EE701: Internet of Things: From Technology to Application

PROJECT PROPOSAL

Project Title : Smart Water Quality Monitoring System

Team Members : Hiren Aravind Murugudu Govindarajan

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Zhe Li

Project Description : The aim of this project is to develop a Smart Water Quality Monitoring System for testing the quality of water, using pH, temperature and turbidity as the parameters, and a User-Friendly Real-time Tracking I Interface. The collective data is utilized to evaluate the quality of water, and to determine if the water quality is sufficient enough for domestic usage. The main goal is to develop a compact, cost-effective, biosafe device to measure the appropriate parameters through the respective sensors, that uploads the compressed data to the cloud in a periodic basis, and to develop a Webpage that allows to monitor the quality-levels on a real-time basis.

PROJECT OVERVIEW:

HARDWARE:

The following list of components will be used in the building of the monitoring device and is accompanied by the specifications and the cost for corresponding components. It is followed by links to the vendors for all the components.

Components	**Model Number**	**Cost**
Waterproof Temperature Sensor	DS18B20	$10.99 (Set of 5)
Turbidity Sensor	SEN0189	$19.69
pH Sensor	YY6237	$33.59
Water Level Sensor	MC050-5	$6.89 (Set of 5)
TI Board	CC2650	Present with the team
SIGFOX Module	RC1692HP	
	Total	$77.15

SENSORS' DESCRIPTION:

1. **Temperature Sensor**: To measure the temperature of water (a requirement in cold places)
2. **Turbidity Sensor**: To indicate the level sediments/cloudiness by suspended particles in water. More turbidity can obstruct light to aquatic plants and also indicates the presence of high bacteria count.
3. **pH Sensor**: To indicate the presence of chemicals.
4. **Water Level Sensor**: To prevent the module from getting completely immersed by sending an alarm/notification.

SENSORS' LINK:

1. Temperature Sensor-

https://www.amazon.com/HiLetgo-DS18B20-Temperature-Stainless-Waterproof/dp/B00M1PM55K/ref=asc_df_B00M1PM55K/?tag=hyprod-20&linkCode=df0&hvadid=241906416474&hvpos=1o1&hvnetw=g&hvrand=18105001736713731292&hvpone=&hvptwo=&hvqmt=&hvdev=c&hvdvcmdl=&hvlocint=&hvlocphy=9005544&hvtargid=pla-525242725178&psc=1

2. Turbidity Sensor-
https://www.amazon.com/gp/product/B078JHBDJK/ref=ox_sc_act_title_2?smid=A2M99LKXDQEZXD&psc=1

3. pH Sensor-

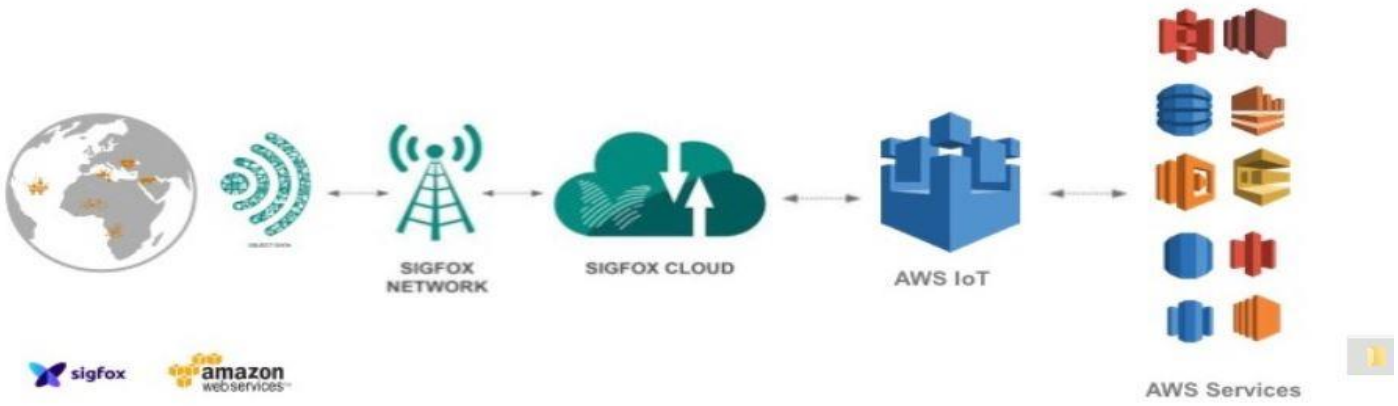
https://www.amazon.com/GAOHOU-PH0-14-Detect-Electrode-Arduino/dp/B0799BXMVJ/ref=sr_1_2_sspa?s=industrial&ie=UTF8&qid=1541886919&sr=1-2-spons&keywords=ph+sensor+module&psc=1

4. Water Level Sensor-
https://www.amazon.com/gp/product/B01FDGU95Q/ref=ox_sc_act_title_3?smid=ADV3ON8ONZPPL&psc=1

SOFTWARE:

The project also involves developing a Static Webpage that provides a User-friendly Web-Interface(AWS Service) to allow real-time tracking of Water-Quality levels, which allows the user to see the latest data available or a time-series data for a particular location either by searching for that location or clicking on the corresponding location on the map. Once the hardware device is connected and sending data to the Sigfox Network, a native AWS IoT connector has to be configured to push the data to AWS cloud, which requires a CloudFormation script that will generate IAM roles and permissions. The data is stored in an Amazon DyanamoDB

table by creating a manual rule. Also, Javascript and HTML is to be used to use the Google maps embed API interaction.



WORK PLAN/DIVISION of WORK:

Process Step	Resources Needed	Expected Effort	Due date
Hardware Requirements	Required: Hiren, Li Optional: Goutham, Ramya	1-day of pre-work (3) 2-hour meetings	11/11/2018
Hardware Development and Testing	Required: Hiren, Li, Goutham Optional: Ramya	2-days of pre-work (8-10) 2-hour meetings	11/18/2018
Hardware Enclosure Development	Required: Hiren, Li, Goutham Optional: Ramya	1-day of pre-work (6-7) 2-hour meetings	12/2/2018
Webpage Development	Required: Goutham, Ramya	(10) 2-hour meetings	11/25/2018
System Integration and Testing	Required: Hiren, Goutham, Li, Ramya	(6) 2-hour meetings	11/28/2018
Project Review And Remodeling	Required: Hiren, Goutham, Li, Ramya	(6) 2-hour meetings	12/5/2018
Documentation/ Cost-Analysis	Required: Hiren, Goutham, Li, Ramya	(2) 2-hour meetings	12/2/2018
Final Report	Required: Hiren,Goutham, Li, Ramya	(3) 2-hour meetings	12/10/2018

Communication between the members of the team would be through Slack and weekly meetings would be conducted to update the weekly progress. The work progress would be tracked using Agile methodology and use Trello Board for managing the project.

TASKS:

The tasks have been divided into separate hardware and software categories along with the integration in the later part after individual tasks have been completed.

Software

- Code development for the data to be collected by the sensors and transferred from the microcontroller to the Cloud(AWS).
- Code development for the analysis of data which has been transferred to the Cloud.
- Webpage development using JavaScript, HTML and XML with Google Map API interaction.

Hardware

- Sensor interfacing with the microcontroller.
- Building the prototype for the physical container which holds the whole circuit using CAD.
- Building the container based on the model.

Others

- Integrating the hardware and software developments.
- Generate a technical report and a user manual.

DIVISION OF WORK:

The team is divided into two sub-teams; Hardware and Software team with each team consisting of two members each. The hardware team will concentrate on the device development including the assembly of sensors in a physical container. The software team will be working on software development involving coding and web development. After the sub-team specific tasks are completed, the teams will work together to integrate the different components and initial testing, and redesigning (if necessary) based on the feedback.

Hardware: Hiren Aravind Murugudu Govindarajan, Zhe Li

Software: Goutham Balasubramaniam, Sai Ramya Gundala