Name(s)

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Project Number

J1129

Project Title

Improving Existing Equipment for Oil Spills in the Ocean

Abstract

Objectives

In order to solve the problem of expensive clean up methods for oil-spills in the ocean, we decided to design an efficient device by improving upon the existing oil clean up equipment called the boom. Our goal was to improve the design by adding functionality, by using software and hardware technologies to the boom to make it efficient and cost effective. Our objective was that our device should clean up 2.5 gallons of oil spill in under 1.5 minutes.

Methods

First of all, we cut one hole on the top and other hole at the bottom of a flexible 12 feet pipe as boom. Next we attached a powerful pump inside the pipe. The pump's nozzle protruded out from the top hole, and the bottom hole allowed the oil and water to enter the closed ended pipe. On the top nozzle we attached vinyl tube so that oil could be pumped out from there and then it would be collected in another container so that it could be measured. We also cut another hole on the top of the boom to fit our distance sensor into the boom. This was our implementation of Raspberry Pi i.e. Raspberry Pi 3 B+ . The distance sensor measured liquid's height as it entered the pipe indicating to us when to turn on the pump, by indicating red, yellow or green LEDs. As the liquid's level rose in the boom the LEDs changed from red to yellow and finally to green indicating us to turn on the pump. Materials that we used were, distant sensors, three LEDs, male to female jumper wires, bread board, and 1K and 2k resistors.

Results

After testing our device in a container with 15 gallons of water and 2.5 gallons of oil, the data we collected portrayed that the boom pumped 0.2 gallons of oil every 5 seconds. In addition, our software components worked as expected for example when the liquid level was high, the green LED lit indicating to us to turn on the pump. As a result our project testing and results were successful. Our device cleaned up the 2.5 gallons of oil in less than 1.5 minutes showing that our device met our objective. It also met our criteria and constraint.

Conclusions

In conclusion, we saw that our prototype could collect the oil from the surface of water efficiently and met all the criteria and overcame all the constraints. Our criteria was that all of the oil must be cleaned up in less than 75 seconds. And the criteria that the distance sensor should work effectively. Our prototype did meet both of these criterion. Some constraints were that the prototype should be under $150. and the device should not be bulky and should be transportable. Our device has overcome those constraints. Our device is

Summary Statement

Our project is improving upon the existing oil spill equipment by adding functionality of Raspberry Pi to the boom, making it more efficient and less costly.

Help Received

We designed and programmed the algorithm ourselves after doing internet search on techniques. Our science teacher Mrs. Rahman reviewed our results.