

Hong Kong Student Science Project Competition 2022

Template of Extended Abstract (Invention Design Proposal)

(Word Limit: 1,000 words, Pages: 2 pages only)

Team Number: SCPE301

Project Title: Awakening W.

Project Type: Invention Design Proposal

To our best knowledge and after thorough literature research, as at 30 June 2022, there are no* similar works. If there are, the reference links are as below:

The enhancement our project has made for the existing related products or research is summarized as below:

***Please delete if not applicable. HKSSPC values the originality of works. Students must conduct literature research thoroughly to ensure that their works are unique, and to list relevant reference materials to complement the research or invention.**

I. Background

In recent years, cases of wounding assault caused by sleepwalkers have been an increasing trend, leading to severe consequences not only for the sleepwalkers themselves but also for society. In order to mitigate the sleepwalkers' current situation and prevent them from taking dangerous actions.

Sleepwalking, or somnambulism, is a type of parasomnia, a medical term meaning that occurs alongside sleep. Nowadays, a number of diagnostic criteria are associated with "sleeping disorders". (American Psychiatric Association, 1994, 2000) The causes of sleepwalking are incompletely understood. Scientists and psychiatrists rely on case studies and symptoms to discover the characteristics of sleepwalking. The symptoms of sleepwalking consist of a series of complex behaviours that begin during slow-wave sleep and result in walking during sleeping. Sleepwalking is treated by safety precautions from professional advice and drugs to have a better sleeping habit.

Sleepwalking behaviours vary in complexity, from simple activities to violent ones. In general, these behaviours include walking around with consciousness and impaired judgement, reducing the reactions to stimuli from the external environment, having poor communication as well as facing a general confusion with distress after awakening. Unfortunately, sleepwalking is sometimes associated with violent behaviour against themselves or other individuals. A commentary by Mark R. Pressman from the Medicine Service at Lankenau Hospital studied that violent behaviours were associated with provocation or proximity in 40%-90% of sleepwalking cases.

II. Objective(s)

Sleepwalkers are suffering a lot. They need a practical and harmless bracelet to solve the above problems. Stopping them before they do risky behaviour can solve the problem of hurting themselves, improve their sleeping quality to a certain extent, and ensure their safety, helping sleepwalkers get rid of unconsciously walking. Awakening W. aims to give sleepwalkers and their families comfortable nights

III. Methodology

RFID and Micro:bit are considered for sending and receiving signals triggered by sleepwalkers when they try to leave the restricted area. After certain concerns, RFID is chosen for the device.

First, the speed at which messages are sent and received in an RFID system is fast and efficient. In everyday life, RFID is used to scan barcodes, pay with Octopus cards or prevent shoplifting. The literature claims that RFID readers can scan tags in milliseconds and work automatically. So, it is time saved through automation.

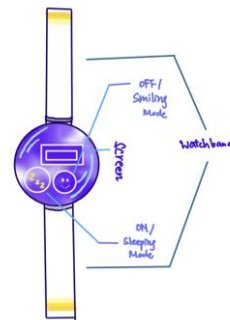
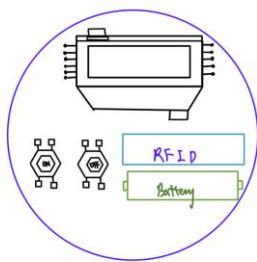
Second, developing RFID is relatively more straightforward than Micro:bit. RFID systems only include a signal sender and a tag receiver to activate the system. For Micro:bit, a tailor-made programme is required to develop. It is more complicated and time-consuming.

IV. Design of Invention

The device is designed as a bracelet and consists of a bracelet band and a body. Two buttons are set, responsible for on, off, and mode-changing functions (Fig a). The screen is in the centre of the main body. The switch, battery, screen and RFID sensor are arranged on the circuit board inside the device (Fig b).

Fig. a) Outlook of the device

Fig. b) Circuit board inside the main body of the device



V. Application / Market Need

Awakening W. should be worn on the user's wrist, and the RFID tag should be placed at the entrance of his resting space to control the range of activities of the user when sleepwalking. If the user goes beyond this space, for example, leaves his room, the device will activate and wake the patient by stimulating, i.e. an electric shock, preventing him from stepping out of safety and causing unnecessary accidents.

Awakening W. is designated for the sleepwalkers who have potential dangers during sleepwalking. If it is invented, produced and sold in the market, sleepwalkers will be less likely to carry out dangerous activities so the risk of injuries and death will be reduced through the product. Thus, sleepwalkers can be more relieved when sleeping with the bracelet worn, and their sleeping quality will be improved.

The circuit board from a common electric shock bracelet with an alarm function is used as a source reference, being chosen to take the responsibility for the functioning of the electric-shocking system. The circuit board from an electric shock bracelet with an alarm function will be combined with the RFID sensor Printed Circuit Board (PCB). The production of PCB of the circuit board is in processing.

The combination of the two PCBs still needs some system communication to achieve in order to complete the design of the circuit board of Awakening W.

RFID tags are placed at the entrance of the room, so if the user is sleepwalking in the room, the device will not be able to detect the RFID tag and shock the user.

VI. Conclusion

Due to the risk of sleepwalking, we used the knowledge of RFID and designed the bracelet Awakening W. to reduce the negative impacts brought by sleepwalking. We hope our design can help sleepwalkers regulate their sleeping routines and prevent them from causing injuries.

Our project is developed based on our school's previous project and the enhancement is as below: