CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)
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Project Number
J1115

Project Title
Smart Waste Management System

Abstract

Objectives/Goals
I created the Smart Waste Management system to optimize garbage collection by efficiently identifying and gathering solid waste and transporting it to landfills to prevent the dumping of waste at a low cost. In addition, I would like the Smart Waste Bin to be installed near public venues such as school and parks to make residents play enforcement roles that result in desirable social behaviors, also to eliminate littering.

Methods/Materials
First, I collected information about the trash bin's fill volume, temperature, and humidity. The attached camera takes pictures of the trash bin and its surroundings. Next, the effectiveness of the pedestrians is checked, and the data is accumulated in the Smart Waste Management software.

Some of the key materials I used include the Raspberry Pi 3, Arduino Uno, Arduino Uno Sensor, Ultrasonic Sensor, Port Hub, Phidget GPS, Light Sensor, and Camera. I also used Bracket and Python software.

For my project, I choose a location that consists of a lot of litter such as parks and schools. Next, I analyzed the routes of current waste management companies and created a Predictive Box Model based on the different fill quantities of simulated bins. Through this, I would like to improve the overall waste pickup by about 20% as the bins will trigger an alarm when they are 70% full.

Results
The extrapolated field test results showed that on the weekends, my trash bin reached the threshold fill volume of 70% and was collected. On a monthly average, each trash bin filled from about 45% to 60%. I learned that it is not feasible for garbage to be collected via dynamic routes. Garbage collectors should make less collection rounds, thus decreasing the overall cost.

Conclusions/Discussion
In conclusion, my Smart Waste Management system allows continuous monitoring of the waste bin to produce standard pick up routes, where only the waste for containers that require collection. Pictures of litter around my waste bin did result in pedestrians playing active roles to reduce the overall littering. The monitoring of the temperature and humidity allowed the faster pick up of garbage that was rotting and had a foul smell. According to my questionnaire, waste bins which are attractive helped reduce litter. Lastly, having the Fun Smart Waste Bin installed at public places will lead to young kids to become future inventors of eco-friendly products.

Summary Statement
My Smart Waste Management system allows for optimized garbage collection and sends pictures of litter around my waste bin for faster pick up.

Help Received
I designed and built the Smart Waste Management System myself. I got help in understanding circuits and software by my teacher.