Introduction of the sensor system

final project

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By the end of 20th of March 2024, human waste has been pumped into the Greater London area of the River Thames for a staggering 1,914 hours since the start of 2024 – equivalent to 79 days [1]! The human waste in it causes Waterborne Diseases, millions of pounds of financial loss and 116 thousand fish dying [2] in the river annually. However, detecting, tracing and predicting the source, distraction and trend of human waste is still a big problem.

Traditionally, people use organic solutions to detect human waste, such as microbial testing, DNA and RNA analysis [3], stable isotope analysis, etc. However, these solutions require expensive devices and a long duration. Based on these shortages, this project plans to develop a lower-cost and faster solution to detect human waste. This project plans to use multi-inorganic content including dissolved oxygen, ammonia nitrogen, conductivity and turbidity with an AI model to judge whether there is human waste in the water sample, what the concentration is and how long it has been in the water. In this solution, the cost is much lower than organic detection. Furthermore, real-time data will be accessible with the help of an AI model. Moreover, using this kind of sensor system, people can monitor the river for 7x24 hours rather than sample by humans and test in the lab.

However, there are still some potential challenges in this situation. For example, there will be a huge amount of data if the whole sensor system is complete. There will be hundreds of sensors, producing data constantly. How to process the data will be one of the most important challenges. Moreover, how to design a durable system is also important. As we all know, the sensors cannot be perfect all the time. Some of them may be broken or even produce wrong data. In this situation, how to make the system robust will be a main challenge.

In summary,

All in all, although with some challenges, this program is still meaningful to not only the citizens in London but also to the economic system in the whole world. This program is making effort on detect, trace and predict many kinds of human waste in the water system. By broaden this new method to the other rivers on this planet, it can provide us a solution to the pollution and make it a better world.

Reference

1. <https://riveractionuk.com/thames-water-raw-sewage-dumped-in-the-river-thames-more-than-1900-hours-in-2024-so-far/#:~:text=Donate-,Thames%20Water%3A%20raw%20sewage%20dumped%20in%20the%20River%20Thames%20more,hours%20in%202024%20so%20far&text=Thames%20Water%20has%20pumped%20human,2024%20–%20equivalent%20to%2079%20days>
2. <https://anglingtrust.net/2024/05/20/huge-increase-in-fish-kills-linked-to-sewage-pollution/>
3. Kildare BJ, Leutenegger CM, McSwain BS, Bambic DG, Rajal VB, Wuertz S. 16S rRNA–based assays for quantitative detection of universal, human–, cow–, and dog–specific fecal Bacteroidales: a Bayesian approach. Water Res. 2007 Aug 1;41(16):3701–15.