E-PROCEEDINGS

INTERNATIONAL TINKER INNOVATION & ENTREPRENEURSHIP CHALLENGE (i-TIEC 2025)

"Fostering a Culture of Innovation and Entrepreneurial Excellence"

23 January 2025
PTDI, UiTM Cawangan Johor
Kampus Pasir Gudang

ORGANIZED BY:

Electrical Engineering Studies, College of Engineering
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PREFACE

It is with great pleasure that we present the e-proceedings of International Tinker Innovation & Entrepreneurship Challenge (i-TIEC 2025), which compiles the extended abstracts submitted to the International Tinker Innovation & Entrepreneurship Challenge (i-TIEC 2025), held on 23 January 2025 at **PTDI, Universiti Teknologi MARA (UiTM) Cawangan Johor, Kampus Pasir Gudang.** This publication serves as a valuable resource, showcasing the intellectual contributions on the invention and innovation among students, academics, researchers, and professionals.

The International Tinker Innovation & Entrepreneurship Challenge (i-TIEC 2025), organized under the theme "Fostering a Culture of Innovation and Entrepreneurial Excellence," is designed to inspire participants at various academic levels, from secondary students to higher education students and professionals. The competition emphasizes both innovation and entrepreneurship, encouraging the development of product prototypes that address real-world problems and have clear commercialization potential. By focusing on technological and social innovations, i-TIEC 2025 highlights the importance of turning creative ideas into viable, market-ready solutions that can benefit users and society. The extended abstracts in this e-proceedings book showcase the diverse perspectives and depth of research presented during the event, reflecting the strong entrepreneurial element at its core.

We extend our sincere gratitude to the contributors for their dedication in sharing their innovation and the organizing committee for their hard work in ensuring the success of the event and this publication. We also appreciate the support of our collaborators; Mass Rapid Transit Corporation Sdn. Bhd. (MRT Corp), Universitas Labuhanbatu, Indonesia (ULB), Universitas Riau Kepulauan, Indonesia (UNRIKA) and IEEE Young Professionals Malaysia, whose contributions have been instrumental in making this event and publication possible.

We hope that this e-proceedings book will serve as a valuable reference for researchers, educators, and practitioners, inspiring further studies and collaborations in both innovation and entrepreneurship. May the knowledge shared here continue to spark new ideas and market-ready solutions, advancing our collective expertise and fostering the growth of entrepreneurial ventures.

B-ST010 - B-ST152

B-ST102: BLIND STICK WITH LED AND ULTRASONIC SENSOR TECHNOLOGY

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ABSTRACT

The development of the Blind Stick with LED and Ultrasonic Sensor Technology is an innovative assistive device designed to enhance the mobility and safety of visually impaired individuals. By integrating ultrasonic sensors, this smart cane detects obstacles in the user's path, providing real-time feedback through a combination of audible alerts and visual LED signals. The stick also features a lighting system that illuminates the user's environment, improving visibility in low-light conditions. This project explores the design, method, potential benefits, novelty, and commercial opportunities of the blind stick. The solution not only aims to improve the quality of life for visually impaired individuals but also offers a significant contribution to inclusive technology and social innovation.

Keywords: Blind Stick, LED, Ultrasonic Sensor, visually impaired individuals

1. Product Description

The Blind Stick with LED and Ultrasonic Sensor Technology is a mobility aid designed specifically for the visually impaired. It combines two key technologies to improve the user's ability to navigate their surroundings safely:

- Switch: To control this system, the switch on the stick is placed under the handle which makes it easier for the user to turn on and off the system.
- Ultrasonic Sensors: These sensors detect objects within the user's vicinity and alert them through audio signals and vibration. The system detects objects in a range of approximately 10 cm to 30 cm, depending on the model, and provides feedback of the detected objects. The closer the distance, the buzzer will sound with a fast blinking.
- LED Lighting: The LED light will light up which functions as an indication or signal to people around the user about the presence of the stick user.

The design is lightweight and ergonomically built for ease of use. The integration of both ultrasonic sensors and LED lighting helps create a more intuitive and effective mobility aid for blind and visually impaired individuals.

2. Method Flow Chart and Product Model

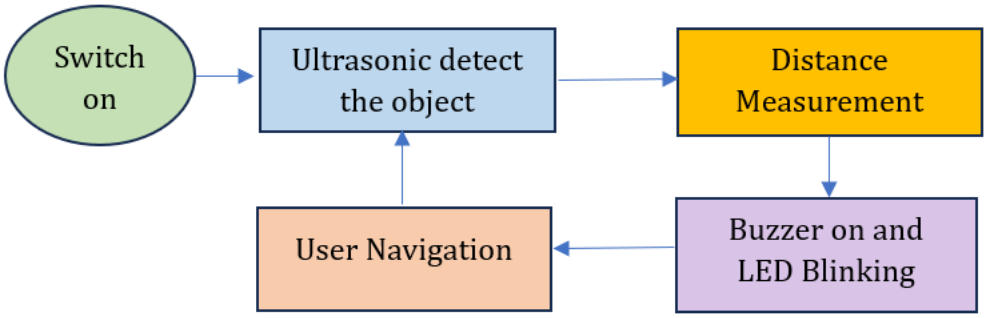

Figure 1. Model Flowchart

With reference to **Figure 1**. The operation of the system as follows;

a) Switch: On the switch to activate the system and begin operation.
b) Sensor Activation: Ultrasonic sensors at the front of the stick continuously emit the sound waves.
c) Object Detection: When the sound waves hit an object, they bounce back to the sensor.
d) Distance Measurement: The sensor calculates the distance between the stick and the object.
e) Buzzer and LED Activation: The buzzer and LED are activated when the ultrasonic sensor at the front of the stick is pointed toward an object. The LED serves as a signal to alert people nearby about the presence of the stick user.
f) Feedback:
    - Audible Alert: If an obstacle is detected, the device emits a series of beeps whose frequency increases as the user gets closer to the object.
    - Vibration Alert: In some models, vibration feedback is provided for more discrete notifications.
g) User Navigation: The user adjusts their movement based on the sensor feedback, successfully avoiding obstacles and navigating safely.

The product model as shown in **Figure 2** and **Figure 3. Figure 2** displays the current blind stick available in the market, which does not include any technology designed to assist visually impaired individuals. Traditional blind sticks are lightweight, durable, and mainly used for detecting ground-level obstacles such as curbs and stairs. However, they have limitations in identifying above-ground obstacles like tree branches or poles. Additionally, folding and adjustable blind sticks offer convenience by being portable and customizable in length, while still maintaining the same basic functionality. **Figure 3** introduces an innovative blind stick featuring advanced technology. This includes ultrasonic sensors to detect obstacles at varying distances, vibration or sound alerts to provide feedback, and LED lights to signal the user's presence to others. Ultrasonic sensors are strategically positioned at the front and sides of the stick to ensure optimal coverage. The LED light is placed at the handle to illuminate the walking surface. The handle is ergonomically designed for comfort

and equipped with tactile buttons for easy control. A battery provides long-lasting power to support both the sensors and lights.

Figure 2. Existing blind stick in the market

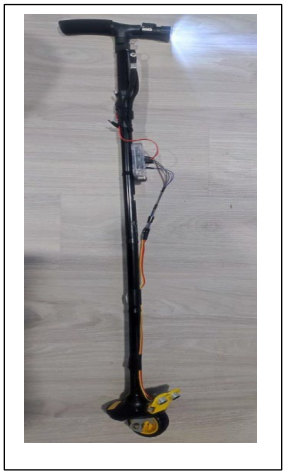

Figure 3. Innovation Blind sticks with LED and Ultrasonics Sensor

3. Novelty and uniqueness

The integration of LED lighting and ultrasonic sensors in a blind stick is a novel concept that enhances traditional stick designs by providing dual functionality, obstacle detection and illumination addressing two major challenges faced by visually impaired individuals. Ultrasonic sensors offer real-time feedback about nearby obstacles, a feature that traditional white canes lack. By continuously detecting and adjusting to the proximity of objects, these sensors improve the user's ability to navigate complex environments with greater awareness. In addition, the built-in LED light provides illumination in low-visibility conditions, acting as a signal to others about the presence of the stick user. This combination of technologies makes the blind stick both adaptive and intelligent, offering a significant improvement over conventional device.

4. Benefit to mankind

The Blind Stick with LED and Ultrasonic Sensor Technology offers several significant benefits for visually impaired individuals:

- Enhanced Safety: By detecting obstacles in real-time, the stick significantly reduces the risk of accidents, falls, and collisions with unseen objects.
- Increased Independence: Users can navigate their environment with greater confidence, reducing reliance on others and improving their mobility in both well-lit and dark environments.
- Improved Social Inclusion: This innovative device promotes greater social inclusion by facilitating independent movement and enabling visually impaired individuals to navigate public spaces more easily.

- Better Access to Public Spaces: The ability to see obstacles and receive immediate feedback makes users more capable of navigating new, unfamiliar places, improving access to essential services, and public transportation.

5. Innovation and Entrepreneurial Impact

The Blind Stick with LED and Ultrasonic Sensor Technology represents a convergence of assistive technology and smart design, addressing the growing demand for accessible and inclusive solutions in the global market. This innovative product integrates ultrasonic sensors for obstacle detection with adaptive lighting systems, which sets it apart from traditional assistive devices. By offering real-time obstacle detection and customizable lighting, the blind stick can adjust to varying environmental conditions and individual user preferences, making it a dynamic solution to an age-old problem. Beyond its technological advancements, the development and commercialization of this product hold immense entrepreneurial potential. With an underserved market that increasingly demands accessible technology particularly as the global population ages and the number of people with visual impairments rises, there is a significant opportunity for entrepreneurs to meet this need. By focusing on user-centered design, the blind stick can be marketed to a broad spectrum of users, offering both social impact and profitable growth in a rapidly expanding sector. The project also has the potential to catalyze further innovations in mobility aids and smart devices for individuals with disabilities, leading to a ripple effect in the industry and providing opportunities for job creation, partnerships, and tech development.

6. Potential commercialization

This product has the potential to be utilized by those with visual impairments either local or international. Partnerships with well-known disability organizations and health care providers can help with product distribution. This innovation can be further enhanced with improved components and functionality through adequate funding or resources, it could be marketed to local and international organization particularly for visual impairments disability.

7. Acknowledgment

The authors would like to acknowledge the Dean and Deputy Dean as well as the Head of Department Advanced Technical and Vocational Education and Training, Faculty of Educational Sciences and Technology, University Technology Malaysia for their invaluable support and encouragement throughout the development of this innovation.

8. Authors' Biography

Hanifah Jambari received her B.E. (Electrical) degree from Universiti Teknologi Mara Shah Alam, the M. Ed (Technical) and PhD in Electrical Engineering degrees from Universiti Teknologi Malaysia in 1996, 2001 and 2014 respectively. She is currently an Associate Professor at Department of Advanced Technical and Vocational Education and Training, Faculty of Educational Sciences and Technology Universiti Teknologi Malaysia (UTM), Johor, Malaysia. Her research interests include areas of technical and vocational education, engineering education, electrical engineering, special needs education, power electronics and food technology.

Abdul Bariq Hamzi Abdul Majid hold a Bachelor of Technology with Education (Electric and Electronics) with Honours from Universiti Teknologi Malaysia. Throughout his academic journey, Abdul Bariq demonstrated exceptional technical knowledge in the fields of electrical and electronic education, as well as a deep commitment to the integration of technology in education. His studies included courses in TVET, circuit design, microelectronics, electrical, and educational technology, equipping him with the skills needed to teach and innovate in both the classroom and industry settings.

Muhammad Syahmi Che Nan holds a Bachelor of Technology with Education (Electric and Electronics) with Honours from Universiti Teknologi Malaysia. Throughout his academic journey, Syahmi has developed a solid foundation in both the theoretical and practical aspects of electrical and electronics education, with a particular focus on integrating technology into educational environments. His coursework covered a broad spectrum of subjects, including TVET education, electrical circuit design, microprocessor systems, automation, education and technology, which equipped him with the knowledge and skills needed to contribute effectively to the fields of technology and education.