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Public Interest Centre of Excellence

International Teaching Aid Competition 2023

Reconnoitering Innovative Ideas in Postnormal Times

iTAC 2023

iTAC 2023
INTERNATIONAL TEACHING AID COMPETITION
E-PROCEEDINGS

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PREFACE

iTAC or International Teaching Aid Competition 2023 was a venue for academicians, researchers, industries, junior and young inventors to showcase their innovative ideas not only in the teaching and learning sphere but also in other numerous disciplines of study. This competition was organised by the Special Interest Group, Public Interest Centre of Excellence (SIG PICE) UiTM Kedah Branch, Malaysia. Its main aim was to promote the production of innovative ideas among academicians, students and also the public at large.

In accordance with the theme "Reconnoitering Innovative Ideas in Post-normal Times", the development of novel ideas from the perspectives of interdisciplinary innovations is more compelling today, especially in the post-covid 19 times. Post-pandemic initiatives are the most relevant in the current world to adapt to new ways of doing things and all these surely require networking and collaboration. Rising to the occasion, iTAC 2023 has managed to attract more than 267 participations for all categories. The staggering number of submissions has proven the relevance of this competition to the academic world and beyond in urging the culture of innovating ideas.

iTAC 2023 committee would like to thank all creative participants for showcasing their innovative ideas with us. As expected in any competition, there will be those who win and those who lose. Congratulations to all the award recipients (Diamond, Gold, Silver and Bronze) for their winning entries. Those who did not make the cut this year can always improve and join us again later.

It is hoped that iTAC 2023 has been a worthy platform for all participating innovators who have shown ingenious efforts in their products and ideas. This compilation of extended abstracts published as iTAC 2023 E-Proceedings contains insights into what current researchers, both experienced and novice, find important and relevant in the post-normal times.

Best regards,

iTAC 2023 Committee
Special Interest Group, Public Interest Centre of Excellence (SIG PICE)
UiTM Kedah Branch
Malaysia

MECHASONIC IRIS PROJECT CONSISTING OF A SMART LENS AND SMART STICK FOR VISUALLY IMPAIRED PEOPLE BY USING ARDUINO UNO AND AN ECO-FRIENDLY LITHIUM POLYMER BATTERY

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ABSTRACT

In the making of the Mechasonic Iris Project, we attempt to address matters that visually impaired people frequently struggle with. This is as such, matters which have been overlooked such as thin obstacles which could be missed by walking sticks. For instance, high signboards within a human's average height are out of the range that could be detected by walking sticks, visually impaired people had to depend heavily on their memories of every placement of things such as house appliances as those things are not easily accessible by walking sticks and most of them need to be accompanied by their relatives and friends to guide them whenever they are outside as many unforeseen obstructions may occur. Therefore, Mechasonic Iris Project aims to support the visually impaired people which complements the use of a traditional stick. This project inspires to boost the user's confidence with every step, allowing them to be more independent and to be able to provide the chance for these people to move around with ease wherever they want to go. The main features consist of an ultrasonic sensor, buzzer, Arduino UNO, and rechargeable battery which is Lithium Polymer Battery. This project mechanically works started with, the ultrasonic sensor with the ability to detect obstacles in front and upfront of consumers within 2 meters range and transfer the input to Arduino UNO for coding which is later on, transmitted to the buzzer to ring and vibrate. Hence, we are positive that the commercialization of our product is highly efficient to make sure the inclusiveness of stakeholders in society, an affordable device for all and we are proud to say that the battery used for this project is free of harmful metals such as cadmium, lead, and mercury which makes it environmental friendly which it is not only consumer-friendly but also eco-friendly.

Keywords: Mechasonic, Iris, ultrasonic sensor, inclusiveness and eco-friendly.

1. INTRODUCTION

Blindness can be total or near total vision loss. It may be congenital or acquired and can interfere with activities of daily living. There are a variety of causes that can lead to blindness. Blindness is defined as visual acuity of less than 3/60 (counting fingers at 3 meters) to no light perception (NPL) in the better eye with best possible correction (WHO, 2016).
The causes of blindness are cataract 51%, glaucoma 8%, childhood blindness and corneal opacities (4% each), uncorrected refractive errors and trachoma (3% each), diabetic retinopathy 1%, and undetermined (21%) (Jeniva, 2012). People with low vision will experience physical, economic, and psychological changes that diminish their quality of life if neglected. Low vision affects daily routines such as walking, going outside and cooking. It can also affect leisure activities such as reading, sewing, travelling or sports. When a person with low vision is not able to perform job-related functions at the work place, this can lead to a loss of income (Omar R and Aziz JR, 2010).

2. RESEARCH OBJECTIVES

Mechasonic Iris Project creates opportunities for the stakeholders with visual disabilities to be able to live 70% as functional as those without any visual problems and those who do not require any assistance. Hence, the research objectives could be listed as below:

2.1 Mechasonic Iris Project aims to reduce the impact of visual impairment disability in terms of restrictions in consumer's independence, mobility, and educational achievement, as well as risk of falls, fractures, injuries, poor mental health, cognitive deficits, and social isolation.

2.2 Mechasonic Iris Project focuses on improving the sensitivity of other sensory systems namely hearing and touch by increasing the factor of alertness covering 180 degrees of a person's frontal area.

2.3 Mechasonic Iris Project intends to level up the efficiency of visual impairments devices used to aid the consumers through a simple technology and is a low cost, easily installed programme.

2.4 Mechasonic Iris Project aims to achieve a few of the Sustainable Development Goals designated by the United Nation namely SDG 3 (promoting good health and wellbeing),

SDG 4 (quality in education) and SDG 10 (reducing inequalities) and thus conforming with the consumers' need.

3. MATERIALS AND METHODS USED

A standard stick commercialised in the market is not provided with a sensory system which causes the consumers to rely solely on their instinct upon the touch of the end of their stick onto the object in front of them thus creating difficulty when they encounter any unfamiliar area without anyone to physically assist them. It is unfortunate too when consumers have to go through public areas which are under construction such as the pavement and bus station. They are basically exposed to the risks of injuries upon any unfavourable accidents happening to them. Inspired by the car reversing alert system where the sound of a buzzer intensifies upon the closer distance of the object at the back of the car, the same concept is applied to our device.

The device in question today is a kit equipped with a sensory stick and glasses paired with ultrasonic sensors, buzzers and LED. The important element of the device is the ultrasonic component and a buzzer to create a smart working system to alert the consumers of the obstacles in front of them. To fully comprehend the whole system of the device, the components required are listed as below:

NO.	MATERIALS FOR SMART STICKS	MATERIALS FOR SMART LENSES
1.	Walking stick	Glasses frame
2.	Buzzer	Buzzer
3.	Maker UNO	Ultrasonic Sensors
4.	Ultrasonic Sensor	Rechargeable battery
5.	Lipo Power Shield + Lipo Battery	Cables
6.	Jumper Wires	Switch

The steps of assembling each component are shown through the video of the prototype. Once done, the sensors have to be set up for the limitation of the distance so as to make it fully functional. Intensity of the buzz will increase as the sensor approaches the obstacle. A specific range of distance is determined so as to show the level of alertness in the form of intensified vibration or ringing sound. The nearer the obstacle, the intensified the vibration or ringing of the buzzer. Through both items equipped with sensory components and alert system, consumers will be able to go through their daily life with maximum efficiency.

4. ADVANTAGES

Based on our research, we have found several types of materials which are used for glasses production. It is crucial for us to understand which material is the most suitable for our climate. The material is plastics which comes with lots of advantages, which are:

4.1 Durable.

Plastics are truly great to resist corrosion, natural elements and are also chemically resistant.

4.2 Flexibility.

Plastic can be shaped and molded into any desirable form, have any color, or any physical property.

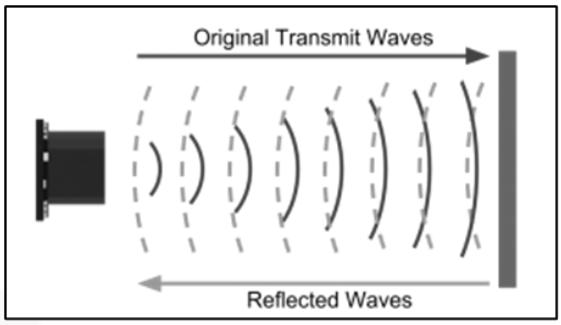
4.3 Sturdy.

Plastics are very light and easy to handle, yet strong enough to withstand physical damage compared to more organic materials.

5. COMPONENTS

5.1 Ultrasonic Sensors

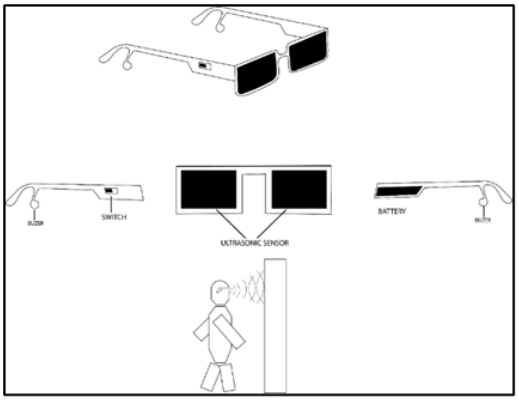
Ultrasonic sensors are instruments that measures the distance to an object using ultrasonic sound waves. Ultrasonic sensors use transducers to send and receive ultrasonic pulses that relay back information about an object's proximity. High-frequency sound waves reflect from boundaries to produce distinct echo patterns (Roderick Burnett, 2018). They serve as the main function of our product which is to determine the proximity of obstacles in front of the user.



Picture 1 - High-frequency sound waves reflect from boundaries to produce distinct echo patterns.

5.2 Light Emitting Diode (LED)

Light emitting diodes, commonly called LEDs, are real unsung heroes in the electronics world. LEDs are just tiny light bulbs that fit easily into an electrical circuit. But unlike ordinary incandescent bulbs, they do not have a filament that will burn out, and they do not get especially hot (Tom Harris and Wesley Fenlon, 2017). In our products, they serve as the indicator for the circuit, either the circuit is open or already closed.



Picture 2 - The labels for each component for Mechasonic Iris Project and the main purpose of the project.

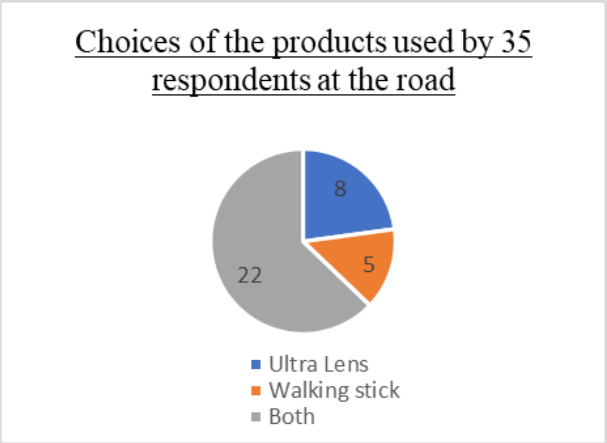
Picture 3 - The actual prototype for Mechasonic Iris Project.

6. EXPERIMENTS AND RESPONDENTS

An experiment was conducted which consist of the choice of 35 respondents between the use of Mechasonic Iris Project, a walking stick or both at once at road. The results were then collected.

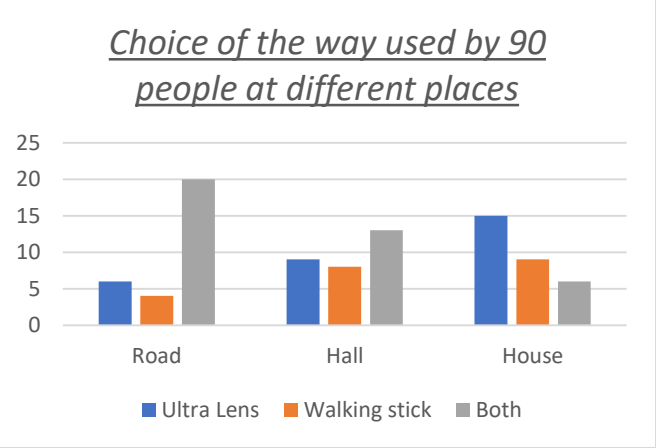
In this experiment, we used the wording Ultra Lens instead of the Mechasonic Iris Project because it describes the ultrasonic sensor we want to highlight in this project. Furthermore, the

word Ultra Lens is more straightforward for respondents to understand and they can make accurate decisions on the questions asked.



Picture 4 - The total of 8 respondents chooses Mechasonic Iris Project, another 5 respondents' choice was walking stick and a whopping result of 22 respondents choose to use both at the same time.

Another experiment was conducted with the amount of 90 respondents, divided into three different places respectively. The experiment took part at a road, a hall and a house.



Picture 5 - Choice of the way used by 90 people at different places.

7. RESULT OF STUDY

An inference based on both experiments; most people who had been introduced to our Mechasonic Iris Project are more likely to consider using our glasses rather than an ordinary walking stick. There are also respondents who prefers both at the same time. This is because Mechasonic Iris Project could provide additional coverage detection especially aerial obstacles. Most respondents at the house experiments prefers Mechasonic Iris Project alone because they already remember most-if not all, because the sudden change of the location-of the placement for appliances in the house. Hence, the common problems that always happen when using an ordinary walking stick could finally solved.

8. CONCLUSION

We guarantee that Mechasonic Iris Project could benefit the users greatly. We hope that our invention could give sightless people hope to explore this wonderful world within their unique point of view. In a few years' time, we believe Mechasonic Iris Project would become one of the basic needs for vision impaired people especially legally blind individuals.

Further studies can be conducted to expand the capability of the Mechasonic Iris Project in order to improve any loopholes that might be upgraded and commercialized by the industry. Soon, Mechasonic Iris Project may come in additional features to ensure maximum capabilities to meet the user's demand.

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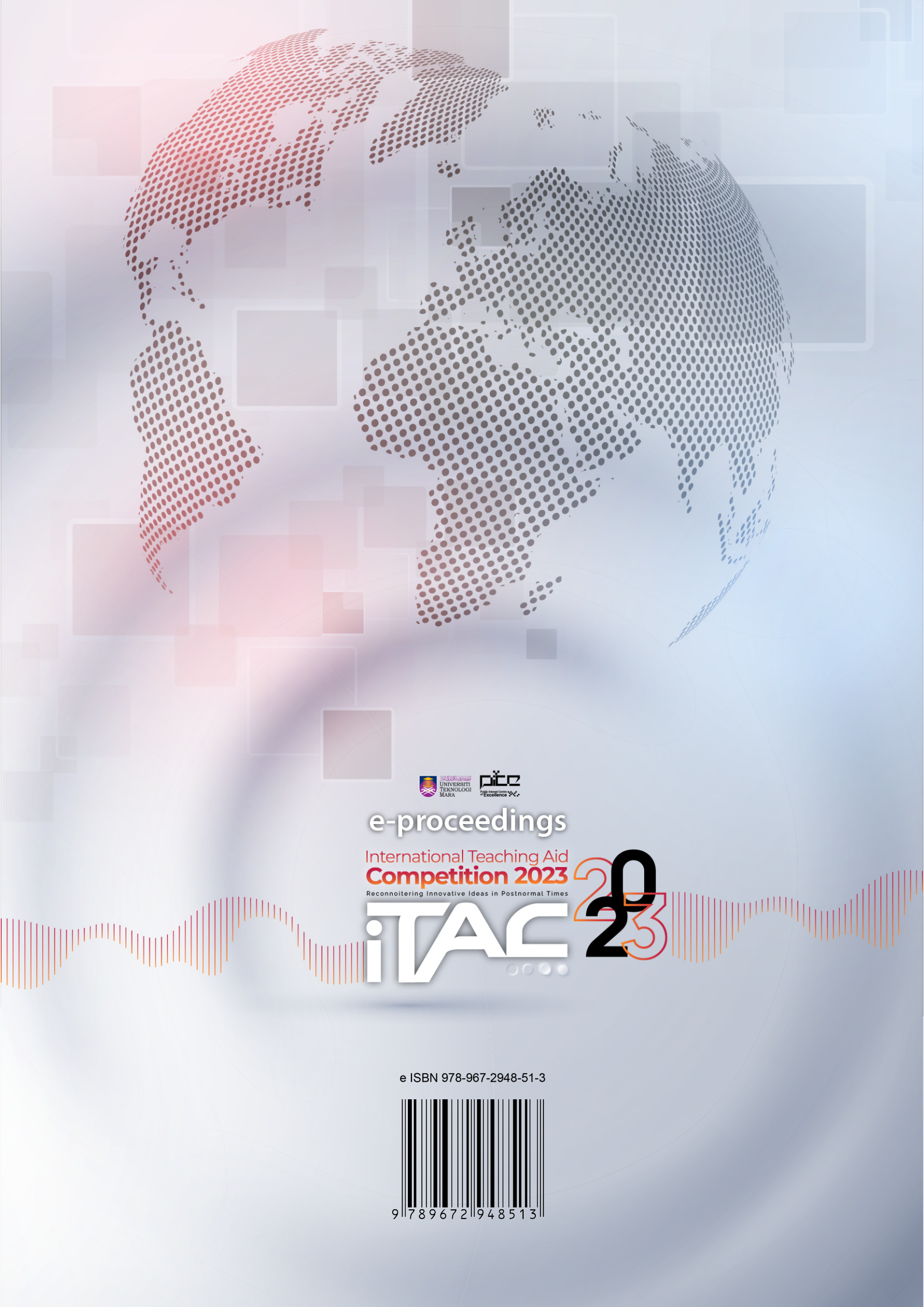

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