**SIVITAS,** *Vol. 6. No. 1 January 2026, 1 –7*

# MATA (MAKE ACTIVITIES BE A SAFE): ARTIFICIAL INTELLIGENCE BASED DIGITAL PLATFORM INNOVATION TO MINIMIZE RISKS FOR PEOPLE WITH DISABILITIES

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**DOI: http://doi.org/10.52593/svs.06.1.01**
**Received: 06 January 2026, Revised: 21 January 2026, Accepted: 30 January 2026**

***Abstract***

***Keywords**:*
*MATA application, visual impairment, artificial intelligence, assistive technology, inclusive education*

*The MATA (Make Activities Be a Safe) application is an Artificial Intelligence (AI)–based digital platform designed to improve safety and mobility independence for visually impaired students. This study used a research and development approach with experimental trials and Focus Group Discussions (FGDs), involving eleven blind students and two teachers at the State Special Needs School (SKHN) 1 in Serang City. The AI component is implemented as a rule-based decision support system that processes real-time distance sensor data to classify environmental conditions into safe, warning, and danger levels and generate adaptive voice guidance for obstacle avoidance. Evaluation using the Mean Opinion Score (MOS) shows high user satisfaction in ease of use, sensor responsiveness, and navigation comfort. The application increased user confidence and reduced reliance on conventional mobility aids, although battery consumption and initial adaptation remain challenges. These findings highlight the potential of practical AI-based assistive technologies in supporting inclusive education.*

***Abstrak***

***Kata kunci**:*
*aplikasi MATA, tunanetra, kecerdasan buatan, teknologi asistif, teknologi inklusif*

*Aplikasi MATA (Make Activities Be a Safe) merupakan platform digital berbasis Artificial Intelligence (AI) yang dirancang untuk meningkatkan keselamatan dan kemandirian mobilitas siswa tunanetra. Penelitian ini menggunakan metode penelitian dan pengembangan dengan uji coba eksperimental serta Focus Group Discussion (FGD), yang melibatkan sebelas siswa tunanetra dan dua guru pendamping di Sekolah Khusus Negeri (SKHN) 1 Kota Serang. Komponen AI pada aplikasi MATA diterapkan dalam bentuk sistem pendukung keputusan berbasis aturan (rule-based system) yang memproses data jarak dari sensor secara real-time untuk mengklasifikasikan kondisi lingkungan ke dalam kategori aman, waspada, dan bahaya, serta menghasilkan panduan suara adaptif untuk menghindari rintangan. Hasil evaluasi menggunakan Mean Opinion Score (MOS) menunjukkan tingkat kepuasan pengguna yang tinggi pada aspek kemudahan penggunaan, responsivitas sensor, dan kenyamanan navigasi. Aplikasi ini meningkatkan kepercayaan diri pengguna dan mengurangi ketergantungan pada alat bantu konvensional, meskipun masih terdapat kendala konsumsi daya baterai dan adaptasi awal pengguna.*

## INTRODUCTION

The development of digital technology has provided significant benefits to various groups in society, including people with disabilities. The development of digital technology has provided significant benefits to various groups in society, including people with disabilities. (Rabbani & Najicha, 2023). Artificial Intelligence (AI)-based innovations have helped improve their accessibility and independence in carrying out daily activities. Technologies such as voice assistants, smart navigation systems, and sensor-based devices enable people with disabilities to move more safely and independently in their environment. These advances reflect the

enormous potential of technology in creating a more inclusive and friendly environment for all individuals (Bramasta, 2024).

In Indonesia, the number of people with disabilities reaches 22.97 million, or around 8.5% of the total population. Although this figure is significant, the implementation of AI technology to support people with disabilities still faces various challenges, including limited access to technology and a lack of adequate infrastructure (Supanji, 2023). The basic assumption of this study is that the rapid development of Artificial Intelligence (AI)-based technology has driven innovation in various aspects of life, including improving accessibility and safety for people with disabilities (Nacheva & Czaplewski, 2024). AI-powered digital platforms enable individuals with physical limitations to be more independent in their daily activities by utilizing smart features that can detect hazards, provide voice-based navigation, and give early warnings of risks around them. This phenomenon has shifted the perception of disability from one that was previously considered a vulnerable group that always needed assistance, to individuals who can participate more actively in social and economic life with the support of technology. The integration of AI in the lives of people with disabilities not only serves as an assistive tool, but also as an innovative solution in creating a safer and more inclusive environment.

Research on the role of Artificial Intelligence (AI)-based technology in improving the independence and safety of visually impaired students at State Special Needs School (SKHN) 1 in Serang City. The main focus of this research is to understand how AI technology can help visually impaired students with mobility, accessibility, and social interaction in their daily activities. This study also analyzes the challenges and limitations of conventional assistive devices and how AI applications can be an innovative solution in inclusive education. Eleven visually impaired students with varying degrees of visual impairment were the subjects of this study, accompanied by two teachers who had experience in teaching children with visual impairments. The criteria for selecting subjects included their level of independence in daily activities, use of navigation aids, and experience in facing accessibility barriers at school and in their surroundings. They consisted of D (11 years old), F (15 years old), A (18 years old), Z (10 years old), R (16 years old), I (12 years old), N (17 years old), M (14 years old), S (13 years old), K (9 years old), and V (19 years old). Data was collected through direct observation in the school environment and in-depth interviews with students and teachers to understand their needs and the effectiveness of AI technology in supporting their lives.

This research is an implementative development study with an application design approach (Justicia, 2017) which aims to develop MATA (Make Activities Be a Safe), an Artificial Intelligence (AI)-based platform designed to improve the safety and independence of visually impaired students at State Special Needs School (SKHN) 1 in Serang City. This research process consists of several stages, namely a literature study to analyze the technological needs of the visually impaired, a needs analysis based on interviews and direct observation, system design including interface design and sensor-based detection features, and application implementation by integrating voice navigation and obstacle detection technologies. Subsequently, the application was tested using Black-box Testing and direct trials by users, which were then evaluated using the Mean Opinion Score (MOS) method (Farid et al., 2020)

Which aims to develop MATA (Make Activities Be a Safe), an Artificial Intelligence (AI)-based platform designed to improve the safety and independence of visually impaired students at State Special Needs School (SKHN) 1 in Serang City. This research process consists of several stages, namely a literature study to analyze the technological needs of the visually impaired, a needs analysis based on interviews and direct observation, system design including interface design and sensor-based detection features, and application implementation by integrating voice navigation and obstacle detection technologies. Subsequently, the application was tested using Black-box Testing and direct trials by users, which were then evaluated using the Mean Opinion Score (MOS) method (Uthpah, 2021).

This process allows researchers to conclude that the use of Artificial Intelligence (AI)-based technology in the MATA (Make Activities Be a Safe) application contributes significantly

to improving the safety and independence of visually impaired people. This reflects how AI technology can be an innovative solution in assisting the mobility of visually impaired people, particularly in recognizing their surroundings and avoiding potential hazards. (Khan & Khusro, 2021). As a result, there has been a shift in how visually impaired people adapt to their environment, from previously relying on conventional aids and human companions, to becoming more independent through the use of AI-based technology that is responsive and adaptive to their needs. (Singh & Treleaven, 2024).

Based on the above discussion, this study is positioned to examine the role of Artificial Intelligence (AI) based technology in enhancing the safety and independence of visually impaired students at the State Special Needs School (SKHN) 1 in Serang City through the development of the MATA (Make Activities Be a Safe) application. This research seeks to understand how AI-supported features, particularly sensor-based obstacle detection and voice-guided navigation, can address the limitations of conventional assistive devices and support students' mobility, accessibility, and social participation in daily school activities. By integrating technological development with user-centered evaluation, this study contributes to the discourse on inclusive education and assistive technology, highlighting AI as a practical and socially responsive solution for empowering visually impaired students.

## METHOD

The methods used in this community service activity are implementative, employing a design and evaluative approach. The activity focuses on the development and testing of the MATA (Make Activities Be a Safe) application, which integrates distance sensor technology with an Artificial Intelligence (AI)–based assistive decision support system to support the mobility of visually impaired students at the State Special Needs School (SKHN) 1 in Serang City (Farid et al., 2020).

The process began with a literature review to identify the mobility challenges and technological needs of visually impaired individuals. This stage was followed by data collection through in-depth interviews and direct observation involving 11 visually impaired students and 2 accompanying teachers. The collected qualitative data informed the design of the application system, including simple interface development, obstacle detection feature integration, and voice-based navigation guidance adapted to users' daily movement patterns.

### Artificial Intelligence Component in MATA

In this activity, AI is implemented in a limited and functional form as an assistive system, rather than as a complex machine-learning or deep-learning model. The AI component in the MATA application consists of:

1. Rule-based decision support, where distance sensor inputs are interpreted using predefined thresholds to classify environmental conditions into *safe*, *warning*, or *danger* states.
2. Context-aware audio response, in which the system automatically generates voice instructions based on the proximity of detected obstacles.
3. Adaptive warning mechanisms, where the intensity and frequency of audio alerts are adjusted according to obstacle distance.

This implementation emphasizes real-time assistance, reliability, and accessibility, making it suitable for educational environments and users with visual impairments.
Evaluation Method and MOS Measurement.

Tabel 1. Mean Opinion Score (MOS) Rating Scale

| MOS Score | Interpretation |
|---|---|
| 5 | Very comfortable, very safe, and very easy to use |
| 4 | Comfortable, safe, and easy to use |
| 3 | Moderately comfortable and usable |
| 2 | Uncomfortable and difficult to use |
| 1 | Very uncomfortable, unsafe, and difficult to use |

Table 1 presents the Mean Opinion Score (MOS) rating scale used to evaluate user experience and system effectiveness of the MATA application. The five-point scale measures users' subjective perceptions of comfort, safety, and ease of use, where a higher score indicates a more positive evaluation. A score of 5 reflects a very high level of comfort, safety, and usability, while a score of 1 indicates a very low level of user satisfaction. Intermediate scores (2–4) represent varying degrees of user acceptance and perceived usability.

The MOS questionnaire consisted of the following items:

1. Comfort level when using the MATA application during daily mobility activities.
2. Perceived safety while navigating obstacles using voice guidance.
3. Clarity of voice instructions provided by the application.
4. System responsiveness to environmental changes.
5. Overall user satisfaction with MATA as an assistive mobility tool.

The final MOS score was obtained by calculating the average of all user responses across the questionnaire items.

Success Indicators

The level of success of this community service activity was assessed based on the following indicators:

1. Attitude change, reflected in increased user confidence in performing daily mobility activities without direct assistance.
2. Social change, indicated by increased social interaction in the school environment as users become more active and independent.
3. Economic impact, represented by the potential improvement in access to education and productive activities resulting from increased mobility independence (AHF, 2025).

## RESULTS AND DISCUSSION

## RESULTS

### Implementation Results of the MATA Application

The implementation of the MATA (Make Activities Be a Safe) application at the State Special Needs School (SKHN) 1 Serang City demonstrated positive outcomes in supporting the mobility of visually impaired students. The application was tested directly by students in classroom corridors and school yard environments after receiving initial training.

During the trial sessions, students were able to operate the application independently using voice-based navigation and obstacle detection features. The AI-based distance sensors successfully provided real-time audio warnings when obstacles were detected in front of the users.

### Mean Opinion Score (MOS) Results

User satisfaction and perceived effectiveness of the application were measured using the Mean Opinion Score (MOS) method on a scale of 1 (very poor) to 5 (very good). The assessment involved 11 visually impaired students who participated in the field trials.

Table 2. Mean Opinion Score (MOS) of MATA Application Users

| Aspect Assessed | Average Score | Interpretation |
|---|---|---|
| Ease of use | 4.3 | Application is easy to operate |
| Sensor responsiveness | 4.6 | Sensors work quickly and accurately |
| Navigation comfort | 4.1 | Users feel confident while navigating |

Table 2 presents the Mean Opinion Score (MOS) results of the MATA application based on user assessments. The results show that the ease of use aspect obtained an average score of 4.3, indicating that most visually impaired users perceived the application as easy to operate after initial guidance. The sensor responsiveness aspect achieved the highest average score of 4.6, reflecting the system's ability to detect obstacles quickly and accurately during real-time mobility activities. Meanwhile, navigation comfort received an average score of 4.1, suggesting that users generally felt confident and comfortable while navigating with the assistance of the application, although this aspect still has room for further improvement. Overall, the MOS results indicate a high level of user satisfaction and demonstrate the effectiveness of the MATA application in supporting safe and independent mobility for visually impaired students.

**Observational Findings**

Direct observations were conducted throughout the implementation and testing process. The following changes were consistently observed: Students showed reduced dependence on white canes, particularly during short-distance walking tests. Users demonstrated improved walking confidence, characterized by smoother movement and fewer pauses. Teachers provided less physical or verbal assistance after repeated use of the application. Students appeared more willing to explore new routes within the school environment. These observations indicate that the MATA application contributed to increased functional independence among users.

**Interview Results**

Short semi-structured interviews were conducted with students and accompanying teachers after the trial sessions. Selected quotations include:

*"I feel more confident walking because the application warns me when something is in front of me."* (Student respondent)

*"Students are less hesitant and move more independently after using the application several times."*(Teacher respondent)

These responses reflect positive perceptions of safety, confidence, and usability associated with the MATA application.

## DISCUSSION

### Effectiveness of AI-Based Mobility Assistance

The MOS results, supported by observational and interview data, indicate that the MATA application effectively supports the mobility needs of visually impaired students. The high sensor responsiveness score aligns with observed improvements in walking confidence and reduced reliance on traditional mobility aids. This finding supports previous studies emphasizing the role of AI-based assistive technologies in enhancing spatial awareness and independence for people with visual impairments.

### Short-Term and Long-Term Impacts

In the short term, the application improved users' responsiveness to physical barriers, introduced them to accessible AI technology, and enhanced their sense of safety during movement. the application has the potential to promote greater social independence, encourage inclusive practices within educational institutions, and expand access to learning and productive activities, which may contribute to future economic participation.

### Strengths, Limitations, and Future Development

The main strengths of the MATA application include its ease of use, responsive distance sensors, and compatibility with Android devices without requiring expensive additional equipment. However, some limitations were identified, such as the need for initial user training, relatively high battery consumption, and reduced accuracy in certain environmental conditions.

## CONCLUSION

The MATA (Make Activities Be A Safe) application, based on Artificial Intelligence, has proven effective in improving the safety and independence of visually impaired students at SKHN 1 Kota Serang. Its main features, voice and vibration feedback, help users detect obstacles, thereby increasing their confidence in daily mobility. The advantages of this application include ease of use, fast sensor response, and compatibility with Android devices at no significant cost. However, there are several drawbacks, such as the need for initial training, high battery consumption, and sensor accuracy that is still affected by environmental conditions. Evaluation results using the Mean Opinion Score (MOS) method show high scores in terms of ease of use, sensor response, and navigation comfort. This application has great potential for further development, such as integration with GPS, improvement of more adaptive AI features, and replication in other schools. Regulatory support, funding, and training from the government and related institutions are urgently needed so that this innovation can be implemented widely and sustainably as part of inclusive technology in Indonesia.

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