二零二三年香港學生科學比賽

延伸摘要範本（發明品）

(字數上限：2,500 字, 頁數上限：3 頁)

隊伍號碼： JAPE101

作品名稱：GOTE

參賽類別：發明品

***就我們所知，坊間 有 / 沒有* 類似的作品*；（如有）相關產品連結如下：**

我們的作品所作出的改良 / 其不同之處為：

坊間只有不同的散件水質檢測器，而我們的作品集齊大部分檢測水質所需的儀器，且能夠進行長期的水質監測，確保了解水質的變化。

****請刪去不適用。本比賽重視作品的原創性，學生須於開始研究或發明前作足夠的文獻搜索以確保自己的作品具一定獨特性並列出相關參考資料。***

I. 前言

- 介紹背景資料，並表述對作品對所關注的受眾的了解
- 概述所參考的文獻及/或相關技術或設備的資料，並列出可靠的資料來源
- 撰寫作品概要，舉出要點以針對受眾的實際需要及關注，並陳述作品嘗試填補的研究/技術缺口

在過去幾年中，香港的河道狀況引起了越來越多的關注。許多新聞報導都強調了城市各地的河流發出惡臭，例如被稱為「垃圾河」的屯門河，以及火炭河的臭味問題。這些問題給附近居民帶來了很大的不便，迫使他們忍受令人不愉快的氣味，可能對他們的身心健康產生嚴重影響。 香港河流的污染是各種因素的結果，例如工業廢料、污水排放和亂丟垃圾。這些污染物的存在不僅影響著水質，還會危及海洋生物。因此，我們必須採取必要的措施來解決這些問題，防止河流水質進一步惡化。 GOTE（Guardian of The Environment） 旨在解決香港的水污染和海洋垃圾問題。我們開發了一個系統，利用即時的水質監測和水面垃圾識別，早期發現水質異常，及時採取行動，防止水污染所帶來的負面影響，例如臭味等。我們相信，透過推廣環保意識和鼓勵可持續發展的實踐，我們可以減少最終流入海洋和水道的廢物量

https://www.hk01.com/%E7%AA%81%E7%99%BC/243572/%E8%AD%98%E8%AE%8A%E8%89%B2%E7%9A%84%E7%81%AB%E7%82%AD%E6%98%8E%E6%B8%A0-8%E5%B9%B4%E8%AE%8A%E6%AC%A1%E8%89%B2-%E6%B2%B3%E9%82%8A%E5%BA%97%E4%B8%BB-%E5%94%94%E7%9F%A5%E5%95%B2%E9%AD%9A%E6%9C%89%E5%86%87%E6%B1%A1%E6%9F%93

https://www.hk01.com/18 區新聞/760299/大埔林村河變-藍色多瑙河-區議員-估計是油漆落入河道

II. 目標

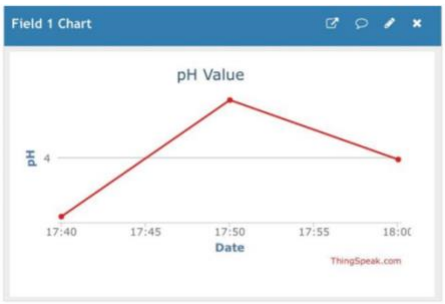
- 列出作品的**目的**

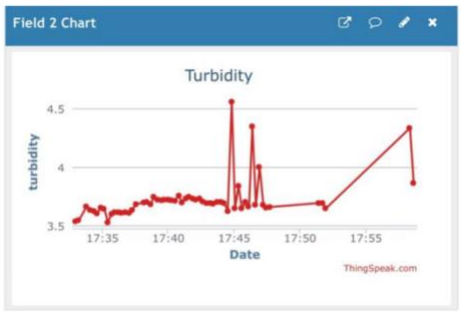
我們的致力於為所有人創造更安全和更健康的環境，包括海洋生物。我們知道解決水污染和海洋垃圾問題需要集體努力。因此，我們希望用 GOTE 與其他組織、政府合作，提高意識並促進可持續實踐，幫助清理香港的海灘、河流和其他水域。這不僅有助於清除這些區域的垃圾，還提高了公眾對環境垃圾的影響的認識，創造更清潔、更健康的環境

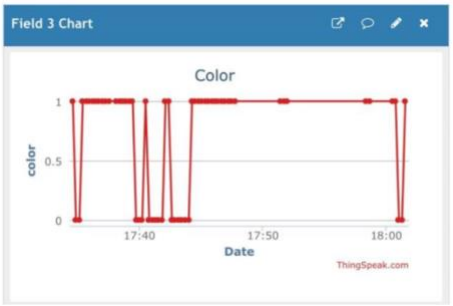
III. 研究方法

- 概述採用的**方案**，例如設備、材料、測試及相關的實驗
- 以**科學理論**支持所選用的實踐方法

GOTE 運用了各種檢測器,如酸鹼度檢測器，混濁度檢測器和顏色檢測器,並使用 Arduino 底板進行編程,令檢測器能夠準確地進行檢測,從而達至能夠二十 四小時,無間斷的水質污染檢測.





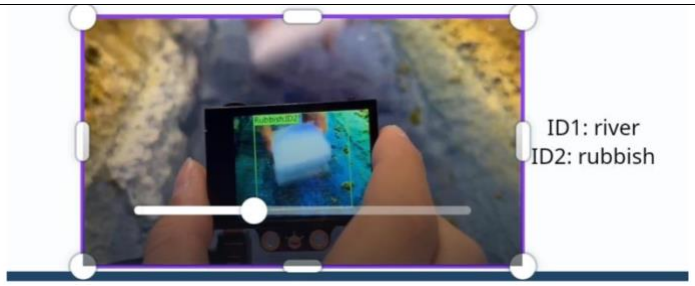


軟件運用:

b. GOTE 運用了 thinkspeak 網站,當檢測器完成檢測後,數據會以圖表的形式展示於網站裏,以方便,即時,準確地供使用者查看和分析水質情況. 3. 大型垃圾警示

a. GOTE 運用了 huskylens 進行垃圾偵測.首先,先讓 huskylens 進行機器學習, 學習辨認垃圾,令

GOTE 能偵測到水面上的垃圾,並且也運用了 ifTTT,當水面上 有垃圾被 gote 偵測到的話,就會傳送訊息給使用者



IV. 發明品的設計

- 描述發明品的**設計**和**原理**（例如：描述項目的意念、並舉出原形及不同的創意方案）
- 展示相關草圖、圖畫或照片

為了更有效地解決香港的河道和沿岸的惡臭問題，我們的 GOTE 項目使用了先進的科技和技術，以提高水質監測的準確性和效率。

除了上述提到的 IoT 技術、Arduino 底板和垃圾辨識技術外，我們的 GOTE 項目還使用了微控制器技術、水下攝像頭技術和人工智慧技術，以提高水質監測的能力。

微控制器技術是一種小型化的電腦技術，可以控制水中傳感器的運作，例如測量水溫、水位和水質等。通過微控制器技術，我們可以更準確地監測水質和檢測污染物，從而保護水域環境和生態系統

水下攝像頭技術是一種高分辨率攝像技術，可以拍攝水下的照片和影片，以便進行水質監測和垃圾辨識。我們的 GOTE 項目使用了高性能的水下攝像頭，能夠清晰地拍攝水下環境，辨識垃圾和污染物，從而及時處理和清理水域。

人工智慧技術是一種模擬人類智慧的技術，可以進行複雜的數據分析和決策。我們的 GOTE 項目使用了人工智慧技術，能夠自動分析和判斷水質和垃圾數據，從而及時發出警報和處理方案，保護水域環境和生態系統。

通過使用以上先進的科技和技術，我們的 GOTE 項目能夠更快速、更準確地監測水質和垃圾，從而及時處理和清理水域，保護香港的水域環境和生態系統。

除了使用科技和技術，我們的 GOTE 項目還注重社區參與和教育宣傳。我們定期舉辦社區清理活動，邀請志願者參與，清理海灘、河流和其他水域的垃圾，提高公眾對環境保護的認識和重視度。同時，我們也與學校合作，進行環境教育宣傳，鼓勵年輕人關注環境問題，並提倡可持續發展的生活方式。

V. 相關應用 / 市場需求

- 解釋發明品的相關**應用**和**功能**

- 指出市場的需求和該發明品的**效益**
- 討論有關**限制**，並就現有相關研究作對比（如有）

從市場上的現有產品來看，大多數水質檢測器只能檢測家用自來水，但這樣的檢測器十分有限，無法檢測環境水質，例如河道和碼頭等公共區域。此外，這些產品大多只能檢測重金屬，檢測範圍非常狹窄。
相比之下，GOTE 的水質檢測範圍更加廣泛，可以檢測自然環境中的水質，包括河流、湖泊、海洋等。因此，GOTE 的應用範圍更廣泛，可以用於農田、漁業、工業和其他方面，對於環境和人類的健康具有重要意義。
此外，GOTE 使用的檢測技術也更加先進和精確，可以檢測多種有害物質，如重金屬、農藥、化學物質等。此外，GOTE 使用的檢測儀器也更加精密，能夠在不同環境中進行檢測，並提供準確的數據。
最重要的是，GOTE 可以幫助政府和公眾關注水質問題，及時掌握水質情況，促進環境保護和公共衛生。
因此，GOTE 的應用前景非常廣闊，可以在未來的環境和健康領域發揮重要作用。
未來，我們將繼續改進 GOTE 的檢測技術和性能，使其更加準確和可靠。同時，我們也將積極開展市場推廣，推廣 GOTE 的應用和優勢，促進其在市場上的普及和應用。通過不斷的技術創新和市場推廣，我們相信 GOTE 將成為未來水質檢測領域中的領先品牌，為環境保護和公共衛生做出更大的貢獻。

VI. 如發明品將角逐可持續發展大賞，請列明作品與哪一個可持續發展目標有關，並說明參與競逐此獎項的原因。*(字數上限 500 字)*

VII. 如發明品將角逐社會創新大賞，請列明作品所針對的目標群組或社會議題，並說明參與競逐此獎項的原因。*(字數上限：500 字)*

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VIII. 結論

- 撰寫以**數據**為本的結論及有關發明的後續安排
- 證明作品是否達到研發目標

Gote 是一種創新的技術解決方案，旨在通過技術手段解決河流水質污染問題。它運用了 ifttt、thingspeak、micro:bit、arduino 和 huskylens 等五大科技，實現了 24 小時遠程監測河道水質情況和辨認水面垃圾的功能，從而減省人力資源和檢測成本。這項技術的出現，為政府部門及時跟進河流問題提供了高效的手段，能夠更快速地解決河流惡臭等問題，進而將河流沿岸變成文娛康樂的聚集地，市民放鬆歡聚的落腳點。這些變化大大改善了公共衛生及附近居民生理、心理健康等方面的問題。總之，Gote 對於解決河流水質污染問題來說，是一項非常有前途的技術創新。

☐ 我們的作品是以之前的比賽作品為題進行了持續研習，有關改良如下：

Hong Kong Student Science Project Competition 2023

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

Team Number:

Project Title:

Project Type: Invention

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

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

In the market, there are only different scattered water quality detectors. Our product collects most of the instruments needed to detect water quality and can conduct long-term water quality monitoring to ensure an understanding of changes in water quality.

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**

In recent years, the condition of Hong Kong's rivers has attracted increasing attention. Many news reports have highlighted the foul-smelling streams throughout the city, such as the Tuen Mun River, which is known as the "trash river," and the odor problems of the Fo Tan River. These problems have caused great inconvenience to nearby residents, forcing them to endure unpleasant odors that could potentially have serious effects on their physical and mental health. The pollution of Hong Kong's rivers is the result of various factors, such as industrial waste, sewage discharge, and littering. The presence of these pollutants not only affects water quality, but also endangers marine life. Therefore, we must take necessary measures to address these issues and prevent the deterioration of river water quality. GOTE (Guardian of The Environment) aims to solve Hong Kong's water pollution and marine debris problems. We have developed a system that uses real-time water quality monitoring and water r surface garbage identification to detect water quality abnormalities early and take timely action to prevent the negative effects of water pollution, such as odor. We believe that by promoting environmental awareness and encouraging sustainable practices, we can ly reduce the amount of steam the ocean and waterways.

II. Objectives

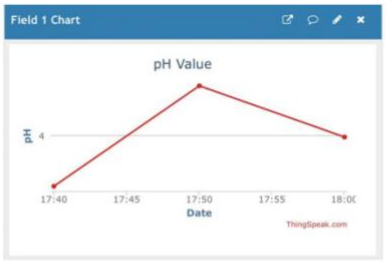
- State the **aim(s)** of project

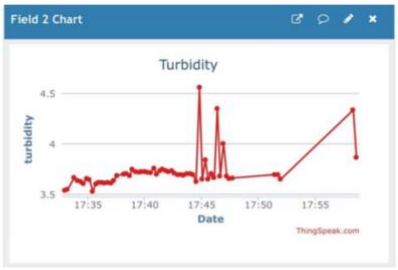
We are committed to creating a safer and healthier environment for everyone, including marine life. We know that solving water pollution and marine debris problems requires collective effort. Therefore, we hope to collaborate with other organizations and governments through GOTE to raise awareness and promote sustainable practices to help clean up Hong Kong's beaches, rivers, and other waterways. This will not only help clear the trash from these areas, but also raise public awareness of the impact of environmental waste, creating a cleaner and healthier environment .

III. Methodology

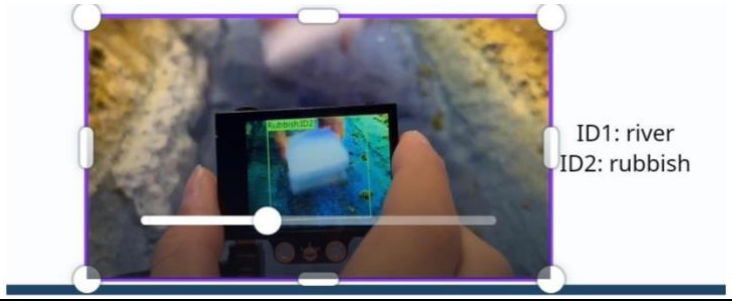
- Briefly describe the **approaches** used e.g. use of equipment, materials, tests and experiments
- Explain the selected implementation strategies with the **scientific theory**

GOTE utilizes various detectors, such as pH detectors, turbidity detectors, and color detectors, and uses an Arduino board for programming to enable accurate detection, achieving 24-hour, uninterrupted water pollution monitoring.
Software Application: GOTE utilizes the Thinkspeak website. When the detector completes the detection, the data will be displayed on the website in the form of a chart, providing users with a convenient, real-time, and accurate view of water quality.





Large Garbage Warning: GOTE uses Huskylens for garbage detection. First, Huskylens is trained to recognize garbage through machine learning, allowing GOTE to detect garbage on the water surface. GOTE also uses ifTTT. When garbage is detected on the water surface, a message will be sent to the user



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

To more effectively address the foul odor problem in Hong Kong's rivers and coasts, our GOTE project uses advanced technology and techniques to improve the accuracy and efficiency of water quality monitoring. In addition to the IoT technology, Arduino board, and garbage recognition technology mentioned earlier, our GOTE project also uses microcontroller technology, underwater camera technology, and artificial intelligence technology to improve the ability of water quality monitoring.

Microcontroller technology is a miniaturized computer technology that can control the operation of sensors in the water, such as measuring water temperature, water level, and water quality. Through microcontroller technology, we can more accurately monitor water quality and detect pollutants, thereby protecting water environments and ecosystems.

Underwater camera technology is a high-resolution imaging technology that can take photos and videos underwater for water quality monitoring and garbage recognition. Our GOTE project uses high-performance underwater cameras that can clearly capture underwater environments, identify garbage and pollutants, and timely process and clean up the water area.

Artificial intelligence technology is a technology that simulates human intelligence and can perform complex data analysis and decision-making. Our GOTE project uses artificial intelligence technology to automatically analyze and judge water quality and garbage data, and issue alarms and processing plans in a timely manner to protect water environments and ecosystems.

By using the above advanced technology and techniques, our GOTE project can more quickly and accurately monitor water quality and garbage, and timely process and clean up the water area, protecting Hong Kong's water environment and ecosystems.

In addition to using technology and techniques, our GOTE project also focuses on community participation and education promotion. We regularly organize community clean-up activities, inviting volunteers to participate in cleaning up garbage on beaches, rivers, and other water areas, raising public awareness and importance of environmental protection. At the same time, we also cooperate with schools to conduct environmental education promotion, encouraging young people to focus on environmental issues and advocate for sustainable lifestyles.

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)

From the existing products on the market, most water quality detectors can only detect household tap water, but these detectors are very limited and cannot detect environmental water quality, such as rivers and public areas like docks. In addition, these products can mostly only detect heavy metals, with a very narrow detection range.

In contrast, GOTE's water quality detection range is wider and can detect water quality in natural environments, including rivers, lakes, oceans, etc. Therefore, GOTE's application range is more extensive and can be used in agriculture, fisheries, industry, and other fields, which is of great significance for the environment and human health.

In addition, the detection technology used by GOTE is more advanced and accurate, and can detect various harmful substances such as heavy metals, pesticides, and chemicals. Moreover, the detection instruments used by GOTE are more precise, can perform detection in different environments, and provide accurate data.

Most importantly, GOTE can help the government and the public to pay attention to water quality issues, timely grasp the situation of water quality, and promote environmental protection and public health. Therefore, the future prospects of GOTE are very broad and can play an important role in the future of environmental and health fields.

In the future, we will continue to improve GOTE's detection technology and performance to make it more accurate and reliable. At the same time, we will also actively carry out market promotion to promote the application and advantages of GOTE, and promote its popularization and application in the market. Through continuous technological innovation and market promotion, we believe that GOTE will become a leading brand in the field of water quality detection in the future and make greater contributions to environmental protection and public health.

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)*

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)

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In addition, the detection technology used by GOTE is more advanced and accurate, and can detect various harmful substances such as heavy metals, pesticides, and chemicals. Moreover, the detection instruments used by GOTE are more precise, can perform detection in different environments, and provide accurate data.

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)

Gote is an innovative technological solution aimed at solving river water pollution problems through technical means. It utilizes five major technologies including IFTTT, ThingSpeak, micro:bit, Arduino, and Huskylens to achieve 24-hour remote monitoring of river water quality and identification of surface garbage, thereby reducing manpower resources and detection costs. The emergence of this technology provides an efficient means for government departments to keep up with river problems, enabling them to more quickly solve problems such as river odors, and turning the riverbank into a gathering place for entertainment and relaxation, a place for citizens to relax and gather. These changes greatly improve public health and the physical and mental health of nearby residents. In short, Gote is a very promising technological innovation for solving the problem of river water pollution.

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