

## Hong Kong Student Science Project Competition 2023

Extended Abstract (Invention)  
(Word Limit: 1,600 words, Pages: 3 pages only)

**Team Number:**

**Project Title: Beacamp**

**Project Type: Invention**

**To our best knowledge, there are no \* similar works in the market; (if there are, ) related product links are as below:**

N/A

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

N/A

*\*Please delete if not applicable. The competition values the originality of works. Students must do enough literature research to ensure that their works are unique and list relevant reference materials before starting research or invention.*

### I. Background

- Provide background information as to learn about the audience for whom the project is addressing
- Provide highlights of **literature review** and/or related technologies or devices, with the support of pertinent and reliable references
- Provide an overview of work, create a point of view as to define the needs and insights of the audience and mention the **research or technology gap the project is trying to fill**

After the Covid-19 pandemic, many people have taken up camping as a social activity to make up for the 3 years spent in lockdown. As such, many campsites both official and unofficial have been overcrowded in certain areas. According to a report by the Education University of Hong Kong, 22.5% of interviewees had their first camping experience after the pandemic began and out of all the questions, the one with the lowest score was “PBC4: Due to the Covid-19 pandemic, I can find a proper campsite.” ([https://www.lib.eduhk.hk/pure-data/pub/202202270/202202270\\_1.pdf](https://www.lib.eduhk.hk/pure-data/pub/202202270/202202270_1.pdf) p.17 line 24, p.21 table 5, p.22 line 7-8) This shows that finding a more open, proper campsite has been proving difficult for people after the pandemic. As such, we wanted to fix this problem and give both new and veteran campers a more enjoyable experience by tackling the overcrowding problem.

### II. Objectives

- State the **aim(s)** of project
- To provide campers with information about the crowdedness of different campsite areas to help with the overcrowding problem

### III. Methodology

- Briefly describe the **approaches** used e.g. use of equipment, materials, tests and experiments
  - Explain the selected implementation strategies with the **scientific theory**
- Beacamp can be divided into transmitters and one or more shared receivers. The transmitters monitor the vacancies of campsites, then it is wirelessly transferred to the receivers to display the results. The transmitters should blend into its surroundings as much as possible and adapt the outdoor environment

well, while the display at the receiver must be low-power by saving power while the content is static and only draws energy if it is necessary to change.

#### IV. Design of Invention

➤ Describe the **design** and the **principle** of invention (e.g. The ideation of the projects, the prototypes or creative solution as far as applicable)

➤ Provide sketches / drawings / photos of the invention

Beacamp consists of Becamp Poles and Becamp Boards, where Poles are the transmitters, and Boards are receivers. In terms of hardware selection, Beacamp is a hybrid product of Arduino and micro:bit coding. Becamp Poles are disguised sensor units installed in pathway lighting, where microwave proximity sensors are included due to its consistent sensitivity and ability to sense through non-metallic material. Becamp Boards on the other hand are dynamic notification boards with an e-paper display because of its minimal energy usage and image memory, drawing power when content is modified.

#### V. Application / Market Need

➤ Explain the area of **application** and function of invention

➤ Indicate the market need and impact of invention

➤ Discuss **limitation** and compare with existing related works (if any)

The Beacamp can be applied in busy campsites to inform campers about which areas are more open before they arrive. This diverts the groups of campers and helps with overcrowding in busy camping periods.

As the central core of the Beacamp system can be easily integrated into different circuits, by simply changing the location of the microwave sensor and changing the output on the display, they can be repurposed to sense crowdedness in a variety of places. Such examples include transportation to redirect and insure all passengers get to have a less crowded ride. It can also be implemented in stadiums to help spectators with finding a seat and avoiding dangerous crowd crushes. This can be greatly beneficial to both everyday inconveniences and safety at big events, showing its impact if introduced to the market.

The microwave sensor cannot detect the exact amount of people in its radius, it is less precise than related works such as cameras with AI recognition, which can be trained to recognize every person. However, it is less infringing on people's privacy than a camera, which can record footage that might be hacked and accessed. As an exact number is not needed for the Beacamp's function, we decided that it would be better if we reduced the risk of privacy to a minimum. In spite of its limitations, we believe that the Beacamp can still carry out its intended function well.

#### 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. (Word limit: 300 words)

Our team will be competing for goal 10, which is "Reduced inequalities". The Beacamp can disperse larger crowds and help in them happening less, this makes the quality of every area more equal and ensures that campers won't get unfairly punished for just arriving later.

#### VII. If your team will compete the Social Innovation Award, please list the target group or social issue the project focuses on, and provide justification for competing for this award. (Word limit: 300 words)

The social issue this project focuses on is the overcrowding problem, as many people often gather at a single place, refusing to spread out to more open places. The Beacamp can help people in all kinds of situations learn to spread apart and make overcrowding less of a problem.

---

## VIII. Conclusion

- Make a **data-driven** conclusion of the project and the way forward of the invention process
- Justify if the proposed project meets the objective(s)

In conclusion, the Beacamp was invented to help campers get informed of less crowded areas at campsites to help with the overcrowding problem. From research it is found that many campers have had a tough time with finding proper campsites since the COVID-19 pandemic, with it being the most disagreed option in the survey. It can also be integrated and used in different systems to help in other areas such as transportation or stadiums with big events. While it cannot count the exact number of people in its radius, it does not infringe on privacy. We believe that the proposed project has met the objective as it can help disperse campers. We are still looking forward to further reduce the number of components as well as increasing the range of wireless transmission by introducing the LoRa communication protocol to Becamp Poles.

**\* Our project is developed based on previous project and the enhancement is below:**

N/A