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## Intelligent Walking Shoes for Blinds

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### ABSTRACT

The World Health Organization estimates that 80% of vision impairment is preventable. As a result, many services and tools are offered to those who have them to assist them live normal lives alongside everyone else. Tactile pavement is one of the government's efforts to help the disabled be seen, and it is mostly found in pedestrianised zones. Intelligent Walking Shoes for Blinds are introduced to help the blind walk normally without complications even in a non-provided tactile pavement. Furthermore, these shoes are designed to solve the issue smarter than the conventional walking stick approach. This product contains a built-in obstacle-detection sensor and a Global Positioning System (GPS) that can be linked to electrical devices, like headphones, to assist with direction. The user's shoes are always linked to the application on their cellphones or the devices of their close friends or guardians. This makes it possible for the guardian to constantly track the user's whereabouts and guarantee their safety. This product is primarily designated for use by the government and medical fields to lessen their burdens. This product has a low cost, and it can be marketed globally as visually impaired people are not limited to this country. To sum up, Intelligent Walking Shoes for Blinds are more useful for enabling the blind to lead regular lives, and it is guaranteed that any visually impaired individual can own a pair.

**Keywords:** GPS; Intelligent Walking Shoes; Obstacle-detection Sensor; Visually Impaired.

### 1. INTRODUCTION

Visual impairment is a term experts use to describe any kind of vision loss, whether it's someone who cannot see at all or someone who has partial vision loss. Based on the National Eye Survey, 1996, (ieeexplore, 2013) in Malaysia prevalence of blindness for all ages is 0.2% while the prevalence of blindness among children 7 to 15 years is 0.1%, based on Refractive Error Study in Children, 2003. They are frequently referred to as visually blind because they have trouble interacting with and sensing their surroundings and the people around them (How to Make Reflective Shoes, 2021). Physical activity has been their largest issue because they have little contact with their surroundings. Visually impaired people frequently find it difficult to walk from one location to another and to recognize the impediments in their path. As a result, blind people have limited mobility since they require assistance with mobility and other daily activities (Braille Technology, 2022). To avoid obstacles like obstructions on sidewalks, walls, or other people, blind persons must always be aware of their surroundings. They may use white canes to assist them in getting around but it is generally made for outside use. They also can ask for sighted support to assist them in getting around but they may not always be available which can restrict their freedom and independence. Additionally, the standard accessibility

features for the blind, such as tactile pavement and textured surfaces to direct and warn persons about routes and crosswalks are not available in all areas. Therefore, we made these intelligent walking shoes to help them move everywhere easily.

## 2. METHODOLOGY

Intelligent blind shoes provide features that help visually impaired people arrive safely at their desired destination. First of all, the special feature that differentiates between casual and sports shoes is the ultrasonic sensor, as shown in Figure 1, located at the toe cap, central, and behind the collar padding embedded inside the shoes. This sensor has the same function to detect ground-level obstacles of different heights as well as ground pits and holes. This sensor works by sending out a sound wave at a frequency above the range of human hearing and using a transducer to send and receive ultrasonic pulses that relay information about an object's proximity (What is a Buzzer, n.d).



**Figure 1.** Ultrasonic sensor

In addition, the sensors are connected to a buzzer 12 V as shown in Figure 2. The main function of it is to convert the signal from audio to sound (Aminah B.M.K, 2012). It has high sound output, good power efficiency, and a rapid response to the object detected by the sensors. As a result, visually impaired people can avoid colliding with any obstacles that could be dangerous to them.



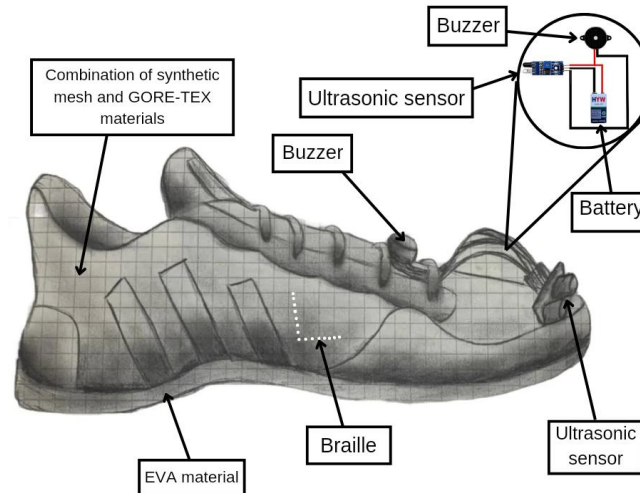
**Figure 2.** Buzzer 12 V

Furthermore, the shoes are made with braille labels on the side of the shoes (viziglow.co, 2021). Braille is a system of writing that uses raised dots or bumps on some surfaces to represent letters and numbers. These labels can help the wearer differentiate between right and left shoes. To ensure the user's safety at night, the shoes are made with a reflective element (maxbotix.com, 2023). For example, white midsoles coated in white reflective paint appear normal in daylight but reflect a brilliant white when light shines on them at night. Other features are also added to this shoe to offer the best quality and comfort to the user, such as a combination of synthetic mesh for lightweight and breathability and GORE-TEX for water resistance. Other than that, ethylene-vinyl acetate (EVA) is used for shock absorption.

## 3. RESULTS AND DISCUSSION

The intelligent blind shoes are designed, as shown in Figure 3, to help blind people navigate to their destination safely. These intelligent blind shoes contribute by providing innovative solutions, such as sensors, to enhance mobility and accessibility for blind people. This product

also incorporates the latest technology from various countries to deliver a better user experience. Moreover, these shoes promote environmental sustainability for society by facilitating social interaction for blind people, improving health, and reducing greenhouse gas emissions by using solar panels as the main energy source.



**Figure 3.** Intelligent Blind Shoes Prototype

The benefits of intelligent shoes are that they help blind people reach their destination safely by identifying an area that is free of obstacles or walls. These intelligent shoes use sensors to detect obstacles that may hinder them. When they encounter objects, the sensors make noises to alert the wearer. Furthermore, these shoes can be likened to a light that brightens the darkness and aids walking. By using these shoes, there is no need for blind walking sticks that can be lost or broken. Additionally, these intelligent shoes implement different technologies for visually impaired people. The most reliable way of obtaining information for blind people is through listening, which the intelligent shoes will provide through sound. Lastly, these intelligent shoes also improve the system performance and reduce the user's burden.

#### 4. CONCLUSION

These intelligent walking shoes help blind people walk safely without worrying about running into other people or solid objects because the sensor on this shoe will beep when approaching an obstacle in front that prevents blind people from stopping or changing direction. Other than that, this intelligent walking shoe is a smarter way to use than using a traditional method of walking due to the possibility of missing. This product has worldwide, global, or worldwide market potential and is expected to have high demand. First, there are many impaired or blind people in the world, which are expected to increase due to ageing, urbanisation, and diseases. Second, the challenges and risks they face in their daily lives, such as mobility, safety, accessibility, and social inclusion. Third, the limitations and drawbacks of the existing products or services that aim to assist visually impaired people, such as canes, guide dogs, smartphone apps, or wearable devices. Four main groups are targeted to buy these intelligent blind shoes. First, the product is specifically created for blind people. Blind people can walk safely along the road since the products include sensors and buzzers that help them avoid obstacles. The second target for the product is elderly people (age 50 and older). As people age, their vision

tends to deteriorate or decline. This increases the risk of accidents for elderly people. This shoe has a variety of sizes and a lightweight design, so it is suitable for kids to wear it everywhere. Kids can use these shoes to go to school since they are adaptable to all conditions, such as dry and wet. When it is raining, the shoes are water-resistant.

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