SATUNETRA DEVELOPMENT, CHAT THERAPY APPLICATIONS BASED ON ARTIFICIAL INTELLIGENCE FOR THE BLIND

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Abstract
Nowadays the level of people with disabilities is increasing, the fact is that the most people with disabilities in Indonesia are blind. Most of the blind people experience visual disturbances so that these limitations trigger mental instability and often experience discouragement, stress, anxiety, over-confidence and lack of confidence. Besides that, like normal humans, blind people also need the role of other people, they also need someone to be a friend or a substitute figure who can always accompany them. With the development of increasingly sophisticated technology, an artificial intelligence-based chat therapy application for the blind has a function as a friend as well as a psychological consultant. This study uses the Waterfall application development method. The application testing was carried out at one of the schools for children with special needs in Makassar, so that the results of the application could be seen whether it really was in accordance with the goals and needs. Therefore, the existence of this application makes it possible to foster motivation to have a return in living life even though in limited vision.

Keywords: visual impairment; artificial intelligence; voice interaction; mental health; smartphone

INTRODUCTION

Blindness is a condition experienced by a person where they experience impediment to the dysfunction of their visual apparatus caused by damage or not functioning perfectly the organ of vision. Blind people who have no residual vision at all will usually use their hearing power to communicate with other people. They are more sensitive and can identify other people's voices well. As a result of psychological blindness, it will have an impact on negative attitudes towards themselves, alienating themselves from the social environment, low self-esteem, feeling incapable and useless and so on, in short, being blind is felt as a heavy burden and affects all patterns and activities of life, including models. religious practice (Arifin, Yusuf, & Yuwono, 2021).

Illiteracy is someone who cannot read and cannot write for capital to communicate. The number of people who are still illiterate in a country is one indicator that shows the country is still not advanced (Jalote, 2012).

Color vision is one of the most important functions of vision in everyday life. Certain jobs require good color-differentiating skills. However, not everyone is blessed with normal color vision skills. One of them is a person with color vision deficiency or better known as color blindness (Edwards & Hendro Purwoko, 2017).

Blind people who are born with conditionally they are more able to accept themselves naturally like people in general, they tend to be happy, no burden, relaxed and some are even very energetic as if there is no burden in their life (Rohr, 2011). But for those who experience visual impairment after they have been able to see, then there is a tendency for them to be very emotionally disturbed. They feel that there is something lacking in them, feel that their life is depressed, they can't accept themselves, blame their fate and many other psychological effects they suffer. They lament

more life as a trial and not a few of them are frustrated. Blind people who are like this second category will differ in terms of religion and self-acceptance (Sulthon, 2016).

There are now many chat-based applications for mental, stress and anxiety therapy available for mobile devices. One of the most commonly used applications and getting a lot of positive reviews is the WYSA application developed by Touchkin. However, this cannot be enjoyed by blind users because this application cannot operate with voice commands and text-based chatbots are used.
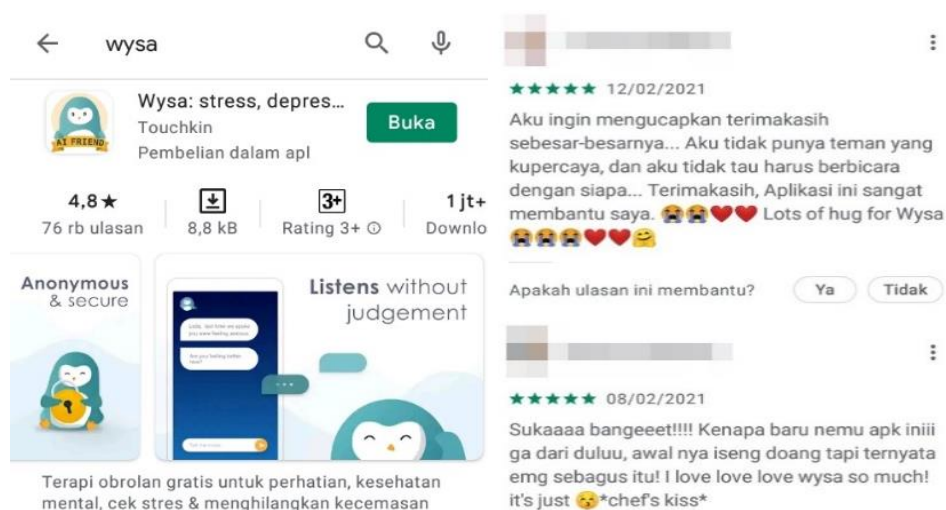
Figure 1
Wysa app and user reviews

Seeing the many reviews contained in the application, we realized that the importance of this application for everyone, especially the visually impaired, who should have more attention. This is because the visually impaired are prone to psychological disorders and the negative effects of this disorder are fatal, such as loss of emotional control, feelings of self-injury, sleep disturbances, leading to decreased endurance.

That's why we developed the SATUNETRA application, a chat therapy application based on artificial intelligence to be friendly to the visually impaired and has a

function as a friend as well as a psychological consultant who can provide mental health therapy solutions, check stress indicators and relieve anxiety (Armstrong & Olatunji, 2012).

This Satunetra application uses a simple artificial intelligence configuration and speech recognizer feature. In general, speech recognizers process incoming voice signals and store them in digital form. The results of the digitization process are then converted in the form of a sound spectrum which will be analyzed by comparing it with the sound template in a database system. With this Speech Recognition, it can make it easier for the visually impaired to run the computer

without hesitation in opening or running applications. Because with this Speech Recognition, their voices can be understood by computers (Dewanta, Isnanto, & Martono, 2015).

METHOD

The implementation method implemented in the development of the Satunetra application is the Waterfall application development method with an overview of the framework as follows:

1. Needs Analysis

In the application development method, the first stage we do is to analyze what will be the basic criteria of the application, such as how the application can make it easier for the visually impaired to use it. We conducted a needs analysis by interviewing a blind person at the resource person's house.

2. System Design

At the system design stage, we did an initial design regarding the flow and workings of the software, namely compiling Entity Relational Diagrams, Data Flow Diagrams, and Use cases. The design of this system is done to make it easier to spell the application or at the coding stage. With several system designs that have been made, it will be easier for programmers to determine the workflow of the application and storage in the database.

3. Design Implementation

Implementation or also known as the coding stage, is the stage where the application developer begins to change the shape of the design so that it can be understood by machines using a programming language (Jalote, 2012).

4. Test

Is the stage where the application developer will test the application and the features in it. This is useful for finding errors in the application and fixing them. In addition, it is also useful to make sure again that the results of the application

are really in accordance with the needs (Barnum, 2020).

5. Maintenance

Software maintenance is the general process of modifying/developing software after it is delivered to the customer. Changes may be simple changes to correct coding errors or larger changes to correct design errors/significant improvements to correct specification errors/accommodation of new requirements.

RESULTS AND DISCUSSION

The results achieved in the implementation of the One Norm application development program are:

1. Interview result

The results of interviews conducted with one of the visually impaired regarding the need for software applications, namely:

a. Blind people need an application that can easily work with voice commands

b. The application that is needed by the blind is able to work both on low vision users or total blind users

c. The application is able to work based on gestures or touches on the screen that

d. The application is able to provide instructions in the form of voice and capture instructions in the form of voice from the user

e. For audio therapy, audio therapy must be clinically tested by a psychologist so that it is safe to be heard every day or heard regularly

2. Initial Design of Application Prototype

In the initial design stage of the application, several early-stage application designs such as Use Case, ERD and DFD (Appendix) are produced. Some of these designs are based on a needs analysis that has been prepared in the early stages of development.

3. User Interface and User Experience

After the initial design of the application system, we designed the User Interface Design first, namely how the application looks when used and the proportion of colors used. This UI design is made by taking into account the principle of contrasting colors so that users who are categorized as partially blind can see the functions of the application clearly.
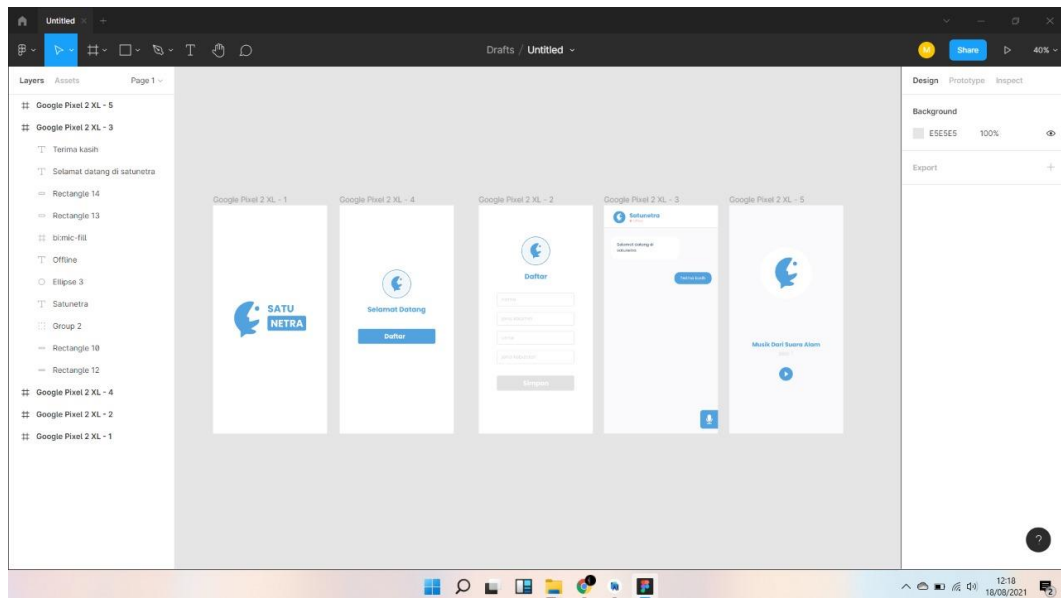
Figure 2
User Interface Design

Next, we design the User Experience, which is how one application page moves to another based on the user's interaction with the application. We designed this user experience by applying the principle of simple transitions to make it easier for users to run the application.

4. Satunetra Application Prototype

After going through the UI and UX design process, then we carry out the implementation process or the application coding stage, we build the application using the Android studio application. As for the initial stages that we have done, such as designing the UI using code in Android Studio.
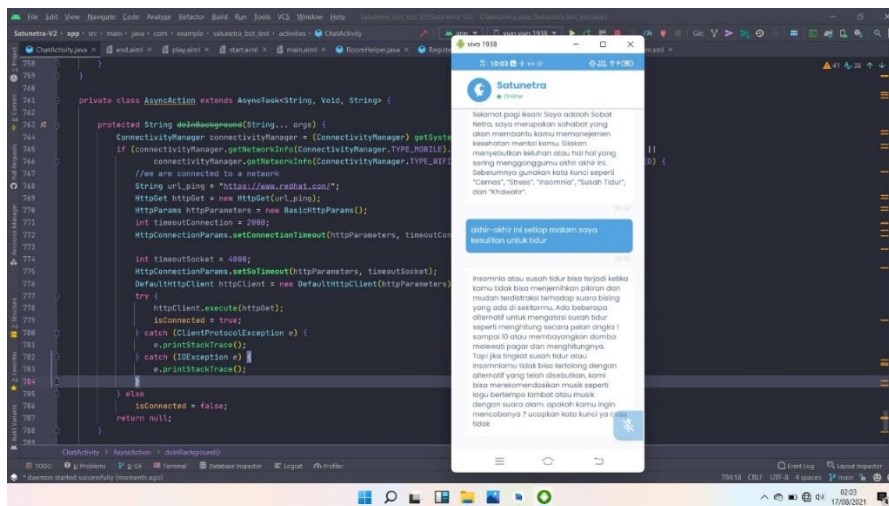
Figure 3
Implementation process of display design and user interaction in code form

After designing the UI, Next we test by running the application on the emulator and debugging to see if there are any code errors in the application creation.
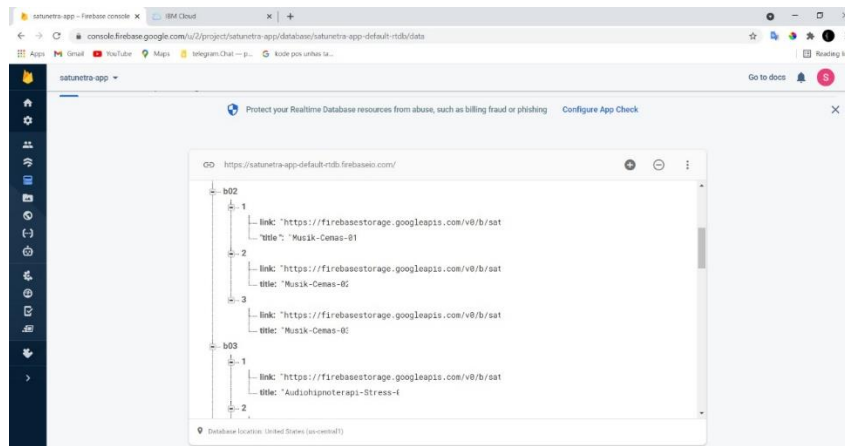

Picture 4
Running on Emulator and Debugging

After running the application on the emulator, the next step is that the application is configured from either a music or audio therapy database and also a chat bot based on logic that has been created using a real time database.

Figure 5
Real Time Database for audio
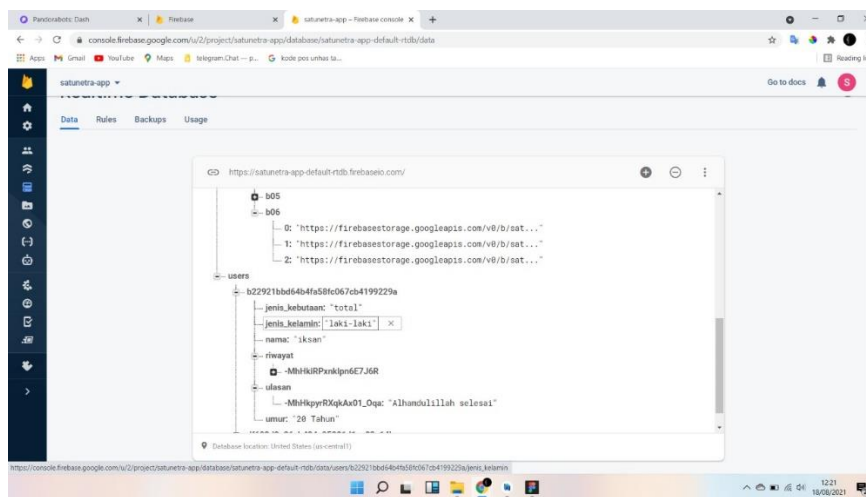
Figure 6
Real Time Database for users, history and reviews

Figure 7
Building and testing a chatbot with aiml (Artificial Intelligence Markup Language)

After going through all the configuration processes above, we built the Satunetra application into a complete application and tested it on several devices with different android versions to test application compatibility.
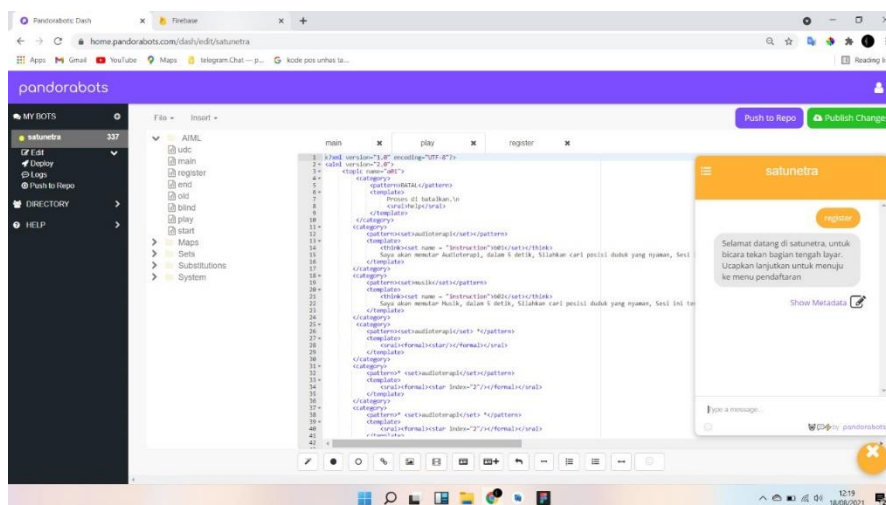
5. Test result

The application test uses the ISO 25010 standard. The test is carried out using 5 characteristics of the ISO 25010 standard, namely functional suitability, usability, reliability, performance efficiency, and maintainability.

a. functional suitability

The system expert validation test serves to determine the feasibility of the Satunetra application that has been developed. The results of the system expert validation test are then used as material for improving the developed system media. Each function is assessed by 2 (two) system experts. The results of testing and assessment of functionality suitability aspects by system experts on the developed product are shown in Table 1.

Table 1
Functional suitability test results

No.	Tested Features	Expected results	Validator Results	
			1	2
1	Pre-Registration Menu	The application is able to give a welcome and provide information about what the user must do to proceed to the registration page	1	1
2	Instructions on Registration Page	The application is able to provide clear instructions to the user on how to input data for registration	1	1
3	Data storage on registration page	After inputting data, the application is able to ask questions whether the user wants to save the data or not, the stored data will be displayed on the user's firebase	1	1
4	Application guide before consultation	The application is able to provide a brief usage guide before the user proceeds to the consultation page	1	1
5	Check Connection	The application is able to identify the status of the user's device whether it is connected to the internet network or not, if it is not connected, the application will provide information that the device is not connected	1	1
6	Chat on the consultation page	The application is able to provide questions and respond to user answers on the consultation page properly and correctly	1	1
7	Audio therapy and music	Therapy audio and music can be played when the user asks to play the audio according to the user's choice	1	1
8	History	The user can hear the history of the consultation from the date, the type of	1	1

	complaint, the type of therapy chosen since the user registered	

Based on Table 1. Then the scores for each assessment are obtained, namely:
(Total score/question item) * 100%
= (8/8) x 100%
= 100%

Based on the calculations in Table 1, the percentage >50% of the functionality test is obtained. This value is then converted to qualitative data and based on a rating scale, from the percentage score obtained, the quality of the software in terms of functionality suitability is acceptable and is in accordance with the functionality suitability aspect.

b. Usability

Usability testing is done by testing directly to users with a total of 5 respondents and 10 questions. The analysis of the results of the usability respondent's response assessment can be seen in the following table.

Table 2
Recapitulation of Usability User Response Test Results

No. Respondent	Score	Maximum Score	Percentage
1	72	100	72%
2	80	100	80%
3	100	100	100%
4	88	100	88%
5	72	100	72%
Total	412	500	82,4%

Based on the analysis of the final calculation obtained a percentage of 82.4% in usability testing. The score indicates that the quality of the software from the usability aspect is appropriate and if it is interpreted with a Likert scale, it is in the very good category.

c. Reliability

Reliability testing is a test that focuses on how the system works in solving problems if there are errors in the software.

Table 3
Reliability Test Results

Reliability Aspect	Evaluation	Results
Maturity	The ability of the software to avoid failure due to software errors	If an error occurs in the Satunetra application, such as unable to capture or listen to audio, the application will re-instruct the user to state the requested information.

	The ability of the software to maintain its performance in the event of an error in the software	If an error occurs in the Satunetra application, such as a weak connection, the application will warn the user that the device used is not connected to the internet.
Fault Tolerance		
Recover-ability	The ability of the software to rebuild performance levels in the event of a system error	If the device is not connected to the internet, the application will provide users with options such as listening to therapeutic audio in offline mode or closing the application

d. Performance Efficiency

Table 4
Performance Efficiency Test Results

Aspect	Evaluation	Results
Time Behavior	The ability of the software to provide appropriate response and management time when performing its functions	Applications can work quickly by responding in real time with the given gestures
Resource Behavior	The ability of the software to use its resources when performing specified functions	The application can work under a 100kbps network which means the application can work even though the network conditions are not very good

e. Maintainability
Maintainability testing is the ability of the software to be maintained, developed or returned to the initial state of the system.

Table 5
Maintainability Test Results

Aspect	Evaluation	Results
Instrument-ation	There is a warning from the system if an error occurs along with identification of the error.	The test results show that the application will give a warning to the user if it cannot identify the words spoken by the user and provide a warning if the application is not connected to the internet network.
Consistency	Use of one design model in the entire system design.	The display on the application has a similar color and type of text along with the voice instructions used in the application only one.
Simplicity	Ease of management, repair, and system development.	The test results show that the application is very easy to develop and improve by using a chatbot with AIML (Artificial Intelligence Markup Language) so that the keywords of the application can be developed at any time so that the use of the application can become more complex.

CONCLUSION

SATUNETRA, a chat therapy application based on artificial intelligence to be friendly to the blind and has a function as a friend as well as a psychological consultant who can provide mental health therapy solutions, check stress indicators and relieve anxiety. This Satunetra application uses a simple artificial intelligence configuration and speech recognizer feature. In general, speech recognizers process incoming voice signals and store them in digital form. The results of the digitization process are then converted in the form of a sound spectrum which will be analyzed by comparing it with the sound template in a database system. With this Speech Recognition, it can make it easier for the visually impaired to run the computer without hesitation in opening or running applications. SATUNETRA is certainly considered as a solution to various problems of blind friends.

REFERENCES

Arifin, Misbahul, Yusuf, Munawir, & Yuwono, Joko. (2021). The Effectiveness of Mentoring Technique to Improve Self-Efficacy in English Language Learning of 7th to 9th-Grade Students with Visual Impairment at SLB A Yaat Klaten. *International Journal of Multicultural and Multireligious Understanding*, *8*(7), 762–768. Google Scholar

Armstrong, Thomas, & Olatunji, Bunmi O. (2012). Eye tracking of attention in the affective disorders: A meta-analytic review and synthesis. *Clinical Psychology Review*, *32*(8), 704–723. Google Scholar

Barnum, Carol M. (2020). *Usability testing essentials: ready, set... test!* Morgan Kaufmann. Google Scholar

Dewanta, Andhika, Isnanto, R. Rizal, & Martono, Kurniawan Teguh. (2015). Perancangan Aplikasi Permainan Let's Say dengan Interaksi Pengenalan Ucapan. *Jurnal Teknologi Dan Sistem Komputer*, *3*(1), 72–78. Google Scholar

Edwards, Betty, & Hendro Purwoko, Penterjemah. (2017). *Menggambar Dengan Belahan Otak Sebelah Kanan*. BP ISI Yogyakarta. Google Scholar

Jalote, Pankaj. (2012). *An integrated approach to software engineering*. Springer Science & Business Media Google Scholar

Rohr, Richard. (2011). *Falling upward: A spirituality for the two halves of life*. John Wiley & Sons. Google Scholar

Sulthon, Sulthon. (2016). Pola Keberagamaan Kaum Tuna Netra Dan Dampak Psikologis Terhadap Penerimaan Diri. *Quality (Jurnal Pendidikan Islam) Stain Kudus*, *4*(1). Google Scholar