Baru Lombok Foundation, as well as several related parties such as the founder of the related foundation, teachers at special schools, sign language interpreters for GERKATIN NTB in open talk activities: ACIBARA TALK with the theme "Knowing Sign Language". In addition, the author also made observations on Teman Dengar, children in Midang Village, regarding their knowledge of SIBI. At the same time, observations of Teman Tuli were carried out at SLB Negeri 1 Mataram. Observations were made by meeting in person to see their SIBI learning model. In addition, observations on deaf friends were also carried out online via social media

chat groups. It was conducted to determine their understanding of the structure of the Indonesian language.

Furthermore, an interview was conducted at the SLB Negeri 1 Mataram on September 10th, 2021. One of the teachers for Teman Tuli, a sign language interpreter (JBI), was the interviewee for this interview. Based on the interview, Teman Tuli use Bisindo at school, so teachers must also learn Bisindo from them. Teachers cannot force them to use SIBI because they worry that the student's enthusiasm for learning will decrease, and there is still no easier way to learn SIBI. Schools are still relaying for the thick printed SIBI dictionary the government gave. The teacher also lent the SIBI dictionary.

Based on the data collected, the analysis is that SLB Negeri 1 Mataram teachers have been provided with SIBI when they want to go to school. SIBI is used in teaching and learning activities at SLB by good and correct Indonesian rules. However, Teman Tuli refuse to study SIBI. Not even a few gave a thumbs-down gesture to express their rejection.

The teacher said Teman Tuli refused it because SIBI was very complicated to learn. It is influenced by the learning model, which is still very manual. Learning is still very dependent on the thick dictionary provided by the government. Teman Dengar was reluctant to open the dictionary to look for SIBI signs. It is rare to even ask their teachers about SIBI signs directly.

Teachers always remind their students to keep using SIBI in the school area. Nevertheless, after so many rejections, they finally learn Bisindo from the students. Not all teachers are not deaf. Both teachers are quite fluent in using Bisindo, so teaching and learning activities can run more smoothly.

In addition, the teachers focus on teaching the correct structure of SIBI and Bahasa Indonesia grammar. Based on the authors' observations, Teman Tuli tend not to follow the grammar when writing sentences.

From the observations in Midang Village and Baitul Hidayah Islamic Boarding School, the authors found that most students do not know the existence of SIBI. Two students did not communicate with other deaf people even though they often met because other deaf people could not speak sign languages.

From previous research [8, 10], it can be concluded that:

1. Inaccuracy of conversion results due to inappropriate pronunciation or movement even though it can be understood by humans so that it hampers the delivery of information.
2. A dictionary only translates a word, so it cannot express a sentence with complex contexts such as affixes, phrases, or even slang that is developing grammatically.

Based on the previous surveys and the weaknesses of the old learning method, an online dictionary is needed to introduce SIBI in an easy-to-understand way. Of course, encouraging someone to like something must start from something considered fun. The goal is that the attraction will have the possibility to last longer, not just be passionate at the beginning.

It inspired the authors to design KADARING SIBI (Indonesian Sign System Online Dictionary). The expected features of KADARING SIBI are as follows:

1. Focus on entering text improves translation results' accuracy.
2. Pay attention to the SIBI structure, and translations are carried out for each morpheme so that Teman Dengar can understand the SIBI structure and Teman Tuli can learn the structure of Indonesian sentences accordingly.
3. Can display signs in a fast and easy-to-understand way.
4. Can translate many words, many sentences, and even many paragraphs.

Keep your text and graphic files separate until after the text has been formatted and styled. Do not use hard tabs, and limit use of hard returns to only one return at the end of a paragraph. Do not add any kind of pagination anywhere in the paper. Do not number text heads-the template will do that for you.

4 Result and Discussion

The Ministry of Education, Culture, Research, and Technology provides a server to host this application. cPanel is used as the server management control panel and MySQL as the database management system. The system stores 179 images and GIFs of SIBI signs. The jpg format is used for pictures because the saved image files are photos. Images describe gestures that do not require movement, whereas GIF describes motions that require movement. The system also contains 356 vocabularies and their synonyms. The synonyms help the system translate words not available in the vocabulary (Fig. 1).

The application is developed with a simple user interface to be easily understood by the user. It also helps beginners to understand the structure and movement of SIBI signals in detail.

The implementation of the stemming algorithm uses Sastrawi. It is a simple python library that allows us to reduce inflected words in Bahasa Indonesia to their base form (stem) [13]. In addition, pre-processing and post-processing are required so that the input can be processed and the output can be displayed as desired. In addition, it takes some functions for some special input (Fig. 2).

The following are examples of some cases that the system should pay attention to:

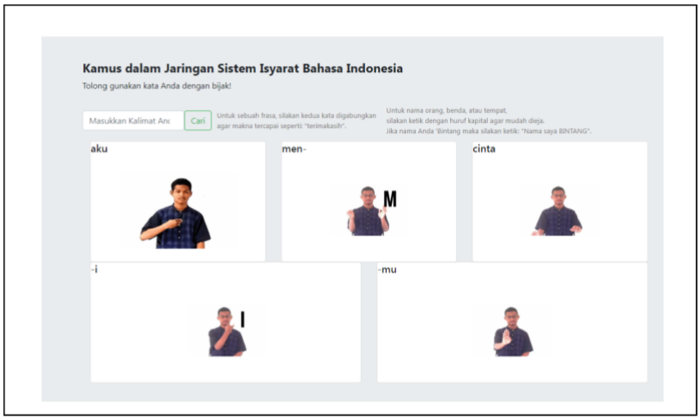

Fig. 1. User Interface of KADARING SIBI

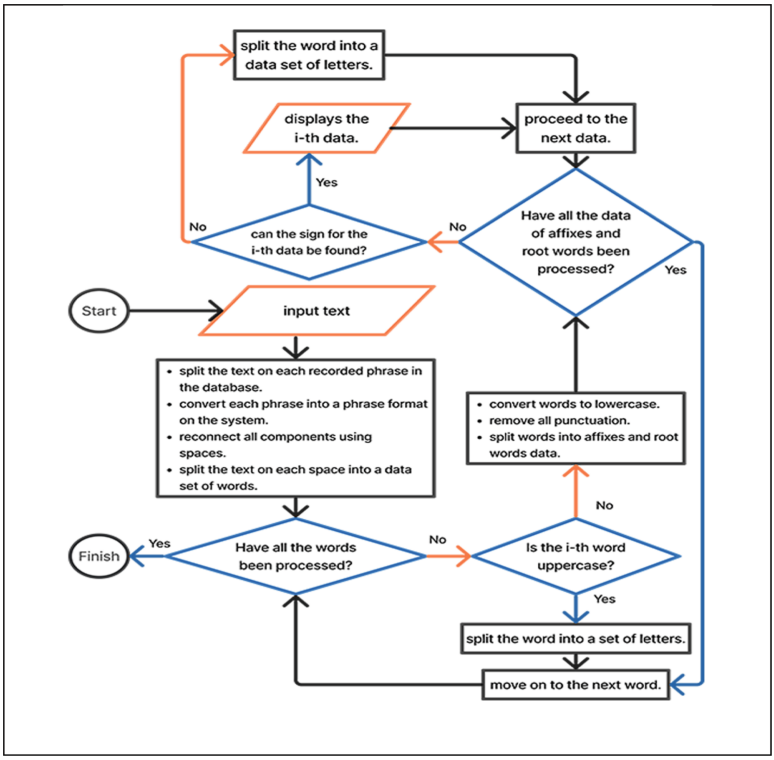

Fig. 2. Flowchart of KADARING SIBI

1. Root Words
2. Foreign Words
3. Slang words
4. Name of Person or Place
5. Numbers
6. Affixes
7. Phrases

The Black box testing method is used in system testing. Then, acceptance testing was carried out using the Mean Opinion Score (MOS) method. The questionnaire was distributed for 50 days, from February 5, 2022, to February 23, 2022; 50 respondents filled out the questionnaire (Fig. 3).

95% of the respondents stated "Sucess." So technically, the whole system can be concluded to be running well according to its function and with only a few errors found (Fig. 4).

The respondents consisted of deaf people, special school teachers, linguists, Provincial Language Agency employees, programmers, students and the public. The result of the test is MOS = 8,72 or can be called a good category.

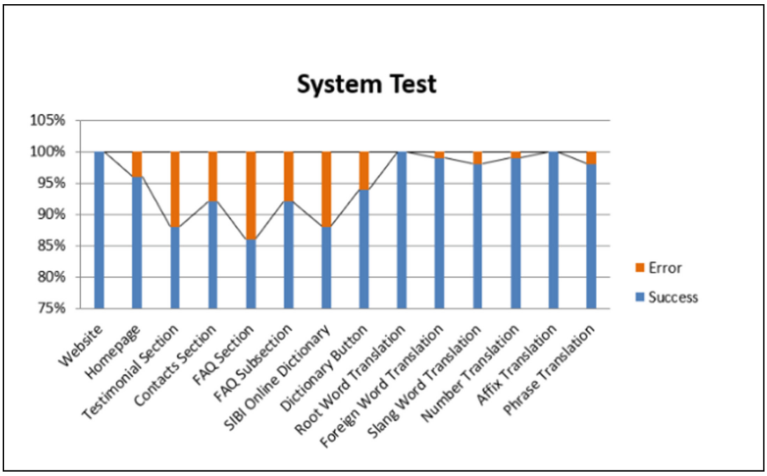

Fig. 3. Result of System Test

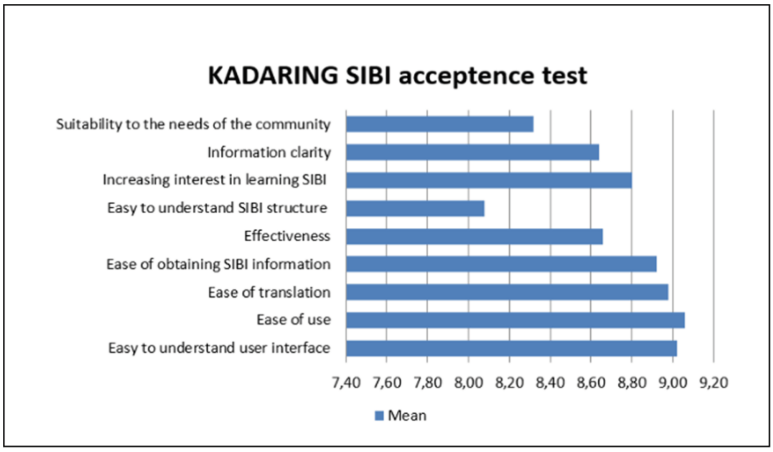

Fig. 4. Result of Acceptence Test

5 Conclusion

Mostly, Teman Dengar do not have any knowledge about the Indonesian Sign System. On the other hand, Teman Tuli use Bisindo, that have different signs and rules to speak the same expression. A national dictionary standardized by the Minister of Education, Culture, Research, and Technology, KADARING SIBI, was created to help Teman Dengar and Teman Tuli learn sign language easily. After testing the system and its acceptance by Teman Tuli, special school teachers, linguists, provincial language agency employees, programmers, students, and public volunteers, it was concluded that the KADARING SIBI works well. It has an easy-to-understand interface. The community can also accept

KADARING SIBI. The system run on the Black Box Testing method produces an average success value of 95%, and acceptance testing using the Mean Opinion Score method has a MOS value of 8.72. The acceptance shows that KADARING SIBI takes the interest of both Teman Tuli dan Teman Dengar and can increase knowledge about SIBI.

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