SMARTBIN

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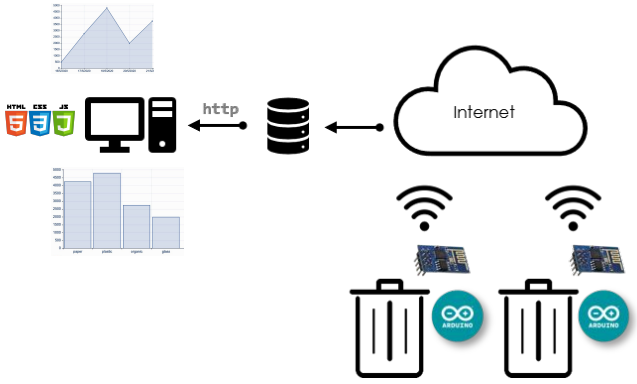
Context and problem description

Waste management is an essential aspect of every community and its improvement is a goal worthy of being achieved.

Currently this complex process, divided among accumulation, classification, transport and disposal, tends to be not only expensive but also not very efficient.

For this reason we designed SmartBin, an IoT based device aimed at reducing the environmental impact of waste management while rising both the quality of life of the users and the performance of the system itself.

SmartBin is able to detect its status through a persistent scanning carried out by sensors, sending the collected data to a back-end software, via wireless network.



Use case

Luigi is an ecological operator who spends most of his shifts moving around in Pisa emptying trash bins. He notices that most of his travels are wasted due to practically empty bins and this makes wandering around a very inefficient task.

The solution would be having new bins able to notify operators like Luigi when their capacity reach a certain threshold, in order to intervene only when needed. Smartbin is such solution, which gives Luigi the capability of traveling only when necessary, making his work much more efficient and also reducing CO_2 consumption.

Furthermore, Smartbin allows users to throw their trash in a smarter way: it is designed in order to encourage them to perform correctly separate collection thanks to its reward system, and also enables identification of users who threw garbage incorrectly in order to notify their mistake in a constructive, well-mannered way, with the aim of improving citizens' behaviour and obtaining cleaner cities.

User Experience

The led's color signals the bin's state and a yellow light is used to highlight a full bin. In this state the users cannot interact with the bin whose state is automatically notified to the admins.

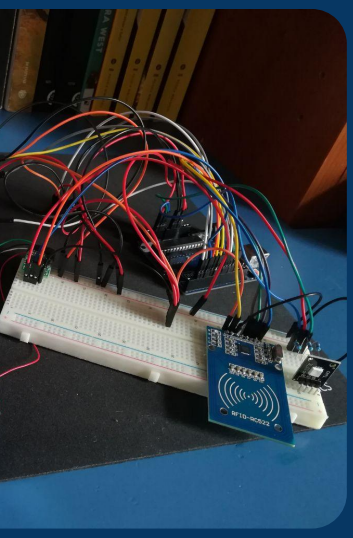
A blue light encourages users to identify themselves by approximating their card to the RFID Reader. A registered card is represented by a green light and by the automatic opening of the bin's cap for a distinct interval of time.

After being filled by the users' garbage, or emptied by an administrator, SmartBin measures both its remaining capacity and the weight of the wastes inserted in it.

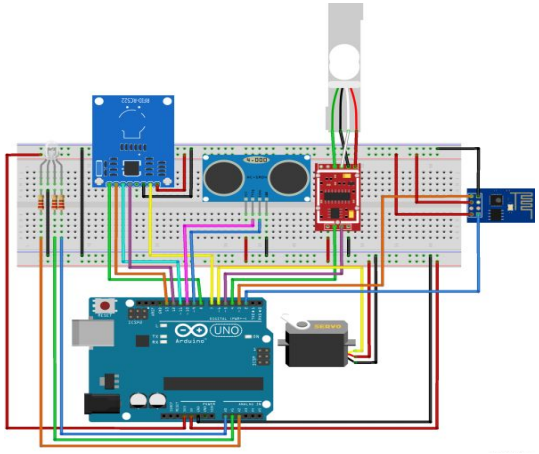
The data concerning each interaction is sent to the server and stored on the database. They are involved in several statistical analysis displayed on the web interface while fueling a gamification system aimed on encouraging a a better classification of garbage in users.

Technologies

- **Device**: Arduino Uno + Weight sensor HX711 + Load cell + RFID Reader MC522 + Ultrasonic sensor HC-SR04 + WiFi Module ESP8266 + Servomotor + RGB Led
- **Server**: Python Flask
- **Database**: MySQL
- **Web Interface**: Chart.js + Google Maps API



Prototype



Future work

- Deeper focus on the gamification system
- Path algorithm to perform a better management of the bins
- Enable the system to evaluate the correct classification of the user's wastes

References

Github: https://github.com/vlnraf/IOT-project
Thingverse: https://www.thingiverse.com/thing:4377030
Youtube: https://youtu.be/DqB3y-n9yO0