Hong Kong Student Science Project Competition 2023

Team Number: SAPE 139

Project Title: Guaranteed Safety

Project Type: Invention

***To our best knowledge, there are similar works in the market*; related product links are as below:**

https://shl.tpcu.edu.tw/ezfiles/24/1024/img/789/560263855.pdf

The enhancement our project made / the difference with related products are:

The trekking stick mentioned above consists only of a GPS positioning function. Since our project aims to minimize hikers' risks of dying and getting injured caused by belated services and medical attention, we included the functions of inquiring hiker's physical condition and SOS messages will be sent to the authorities (992) when the hiker requests medical services or he/she gives no response.

I. Background

With more Hongkongers heading outdoors to get some exercise and fresh air during the coronavirus pandemic, the number of hiking accidents has skyrocketed in recent years. Unprepared and unaware of hazards, many hikers flocked to the city's popular outdoor trails and ventured in search of selfies in dangerous spots, resulting in unnecessary tragedies. According to the fire services department, a total number of 687 cases were reported in 2022, in which 18 people died of their injuries during their hike. In light of the massive number of tragedies caused by hiking, we believe that our invention - "Guaranteed Safety" will be one of the solutions to reduce the number of deaths and injuries.

II. Objectives

In order to minimize hikers' risks of dying and getting injured caused by belated rescue services and medical attention, as well as reassuring their family members by sharing their hiking locations. When the trekking pole experiences shock or vibration, our device will be activated to inquire about the hiker's physical condition through the LED screen to ensure that he/she is safe and sound. If the hiker does not show a response to confirm his/her safety (e.g. when the hiker has fallen unconscious or separated from the trekking pole due to immobility or injuries), SOS messages will be automatically sent to the hiker's family members and the authorities.

We believe that hiking should be an athletic activity that provides hikers with the tranquilizing experience they desperately need, especially in Hong Kong, where residents are living fast-paced lives around walls of concrete and glass, leaving no air for them to breathe in. It is undeniable that all the unfortunate demise and injuries of hikers could be easily averted with prompt medical attention and rescue services, which we are hoping to achieve with our creation 'Guaranteed Safety', giving both the hikers and their families their peace of mind during their voyage.

III. Methodology

Materials: Arduino Uno R3, breadboard, jumping wires, 1.8" TFT LCD Display, ATGM332D GPS Tracker, push buttons*3, Trekking Pole, Knock sensor (KY-031), AA batteries, transparent plastic box

Experiment methods:

In the first stage of the project, we carried out research on the general causes of hiking tragedies, and the factors attributing to these causes of death. Unfortunately, we could not consult hiking specialists as we had planned in the first proposal, but we thought that we had enough information and understanding of the subject to carry out our next stage.

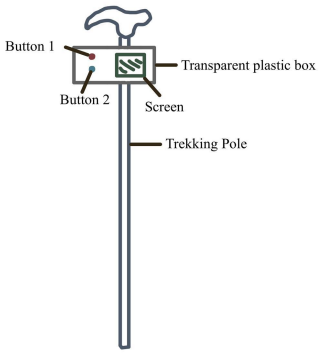
In the second stage, since our invention mainly centered around coding to execute the program, we learned programming skills and techniques by diligently viewing YouTube tutorials, online blogs, and the Arduino official website, and seeking help from experienced programmers and teachers. Upon acquiring fundamental skills in programming, we gathered the necessary gadgets and electronics from the shops.

In the third stage, we experimented with various wire connections and different codes to operate the LED screen. Then, we tested the shock sensors and the buttons to be attached to the Arduino Uno board. We spent a lot of time figuring out how to function the GPS tracker properly since the model is quite rare and little information about its connection could be found on the internet. Eventually, after numerous trials and consistent evaluation, we figured out how to receive coordinates by assessing them in different locations (e.g. parks and balconies) and sending them to the hiker's familial contacts and the authorities via SMS

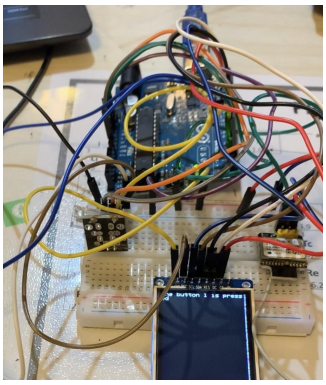
In the last stage, we attached the Arduino UNO board and other components to the trekking pole by situating them in a transparent plastic box. We ran a bunch of tests on the invention, tested its practicality and feasibility by going on a hike ourselves, and made amendments to our programs.

IV. Design of Invention

Principle: This trekking pole can detect vibration due to shock, e.g. when falling onto the ground. The program will be triggered by the vibration, running a series of commands to firstly ensure hikers' safety by asking if they are injured, and secondly contact emergency services through 992 and hikers' family members to alert them of the situation if hikers are injured. Exact location of hikers will also be sent to emergency services so that rescue teams can pinpoint the location and provide help.



← Design of "Guaranteed Safety'



V. Application / Market Needs

Effectiveness of invention:

- ➢ It is expected that 'Guaranteed Safety' will be able to detect vibrations and shock, triggering a series of response from the hiker to determine his/her safety

Areas of application:

- ➢ The main purpose of the invention is for hiking
- ➢ The trekking pole could be converted into a walking stick to be adopted by the elderly or the disabled. Automatic SOS and GPS functions will still be activated to ensure their safety.

Market need:

- ➢ As hiking accidents happen frequently, causing injuries and loss of lives, it is believed that this trekking pole will be needed by many since the automatic SOS function can effectively maximize the chance of survival of hikers.
- ➢ By using this trekking pole, hikers' safety will be ensured

Limitations:

- ➢ The invention requires the insertion of a SIM card
- ➢ The batteries need to be replaced occasionally
- ➢ Slight movements and vibrations may be misinterpreted and pose a nuisance for hikers
- ➢ The invention would not work if wires are loosely connected or disconnected to Wi-Fi

VI. If your team will compete the Sustainable Development Award, please indicate the specific sustainable development goal the project is related to, and provide justification for competing for this award.

This project is related to sustainable development goal number 3 of the United Nations, Good health and well-being. Being able to maximize hikers' chance of survival, it is believed that the trekking pole can contact emergency services to seek help from rescue teams the fastest possible because the SOS calling function is triggered immediately and automatically once the trekking pole senses vibration, i.e. once hikers collapse or get injured. This is significant to hikers' health and well-being, especially in remote trekking rails where less hikers visit and less people may be aware of his / her injury and seek help. With this hiking pole, rescue service can be provided more rapidly, hopefully resulting in less severe injuries or death. Therefore, hikers' health, well-being and life quality can be maintained after accidents.

VII. Conclusion

Not only can this invention help hikers seek rescue services effectively by contacting their family members upon detecting vibration of the trekking pole, the hikers' locations can be monitored at any time and sent to authorities as long as it is connected to a network. We anticipate that our invention can bring significant life-saving impacts as well as entitle all hikers to enjoy their hike without any concerns.