



Development of Distributed Applications

Design Document

Version 1.0

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1 Introduction

1.1 Purpose

Clean, accessible water is critical to human health, a healthy environment, poverty reduction, a sustainable economy, and peace and security. Developing countries are most affected by poor water quality. Up to 80% of illnesses in the developing world are linked to inadequate water and sanitation. In many countries, pollution or rising sea levels are contaminating trusted water sources. It is then critical to monitoring levels and evolution of sea and fresh water pollution. Problem is that full coverage is often inadequate and difficult to obtain because of costly instruments and dimension of the target area.

SeaUrchin is proposed as a possible solution to the problem. The idea is to track pools of water status in real-time by using "swarms" of easy to build and very cheap devices based on esp8266 microcontroller.

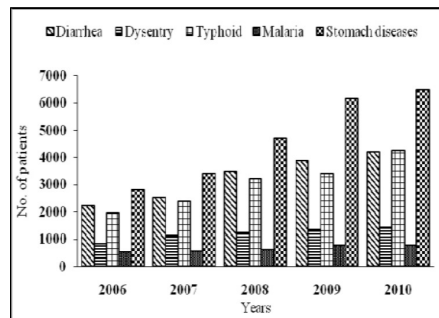


Figure 1: Five years registered data of the patients suffered from water-borne diseases (from a rural community in Lahore, Pakistan)

2 Architecture

A great number of water floating devices interconnected that send a real time stream of data to a server using a "Wifi boe" as router. The data is analyzed and different tasks can be accomplished (for example an alert message is dispatched to authorities if sensors indicate an hazardous environment).

3 Technologies

The floating devices will be build using an **ESP8266** microcontroller as core module, the choice was dictated by the fact that it is smaller than an arduino UNO board and has a built in Wifi module, it is also very cheap (see Bibliography for reference).

3.1 Sensors

The goal is to achieve an economically sustainable solution and a wide area coverage, thus the focus should be on producing a large number of cheap devices and accuracy on the single device is not a priority.

3.1.1 List of sensors

Turbidity sensor (see reference) : Turbidity is a measure of the cloudiness of water. Turbidity has indicated the degree at which the water loses its transparency. It is considered as a good measure of the quality of water. Turbidity blocks out the light needed by submerged aquatic vegetation. It also can raise surface water temperatures above normal because suspended particles near the surface facilitate the absorption of heat from sunlight.

Temperature sensor DS18B20 : Water Temperature indicates how water is hot or cold. is digital type which gives accurate reading.

Water flow sensor (optional): Flow sensor is used to measure the flow of water through the flow sensor. This sensor basically consists of a plastic valve body, a rotor and a Hall Effect sensor. The pinwheel rotor rotates when water / liquid flows through the valve and its speed will be directly proportional to the flow rate.

4 Market analysis

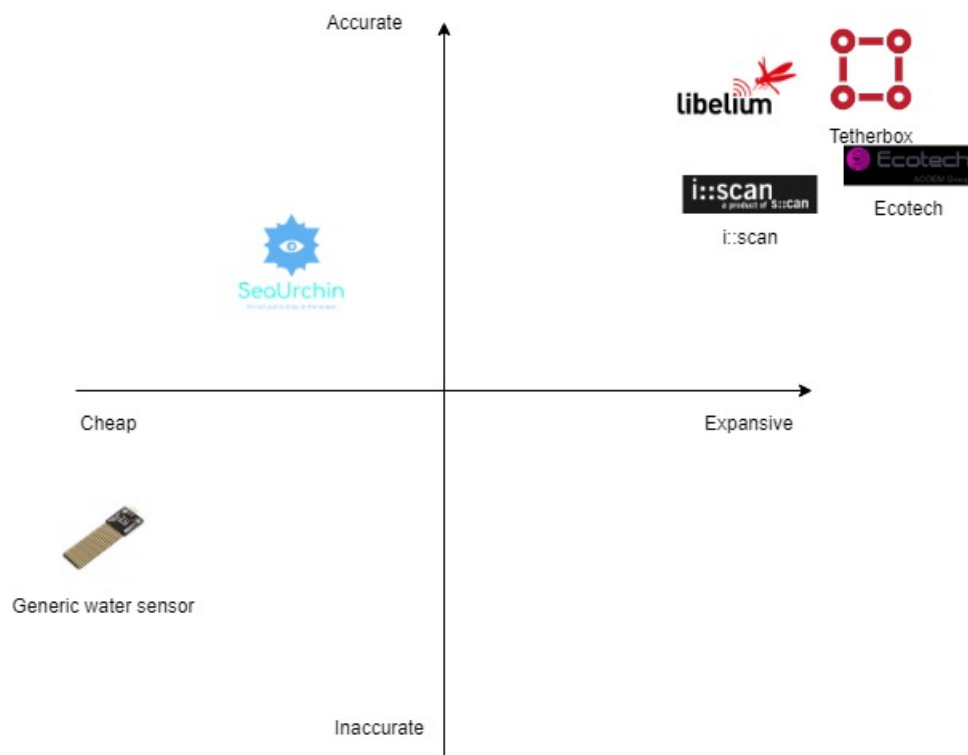


Figure 2: Marekt Analysis for SeaUrchin, on the X axis costs of the solution, on the Y axis Accuracy, we must keep in mind that expansive solution are not scalable

A rapid market analysis reveal that the majority of the available solutions are out of the scope of SeaUrchin, we want to offer a reliable and fast way to monitor large body of water without a big economic investment.

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