ITE STUDENT ACHIEVERS' AWARDS 2025

Lee Kuan Yew Technology Award

SMART MOBILITY AID FOR VISUALLY-IMPAIRED

Heads Up!

According to a 2021 The Straits Times article, obstacles located above waist-level cannot be detected by canes or guide dogs. This significantly increases the risk of collision for the visually-impaired. Often, the impact leaves them with head injuries. The Sustainable Smart Mobility Aid for Visually Impaired was created by a team of four Chemical Process Technology students to address this issue. They hope that with this device, visually-impaired individuals become more independent with safer mobility.

Drawing inspiration from a dolphin's echolocation ability, the team attached an Arduino-powered ultrasonic sensor onto a cap. When worn, the sensor emits sound waves. Upon encountering an object, the sound waves are reflected, allowing the sensor to calculate the distance the user is from the object. The device then emits beeping sounds to alert the user of the object's distance. The team found great success with this device – their test participant was able to avoid all obstacles safely when wearing it.

Innovators' Inspiration

"One of our team members came across an article in The Straits Times that highlighted 94% of 300 visually-impaired respondents surveyed had experienced head injuries after colliding with an obstacle. This inspired us to design a device to help prevent such accidents. We saw it as an opportunity to apply our knowledge by integrating both process control and mechanical aspects to come up with a solution. We felt a great sense of pride and accomplishment seeing our device function effectively. It was even more rewarding when we received positive feedback from visually-impaired individuals from the Singapore Association of the Visually Handicapped – they expressed interest in purchasing it if it was available in the market!"

~ Koh Si Yee

What's So Special

- The device is able to help the visually-impaired detect obstacles and assess its distance by emitting distinct audio tones – fast beeps when an object is near, and slower beeps when it is further.
- The device can also help people working in environments with limited visibility 'see' better. For example, it can help firefighters operating in smoke-covered areas detect dangerous obstacles in their pathway.
- By using sound waves to mimic echolocation, the team is able to ensure that the device can identify obstacles made of a wide variety of materials. For example, infrared sensors rely on light, so they struggle to detect transparent and translucent materials, making it less reliable than sound waves in detecting such objects.
- In line with sustainability initiatives, the team used a rechargeable battery that utilises solar energy to power their device. This reduces e-waste.
- The team improved on the device's wearability by attaching the sensors to a cap. The cap is not only visually appealing, but also comfortable for the wearer. A cover protects the sensor from bumps and the elements. Reflective material at the side of the cover makes it easier for motorists, cyclists and pedestrians to spot the wearer.
- The prototype cost less than $60 to develop. The team plans to integrate the components into a smaller circuit to reduce cost further.

Members:

Koh Si Yee
Nurul'Syafa'Ah Binte Nasir
Lim Chee Chye
Lim Jie Wei
Prithikka Divyashini

Course & College:

***Nitec* in Chemical Process Technology**

***Higher Nitec* in Chemical Process Technology**

ITE College East