

Hong Kong Student Science Project Competition 2022

Template of Extended Abstract (Invention)

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

Team Number: SABC010

Project Title: Water Level Detection Device For U-shaped Traps

Project Type: Invention

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

<http://wtsmc.edu.hk/24thhkstic/>

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

Connecting the device with microbit to achieve notifying function

***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

- 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**

Our device connected two pieces of metal, zinc and copper by wire. Because of the different reactivity between zinc and copper. There are losing electrons via external circuit due to different metal reactivity when both metals are dipped in water. And the presence of water is to act as an electrolyte because water can slightly ionize to form OH⁻ and H⁺ which are mobile ions for conducting electricity.

II. Objectives

- State the **aim(s)** of project
- To detect the water level inside a U-shaped trap and notice when there is not enough or out of water.**

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**

U-shaped traps, copper, zinc, micro bit, voltmeter and electric wire.

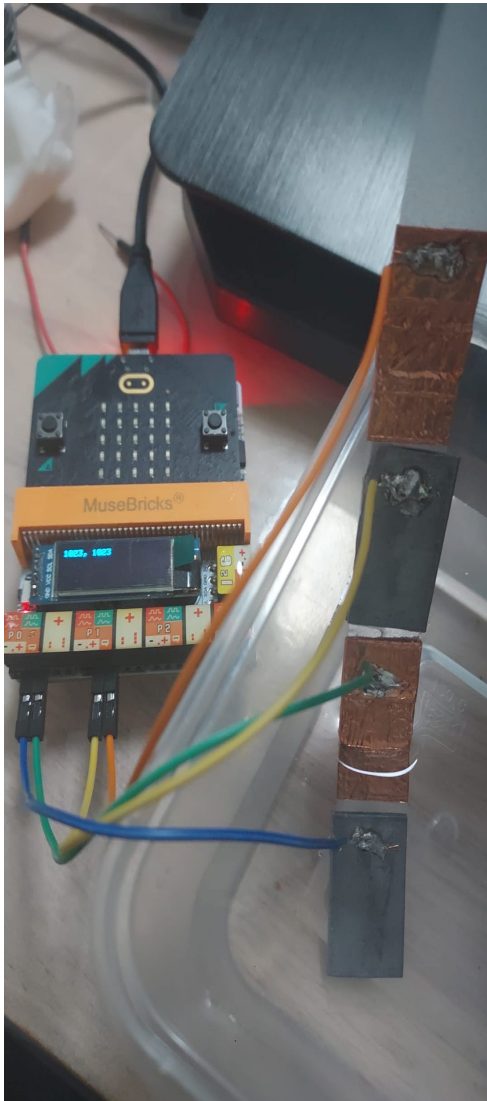
We use a voltmeter to test the voltage produced by the device.

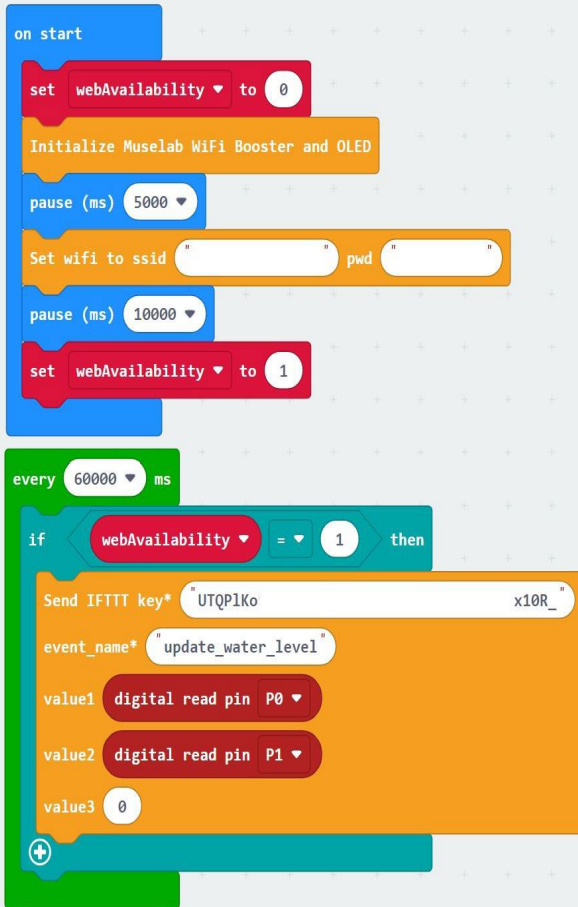
IV. Design of Invention

- 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

Because of the different reactivity between zinc and copper. There are losing electrons due to different metal reactivity when both metals are dipped in water. And the presence of water is to act as an electrolyte because water can slightly ionize to form OH⁻ and H⁺ which are mobile ions for conducting electricity.

Our device connected two pieces of metal, zinc and copper. And are both connected with micro bit bits with wires and the whole device is placed in the U-shaped trap. When there is a presence of water in the trap, the circuit is completed and the micro bit can then receive the signal. At last, the micro bit with notify you of the water level(the presence or not enough water)





```

backend > index.ts > app.post("/water_level") callback
19
20 app.get("/", (req, res) => {
21   res.send({ "message": "Hello Microbit!" })
22 })
23
24 app.get("/water_level", async (req, res) => {
25   let obj = {}
26   let count = (await counter.get("counter"))?.value as number
27   if (count === undefined) { obj = { "message": "OK", "value": null } }
28   else {
29     obj = (await store.get(count.toString()))?.value as Object || res.send({ "message": "OK", "value": null })
30   }
31   if (obj === null) { obj = { "message": "OK", "value": null } }
32   res.send(obj)
33 })
34
35 app.post("/water_level", async (req, res) => {
36   let inp = req.body
37   let count: number = (await counter.get("counter"))?.value as number || 0
38   let date = new Date()
39   count++
40   counter.put({ "value": count }, "counter")
41   // { "value": inp["value"], "timestamp": Date.now() }
42   store.put[
43     { "value": inp["value"], "timestamp": Date.now() },
44     count.toString(),
45     { "expireAt": date.setDate(date.getDate() + 1) }
46 ]
47   res.send({ "message": "OK" })
48 })

```

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)

Due to the pandemic, people found that the coronavirus can float into houses through the water pipe. So U-shaped traps are used to block the virus with water in the traps. But you may forget to add water into the U-shaped traps regularly causing health problems. So our device can help you avoid the above negligence and is needed for every resident to prevent infection of the virus.

VI. 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)

Putting Cu and Zn in water as a part of the complete circuit can generate electricity and power the components.

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

Establishing a notification system for the U-shaped traps detector