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Application Design for the Deaf Users of Trans Jogja Based on Android

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Abstract This study proposes the design and development of an Android application tailored specifically for the deaf users of the Trans Jogja public transportation system. With the aim of enhancing accessibility and usability for this marginalized user group, the application integrates features that cater to their unique communication needs and challenges.
Purpose: Universitas Nahdlatul Ulama Yogyakarta has a Disability Services Unit or ULD called GESI. This unit accommodates the accessibility needs of deaf students. Deaf students usually use Trans Jogja as a means of transportation to campus. An obstacle that students often face is missing the location of their destination bus stop. This happens because students are too busy playing with their cell phones, causing a loss of focus. Therefore, tools are needed as a reminder of the location of the destination bus stop. This research aims to design a tool application for deaf students using Android-based Trans Jogja public transportation.
Methods/Study design/approach: This research methods uses a prototype which includes communication, quick plan and design modeling, construction of prototype, and development delivery feedback.
Result/Findings: The results of this research are in the form of a prototype that has several features, namely searching for starting and destination stops, text to voice, word dictionary, volume settings, and distance settings.
Novelty/Originality/Value: The design of an application to assist deaf people in using Trans Jogja based on Android is used for students with hearing impairments, especially for Trans Jogja public transportation.

Keywords: assistive applications; deaf; android; prototype
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INTRODUCTION

People with disabilities constitute a significant portion of society and often encounter obstacles when it comes to fully participating in community life and exercising their rights and responsibilities as citizens. Among the numerous challenges they face, a prevalent issue is the insufficient availability of public facilities designed to accommodate their diverse limitations. This discrepancy is particularly evident in educational institutions, including universities, where the focus tends to be primarily on providing facilities for individuals with mobility disabilities. While wheelchair ramps and accessible restrooms cater to this demographic, other types of disabilities, such as visual or hearing impairments, are often overlooked. Consequently, individuals who are deaf, blind, or have other sensory or cognitive impairments may find themselves unable to access or utilize public facilities effectively. Given the principles of equality and inclusion, it is imperative for universities and other public institutions to adopt a holistic approach towards accessibility [1]. This entails the provision of inclusive services that cater to the diverse needs of all categories of disabled individuals, ensuring that they can fully participate in academic life and engage with the community on an equal footing with their non-disabled peers. By embracing inclusivity, universities not only fulfill their moral and legal obligations but also foster a more diverse, equitable, and enriching learning environment for all members of their community [2][3].

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The presence of inclusive services plays a crucial role in enhancing the educational experience and overall well-being of students with disabilities, enabling them to engage in various academic and extracurricular activities with greater autonomy and confidence. Universitas Nahdlatul Ulama Yogyakarta (UNU-YK), recognizing the importance of fostering an inclusive learning environment, has taken proactive steps towards addressing the needs of students with disabilities [4][5]. One notable initiative is the establishment of the Disability Services Unit (DSU) known as GESI (Gerakan Edukasi dan Sosialisasi Inklusi), which serves as a dedicated support system for students with disabilities. GESI not only facilitates access to essential facilities but also provides personalized assistance and advocacy to address the unique challenges faced by these students. Through GESI's efforts, the university's commitment to inclusivity is reflected in the continuous evolution and enhancement of facilities and services tailored to the diverse needs of students with disabilities. By fostering a culture of accessibility and accommodation, UNU-YK demonstrates its commitment to ensuring that all students, regardless of their abilities, have equal opportunities to thrive academically and actively participate in campus life. Moreover, the proactive measures taken by DSU like GESI not only benefit students directly but also contribute to raising awareness and promoting a more inclusive mindset within the university community and beyond [6][7].

One of the significant challenges encountered by deaf students with disabilities at Universitas Nahdlatul Ulama Yogyakarta (UNU-YK), which has been brought to the attention of the Disability Services Unit (DSU), pertains to their experience while using the Trans Jogja public transportation service to commute to the university. A recurring issue reported by these students is the difficulty in accurately identifying and disembarking at their intended bus stops [8]. Despite Trans Jogja's efforts to implement accessibility features such as ramps and loudspeakers for disabled individuals, these measures have not sufficiently addressed the specific needs of deaf students. A notable contributing factor to this challenge is the students' reliance on mobile phones, which often diverts their attention away from auditory cues provided by the loudspeakers. Recognizing the limitations of existing solutions, there is a pressing need for a more effective and tailored approach to support deaf students in navigating the public transportation system. Leveraging technological innovations presents a promising avenue for addressing this issue comprehensively [9]. By developing a mobile application specifically designed to assist deaf users of Trans Jogja, incorporating visual cues, vibration alerts, and real-time notifications, it is possible to provide these students with the necessary information and prompts to ensure they reach their destinations safely and efficiently. Through collaborative efforts between UNU-YK, DSU, and relevant stakeholders, such a solution can not only enhance the mobility and independence of deaf students but also serve as a model for inclusive transportation services in the broader community [10][11].

In the current era of technological advancement, harnessing the power of technology to tackle the challenges faced by deaf students navigating the Trans Jogja public transportation system emerges as a fitting solution. Within the realm of mobile applications, a diverse array of tools has been developed to address a wide spectrum of issues, including those pertaining to accessibility and transportation [12][13]. One notable area of research focuses on mobile location-based support applications tailored specifically for disabled individuals, aiming to provide timely assistance in moments of urgent need. Building upon this foundation, subsequent investigations have delved into the development of innovative solutions such as a bus route recommendation application utilizing Google Maps API and Google Places API. This pioneering endeavor seeks to streamline the travel experience for passengers using Trans Jogja by offering personalized route recommendations from their current location to their desired destination. By leveraging real-time data and geolocation services, the application can identify the nearest Trans Jogja bus stop to the user's specified location and generate optimized routes accordingly [14]. This integration of cutting-edge technologies not only enhances the accessibility and efficiency of public transportation but also empowers deaf students with the tools they need to navigate their daily commute with greater ease and confidence. As such, the adoption of technology-driven solutions represents a promising step towards fostering inclusivity and autonomy for individuals with disabilities in the realm of urban mobility [15].

Based on the description, the research problem is formulated as follows: to design a Trans Jogja reminder application using the prototype methods. This aims to assist deaf individuals with disabilities in not missing their intended bus stops when using the Trans Jogja public transportation service. This solution is suitable for implementation as it can effectively help address the challenges faced by deaf individuals with disabilities. It is worth noting that this solution leverages technology that is widely accessible to the public through their mobile phones.

METHODS

Data Collections

The methods employed in the data collection phase are interviews, literature review, and Focus Group Discussions (FGD). Interviews in this research are conducted in collaboration with deaf students from Nahdlatul Ulama University to identify the main issues at hand. The literature review methods involve searching on Google Scholar using the keyword "deafness." Meanwhile, the FGD methods is conducted with representatives from GESI, deaf students, PLJ DIY coordinators, DPD Gerkatin DIY officials, and sign language interpreters.

System Development Methods

The methods used for developing the Android-based application in this research is the prototype methods [3]. The prototype methods are depicted in Figure 1 and begins with the communication stage.

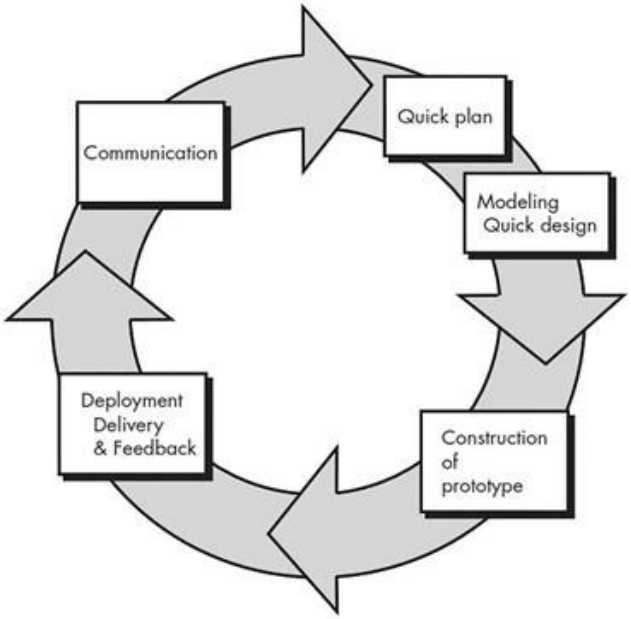

Figure 1. Prototype Methods

Communication

In this stage, data is collected to analyze and define the requirements for the program to be achieved. Data collection at this stage is done using the FGD methods. FGD is conducted to obtain answers related to the precise requirements for realizing the research and opinions related to the development of the research. This stage will result in user requirements or data related to user preferences in the creation of the system. This data will be a reference for the system analyst to translate into a programming language.

Quick Plan and Modelling Quick Design

In this stage, a rapid design model is created. The creation of this software design is used as an estimate before the actual coding. The concept used is the user interface design concept. Interface design is created to make the interaction between end-users and the system effective and consistent with the previous stage, which is the system's requirements. This system design is created using Figma.

Construction of Prototype

This stage involves the creation of a prototype based on the predefined device criteria as per user requirements. The prototype development phase involves coding and debugging, which includes planning, design, and unit testing. This system is developed using a framework.

Development Delivery Feedback

In this stage, the prototype that has been created is handed over to stakeholders and will be tested by users. After user testing, an evaluation of user needs and deficiencies in the prototype is carried out to make improvements. This stage verifies the system's behavior using test cases. Test cases can involve trying input

on the available features in the prototype and observing the reactions, whether they meet the expectations or not.

RESULT AND DISCUSSION

Data Collection Results

This research began with interviews conducted with deaf students at Universitas Nahdlatul Ulama Yogyakarta, which then revealed an issue: some deaf individuals with disabilities often miss their intended bus stops when using the Trans Jogja public transportation service. Subsequently, this research continued with a Focus Group Discussion (FGD) involving GESI, the Coordinator of PLJ DIY, the officials from DPD Gerkatin DIY, and sign language interpreters. The purpose of the FGD was to further identify and understand the issues related to deaf individuals with disabilities to support the continuity of the research. Based on the outcomes of the FGD, several insights were obtained to assist in the application design, including the addition of features that could help deaf individuals with disabilities communicate with fellow passengers or conductors on the bus, a text-to-voice feature, a recommended reminder feature that should appear when approaching the bus stop location to allow deaf individuals with disabilities to prepare before getting off at their intended stop, the provision of destination maps for broader coverage, and discussions regarding the development of assistive devices and curricula for students with disabilities, including the deaf, as well as ideas for conducting further research aimed at assisting individuals with disabilities, especially the deaf, in the future.

System Development Methods

Based on the analysis of requirements, the results of the use case diagram were identified, and categorized into actors and roles. The acting actor is the application user [4]. The use case diagram is displayed as shown in Figure 2.

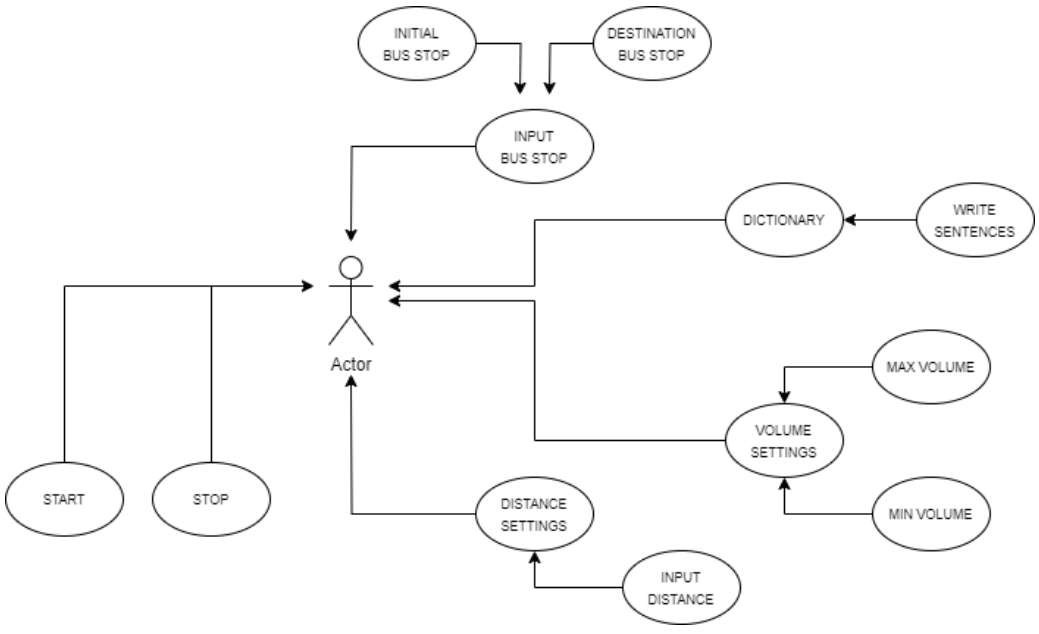

Figure 2. Use Case Diagram

Quick Plan and Modeling Quick Design Results

Based on the Focus Group Discussion (FGD), a system was developed in accordance with the designed plan [5]. The interface design for the application pages includes the input stop menu, start button, stop button, dictionary menu, voice settings menu, distance settings menu, and text-to-voice button. The design overview of the application prototype is shown in Figure 3 below.

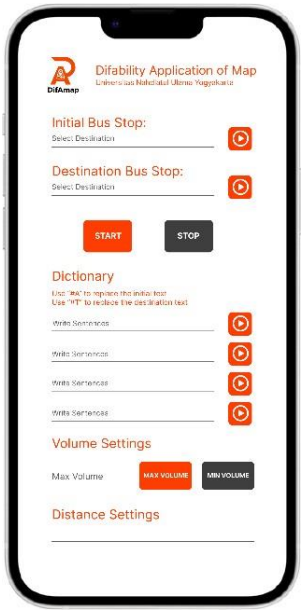

Figure 3. The design overview of the application prototype

Implementation and Testing Results

In the stop input menu, application users can input their initial stop, which is the stop from where they are departing, and their destination stop, which is the stop they intend to reach. This menu is equipped with a text-to-voice button to inform the Trans Jogja bus conductor about the user's intended stop. The design overview of the application prototype is shown in Figure 4 below.

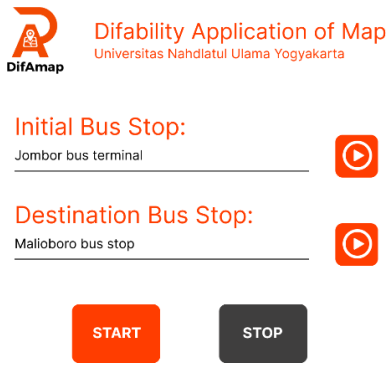

Figure 4. Stop Input Display

In the dictionary menu, there is an input for sentences and a text-to-voice button as a communication aid for the conductor or fellow Trans Jogja bus users. The design overview of the application prototype is shown in Figure 5 below.

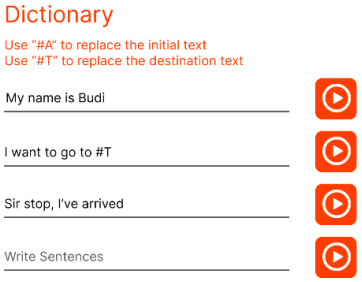

Figure 5. Dictionary Display

In the sound settings menu, application users can adjust the volume, which is available in two options: minimum volume and maximum volume. Additionally, there is a distance settings menu to set the reminder distance during the journey before reaching the destination stop, which will be signaled by phone vibration. The design overview of the application prototype is shown in Figure 6 below.

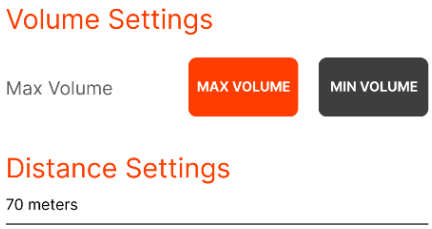

Figure 6. Settings Display

CONCLUSION

This application prototype was designed using the prototyping methods, which includes communication, quick planning and modeling quick design, construction of the prototype, and development delivery feedback. In the communication phase, discussions were held with deaf experts to further explore the requirements for the research. The next phase, the quick plan, involved interface design, which includes stop input, dictionary, text-to-voice, sound settings, and distance settings. The construction phase involved building it using the Java programming language. The prototype results were then evaluated by deaf experts.

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