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E-PROCEEDING

EXTENDED ABSTRACT

UiTM *di hatiku*

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E-PROCEEDING

EXTENDED ABSTRACT



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Welcome Message

RECTOR, UITM KEDAH BRANCH

Assalamualaikum warahmatullahi wabarakatuh,

First and foremost, I would like to extend my deepest appreciation to the organising committee of i-SPIKE 2025 for their steadfast dedication and commitment in making this prestigious event a reality. My heartfelt congratulations to the committee for their tireless efforts in ensuring that i-SPIKE continues to grow as a meaningful and impactful platform for academics, researchers, students, and industry players worldwide.

The theme for this year, “Empowering Minds: Bridging Innovation, Knowledge and Education for a Sustainable Future,” is both timely and significant. It reflects our shared responsibility to not only embrace creativity and technological advancement, but also to ensure that innovation directly contributes to sustainable development, equitable education, and the well-being of future generations.

i-SPIKE 2025 provides a dynamic platform for showcasing innovations that address real-world challenges while opening new avenues for collaboration, engagement, and inclusivity. By bridging knowledge, innovation, and education, this symposium strengthens our collective capacity to design solutions that empower communities and inspire positive change.

I am truly impressed by the diversity and calibre of participants in this year’s event. The projects and ideas presented highlight the extraordinary creativity and determination of our innovators. I am confident that the insights and solutions shared here will pave the way for continuous advancement in teaching, learning, and innovation.

It is my sincere hope that you will find i-SPIKE 2025 an enriching experience, one that sparks new ideas, builds lasting collaborations, and strengthens our shared vision for a sustainable future. To all participants, I wish you every success, and to the winners, my warmest congratulations.

Once again, I thank the organising committee, partners, and contributors for their invaluable support. May i-SPIKE 2025 continue to inspire and empower minds for many years to come.

Professor Dr. Roshima Haji Said
Acting Rector
Universiti Teknologi MARA (UiTM) Kedah Branch

Welcome Message (i-SPIKE 2025 CHAIR)

It is my great pleasure to welcome you to the 4th International Exhibition & Symposium on Productivity, Innovation, Knowledge, and Education 2025 (i-SPIKE 2025). This year's theme, "Empowering Minds: Bridging Innovation, Knowledge, and Education for a Sustainable Future," reflects our collective commitment to advancing innovation and fostering meaningful collaboration across academia, industry, and communities.

i-SPIKE 2025 provides a platform for scholars, researchers, students, and practitioners from diverse fields to showcase their ideas, share knowledge, and inspire new solutions to global challenges. We extend our sincere appreciation to all participants and contributors whose efforts and dedication have made this symposium possible.

We hope that this e-proceedings serves not only as a record of the innovations presented but also as a valuable resource that continues to inspire long after the event.

Thank you.

Dr Junaida Ismail
Chair

4th International Exhibition & Symposium on Productivity, Innovation,
Knowledge, and Education 2025 (i-SPIKE 2025)

PREFACE

The 4th International Exhibition & Symposium on Productivity, Innovation, Knowledge, and Education (i-SPIKE 2025) marks yet another milestone in our ongoing commitment to fostering innovation, creativity, and collaboration across disciplines. Guided by this year's theme, "Empowering Minds: Bridging Innovation, Knowledge and Education for a Sustainable Future," the event provides a dynamic platform for students, educators, researchers, and professionals to share their ideas, showcase their innovations, and engage in meaningful knowledge exchange.

This year, we are pleased to report that i-SPIKE 2025 received approximately 50 initial submissions, with more than 35 projects successfully advancing to final presentation and exhibition. These projects reflect a rich diversity of innovation, ranging from educational technologies, digital applications, and gamified learning tools to sustainable materials, cultural heritage preservation, and community-focused solutions. Collectively, they embody the spirit of bridging innovation and education to address pressing societal and global challenges.

We sincerely thank all participants, reviewers, and committee members for their invaluable contributions in making i-SPIKE 2025 a success. It is our hope that this e-proceedings will not only serve as a record of the ideas and innovations presented, but also as an inspiration for future collaborations and advancements in the pursuit of sustainable knowledge and innovation.

Assoc. Prof. Dr. Azlyn Ahmad Zawawi
Editor-in-Chief, i-SPIKE 2025 Proceedings

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CATEGORY 3

PRODUCT RESEARCH DESIGN

(YOUNG)

SENSME SMART GLASSES (ASSISTIVE WEARABLE TECHNOLOGY FOR VISUAL IMPAIRMENT)

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ABSTRACT

SENSME is an innovative assistive smart glasses system designed to enhance mobility and safety for individuals with visual impairments. Addressing the limitations of traditional aids like white canes, SENSME integrates a 360-degree camera system that provides real-time obstacle detection and directional vibration alerts, promoting greater independence and confidence. This wearable device combines advanced sensor technology with ergonomic design for comfort in daily use. Prototype evaluations and user surveys indicate strong acceptance and effectiveness, reflecting its potential to significantly improve the quality of life for visually impaired users. SENSME represents a practical, scalable solution to an urgent social inclusion challenge.

Keywords: Assistive technology, visual impairment, wearable, 360-degree camera, haptic feedback

INTRODUCTION

People with visual impairments face significant challenges in navigating their environments safely and independently. Despite technological advances, many still rely on outdated aids such as white canes, which provide limited spatial awareness and confidence in complex settings (Ibrahim et al., 2023). SENSME smart glasses address this gap by leveraging real-time environmental sensing and intuitive feedback to improve mobility, safety and autonomy. This device empowers users to perceive hazards from all directions silently through vibration alerts, enabling safer, more confident movement in everyday life.

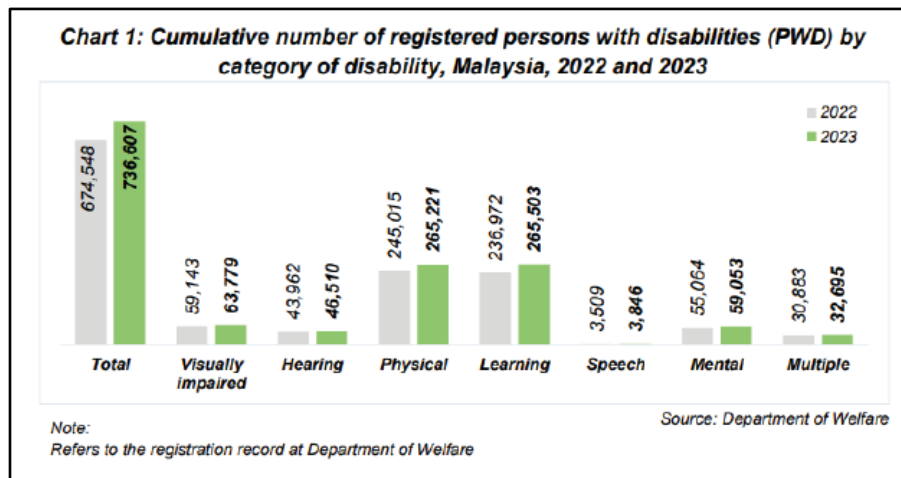


Figure 1.1 Cumulative number of registered persons with disabilities (PWD) by category of disability, Malaysia, 2022 and 2023

According to the most recent data from the Department of Welfare in 2023, there are over 736,607 registered PWD individuals in Malaysia (Figure 1.1). There are 63,779 visually impaired people among them, which makes them one of the most in need of safety equipment and navigation support. SENSME provides these people with greater independence, enabling them to navigate everyday situations with assurance, whether in public areas, workplaces, or educational institutions.

PROBLEM STATEMENT

Visually impaired individuals face significant mobility challenges that limit their safety and independence. Globally and locally, many still rely on traditional assistive devices such as white canes, which offer limited environmental awareness and often fail to detect hazards like moving vehicles, obstacles, or silent electric cars (Ibrahim et al., 2023). This results in a high risk of accidents and social marginalization due to restricted mobility.

Statistics from our survey show that a considerable number of people with disabilities suffer from diverse impairments affecting their ability to navigate safely (Gillis, 2022). Despite existing technologies, there is a lack of effective, affordable, and user-friendly solutions to enhance spatial awareness and hazard detection for this community (Wayband, 2022). Additionally, the awareness gap and limited access to modern assistive technologies contribute to the continued reliance on inadequate aid, underscoring the urgent need for innovative interventions that empower the visually impaired to navigate safely and independently.

SOLUTIONS

SENSME smart glasses offer a sophisticated and practical solution to these pressing mobility and safety problems. By integrating a 360-degree camera system with advanced real-time obstacle recognition and multi-directional vibration feedback, SENSME provides users with comprehensive situational awareness without the need for auditory or visual alerts (Gastaldello, 2025).

This wearable technology's key features include:

- Continuous 360° environmental monitoring to detect stationery and moving hazards from all directions.
- Silent, directional haptic feedback to intuitively communicate the location and proximity of obstacles.
- Ergonomic design with lightweight, flexible materials for comfortable daily wear.
- Accessible controls, including a tactile multi-function button for easy device management and emergency alerts.
- Rechargeable battery and efficient power management for all-day use.

SENSME empowers visually impaired users to gain independence, reduce reliance on outdated aids, and navigate their environments safely and confidently. The device's development focused on practicality, usability, and affordability, making advanced assistive technology accessible to a wider community and addressing a critical social inclusion gap.

PRODUCT DESCRIPTION

The core innovation in SENSME lies in its 360° multi-lens camera system, continuously monitoring the user's surroundings to detect obstacles including vehicles, pedestrians, and other hazards (Patel et al., 2012). Visual data is processed instantly via embedded algorithms that trigger localized haptic vibrations on the glasses frame. Users receive discreet, directional feedback indicating the location and proximity of dangers without relying on audio cues. In addition, an ergonomic tactile multi-function button allows mode switching, emergency alerts, and easy device control. The lightweight frame made from TR90 material ensures comfort during prolonged wear, and a rechargeable battery offers extended use with efficient power management.

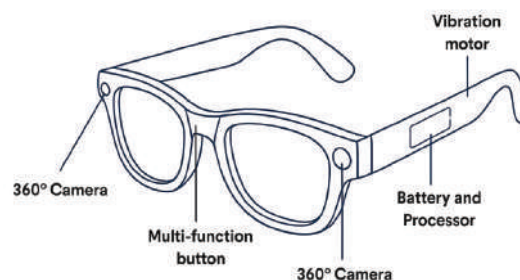


Figure 2.1 Exterior 2D visualization of SENSME



Figure 2.2 Exterior 3D visualization of SENSME

TECHNOLOGY

SENSME combines cutting-edge imaging technology with machine learning to provide reliable real-time hazard detection. The lightweight glasses feature:

- High-resolution 360° camera array for panoramic situational awareness
- Low-power embedded processor for fast environmental analysis
- Precision vibration motors delivering silent, directional alerts
- Ergonomic controls designed for users with limited vision or dexterity
- Durable, flexible TR90 frame material for comfortable daily use
- Rechargeable lithium-polymer battery robust for all-day operation

This integration of hardware and software provides a seamless assistive experience that enhances safety without distracting or alarming the user (Virginia, 2024).

NOVELTY AND IMPACT

Unlike conventional assistive devices, SENSME offers a multi-directional sensory input system that actively detects environmental hazards and communicates them through intuitive haptic signals. By replacing or augmenting white canes with smart, wearable technology, SENSME can drastically reduce mobility risks for visually impaired users. Its user-centric design, validated through surveys and concept testing, ensures both practicality and accessibility (Gastaldello, 2025). SENSME has the potential to transform assistive mobility aids, promote social inclusion, and improve independence significantly.

COMMERCIALIZATION AND FUTURE DEVELOPMENT

SENSME is positioned for scalable production using accessible sensor and microcontroller components such as Arduino (Gillis, 2022). Market feedback indicates strong demand, with users endorsing features including the 360° camera, vibration alerts, and rechargeable battery (Store, 2018). Potential partnerships with government and NGOs could enable subsidized distribution to the disabled community. Future enhancements include GPS integration, AI-based hazard prediction, and expanded multi-sensory feedback options (Hanna, 2022; NoorCam MyEye, 2023). SENSME aims to establish a new standard in assistive wearable technology for disabled individuals.

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