# Hong Kong Student Science Project Competition 2022

Template of Extended Abstract (Invention)

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

**Team Number: SAPE171**

**Project Title: AI Search and Rescue on the Hill**

**Project Type: Invention**

**To our best knowledge and after thorough literature research, as at _22__/_6__/_2022__ , there ~~are /~~ are no* similar works.**

Existing Technologies involved:

1. CV Zone (https://www.computervision.zone/)
2. Open CV (https://opencv.org/)
3. Mediapipe Pose (https://google.github.io/mediapipe/)

## I. Background

In Hong Kong, hiking is a common activity for different people in different age groups. However, in recent years, there have been a lot of cases of people missing when hiking. According to the government press release, there were more than 800 people who sought help for rescue, and 11 people were dead when they were found. For most cases, rescue departments can only start the rescue after their family members or passerby seek help to find a missing person and it requires much time to search and rescue the missing people. Worse still, many people are already dead when they are found.

## II. Objectives

1. Enhance the efficiency of rescue
2. Lower the death rate due to delay rescue
3. Assist rescue department to locate the injured.

## III. Methodology

**1. Definition of Problems**

**The following ways are the research we do to clarify the objectives and needs of the people.**

| **1.1 News Excerpt** | **1.2 Data from the Government** | **1.3 Examination of Current Solutions** |
|---|---|---|
| It was found that the majority of cases have the common characteristics from different news:<br>• long time to begin the rescue<br>• dangerous & unfavourable lost location<br>• long rescue time | • according to the data from the GFS, the mountain rescue call-outs was rising from 2018 to 2020. | Attempting to use some existing solutions, we discovered some problems:<br>• relying on hikers' initiatives<br>• Low accuracy |

In consideration of the above research, we aspire to produce an automated drone that can regularly patrol and search for unconscious hikers who were left unattended on the hill.

**2. Methodology – Testing & Implementation**

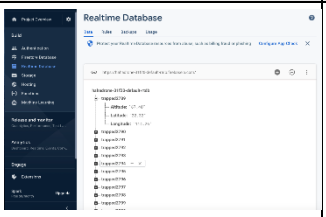
- At the beginning, we make use of the AI recognition program by *CVZone* and *Mediapipe* as the source code to further develop our product. We did our test in the indoor environment at the very beginning to increase its accuracy to detect humans' joints. The initial percentage of success was quite low owing to the inadequate data.

- After over 200 times testing at school like our teammates lying on the ground in different postures, we successfully enhance its accuracy to detect people in different postures for 90%
- Then, we went to the Ap Chai Hill for field testing the patrolling function and recognizing feature. We embed the original built-in patrolling function with our Python code to control the robot. After further amendments on the programme, the drone can successfully patrol in a designated route without crash and stop when the unconscious hikers are detected.
- Moreover, we added a programme to extract the data from the drone to upload such as GPS location and photos can be upload to Firebase successfully with the aid of the notebook connected (as the terminal)
- In terms of the accuracy of AI, it was found that there was around 4% of detection will recognise the surroundings like trees to human beings or cannot detect human beings. We hope to combine thermal camera in our drone in order to enhance the accuracy in the future

## IV. Design of Invention

We have the following four functions to solve the issue aforementioned.

| 1. Locating the hikers | 2. Differentiating different situation of hikers |
|---|---|
| Camera in Drone is used to detect the hikers and classify his or her status.  | If the hiker found is lying on the ground with no movement, the drone will send signal to nearby rescue service.  classified as in danger |

| 3. Sending location of the hiker to department | 4. Patrolling |
|---|---|
| With the built-in GPS module from the drone, the drone will send the GPS location of the injured hikers to the phone through firebase.   | In order to allow the drone can be automatically search for injured hikers on the hill, we would customize a patrolling route for the drone in different are of each hill.  |

## V. Application / Market Need

This application will mainly be applied to the rescue departments like Fire Services Departments and Government Flying Services in Hong Kong. It can help them locate the unconscious hikers, clarify their status as well as inform them through the Internet as soon as possible. If it is introduced in society, it is foreseeable that the death rates due to the delay in rescue can be minimized.

Compared with the existing app like downloading “Enjoy Hiking” on their mobile phones, our product will be more preferable because of its passive and prevention nature. Hikers need not download the app so regardless of who they are, they can be protected too.

## VI. Conclusion

It is firmly believed that our solution can help departments find lost people who are life threatened as soon as possible in hiking trails. Meanwhile, our programs can also aid departments to search for hikers in countryside or hiking trails. It is hoped that the solution can be implemented in society and minimize the death cases in hiking trail.