SMART BINS - AUTOMATED TRASH SORTING SYSTEM

Team Members: Danny Nguyen (CSE), Shayla Luong (CSE), Timothy Ta (CSE), Jason Chuang (CpE)
Advisor: Stuart Kleinfelder

UCI Samueli School of Engineering | Department of Electrical Engineering and Computer Science

Introduction

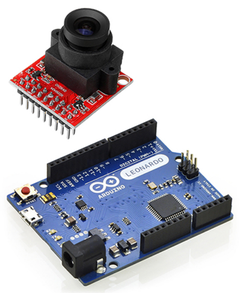
While throwing away trash, people are often uninformed about the proper bin to place their garbage in. This may cause compostable trash to go into recycling bins, causing detrimental trash sorting problems. Putting non-recyclable material into the recycling bin not only hurts the planet but also incurs higher safety risks for recycling facilities.

Project Goal

The goal of our project is to make it easier for people to simply throw away their trash. People will not have to debate between the differences between recycling and compost. We provide an automatic sorting in the small form of a trash can that can be used anywhere.

Material

- Arduino
- Camera module
- Servos/Actuators
- Trash Bins
- Microsoft Azure



Current Progress

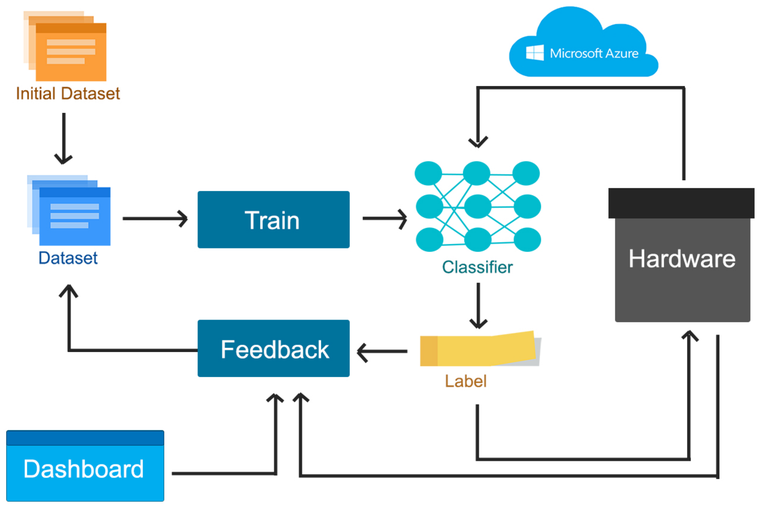
Software
- Created an initial classifier
- Gathered datasets from online sources
- Set up database to store image data

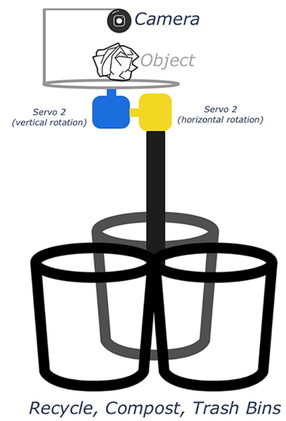
Hardware
- Adding camera modules to existing trashcans
- Programmed callback to Azure from Arduino
- Construct trash-sorting mechanisms

Future Work

- Continute training model for higher accuracy
- Set up arm and testing station for testing hardware portion in tandem with the software.

System Architecture





Trash Bin Design

Challenges

Machine learning projects typically have trouble collecting enough data to train a viable model. To remedy this, we designed our project with the ability to collect more data as time goes on. This is done by having a feedback loop where people can correct mislabeled waste, which in turn will allow the classifier to improve itself and make better predictions. Another challenge we faced was coming up with a simple, yet versatile design that allows waste to be thrown away without user interaction.

Milestones

Milestone 1: Improve the accuracy of the project's Machine Learning model by at least 10% by collecting more images of common garbage objects.
Milestone 2: Integrate the project's updated frame design with sturdier parts and larger servos to handle sorting objects that weigh at least 15kg.
Mllestone 3: Develop an analytics dashboard inorder to track smart bin usage, machine learning model accuracy, trash ourput statistics, and images of trash thrown away.

References

1. M. Yang and G. Thung, "Classification of Trash for Recyclability Status." https://pdfs.semanticscholar.org/c908/11082924011c73fea6252f42b01af9076f28.pdf. [Accessed: 10-Oct-2019].

2. J. Hopewell, R. Dvorak, and E. Kosior, "Plastics recycling: challenges and opportunities," Philosophical transactions of the Royal Society of London. Series B, Biological sciences, 27-Jul-2009. [Online]. Available: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2873020/. [Accessed: 04-Oct-2019].

3. C. Ching, "How to build an image classifier for waste sorting," Medium, 29-Mar-2019. [Online]. Available: https://towardsdatascience.com/how-to-build-an-image-classifier-for-waste-sorting-6d11d3c9c478. [Accessed: 12-Oct-2019].