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HouseHold Recycle Sorting Bin System Design

Introduction

Global urban waste quantities are estimated at **2 billion tonnes** per year[1]. However the **recycling frequency** in urban areas is

under-performing at only **37%**[2]. Research shows that slight improvements in the **convenience** of recycling can drastically **increase** individual **recycling rates**. This project therefore aims to increase urban household recycling rates by assisting in the sorting of household recycling. This is to be achieved by **designing** a household recycle sorting bin system that can **sort plastic, glass, metal, and paper** recyclables into different bins through the use of physical sensors and machine learning.

Discussion

Conclusions drawn from a **review of 22** waste sorting bin **systems**:

1. Available methods for **classifying organic** waste are **unreliable** and organic waste contaminates recyclables. Hence the exclusion of organic waste sorting from this design.
2. **Sensors and computer vision struggle** to separate glass from plastic. Due to this, we use the sound the material makes when struck by metal to classify plastic and glass, as this has not been attempted in any of the reviewed systems. The use of sound eliminates the need for light and the shape of the material does not affect classification.
2. **Inductive sensors** are the **best** at detecting metal.



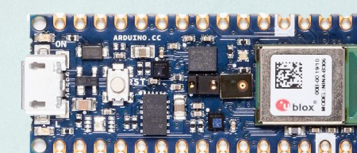
[1]D. Wilson et al., 'Global waste management outlook: Summary for decision-makers,' 2015

[2]NESPRESSO, 'Consumer attitudes to recycling,' May 2017, p. 14.

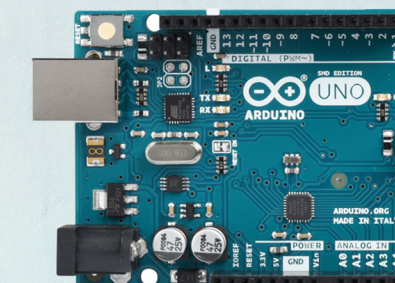
Technologies



Nano33 BLE sense



Arduino Uno



An arduino nano 33 BLE sense runs the classifier but has also been used to record a dataset of general noise and the sound different plastics and glass make when struck by metal.

An Arduino Uno controls all the components and receives data from the nano through an I2C connection.

The program is coded in C++ using the Arduino IDE.



The classifier has been trained, tested and deployed as an arduino library through the Edge Impulse web application

Future Work

Develop a user interface for the bin, that people can interact with and learn more about how to recycle correctly.

Design

