<u>Gomi-Betsu Bot</u>



Josiah Balona Shun Collier JinWoo Lee Emily Love Team 99484B While everyone celebrates the concept of recycling, materials of course must be separated before they can be recycled. This is often very tedious, and either requires large separation factories manned by many laborers, or the diligence and cooperation of every citizen in a municipality, which can be a very tall order. If there was a method by which individuals could separate their own trash without having to change their habits, these dramatic goals of saving the earth become a little bit more achievable. The robot we have created to address this need is named the "Gomi-Betsu bot," meaning "trash divider bot" in Japanese. Essentially, we struggled with how we could distinguish different types of bottles using sensors.



Figure 1: Initial sketch of robot

After extensive research on the different properties of different materials and contemplating how we could implement them into our design, Josiah came up with the idea using a light sensor to distinguish plastic, glass and aluminum based on their different reflective abilities. We began experimenting with different kinds of recyclable trash: glass bottles, plastic (PET) bottles and cans. After our initial experiments, we realized that sensing the reflection of light of any surface was risky; bottles could be wrapped with less or more reflective material, and cylindrical sides were harder to get an accurate reflection reading off of. We decided to only allow the bottom of the bottle to be sensed, and designed the chute to automatically orient the bottles accordingly. In this way, the surface that the light sensor contacts with will be consistent. If using this design in an actual home environment, it may include a large funnel over the mouth of the chute, for ease of throwing the trash in. Also, though the addition of the bright flashlight does help to regulate the light picked up by the light sensor, ideally there should be a cover over the machine, both for aesthetic purposes and to further improve the sensor's accuracy when placed in various different outside lightings.



Figure 2: Chute with flashlight and light sensor

After prototyping all of our functional parts, we built the frame around the device. We built the chute with three gates in total; right side, left side, and the bottom. A flashlight and light sensor are at the end of the chute, shielded from the recyclable by a strip of plexiglass, and the sonar is attached on the side to detect the presence of an object. The program can run entirely autonomously. When the sonar senses a bottle in the chute, it will turn on the flashlight and record the reflected value with the light sensor. Depending on the range the value falls in, the trash will be classified as one of the types of recyclables, then the corresponding gate opens, and the opposite gate pushes the bottle out of the chute and down a ramp. The bottom gate simply opens downward and lets the bottle drop into the bin below. The gates each required a single motor to be attached, along with potentiometers to ensure consistency in opening and closing. Ramps were attached on the side to smoothly roll the bottles to corresponding trash bin. The outside frame holds the entire device, which is hooked on top of a trash bin, with the ramps extending to two adjacent bins.



Figure 3: Final product

This device can be one of many ways to avoid further damage of our beautiful nature. In Japan, separation of garbage is taken very seriously, and metal, glass and plastic are collected on different days, for ease of recycling. This device will make these practices easier in Japan, as well as help implement such practices in other parts of the world with minimal effect on the citizens' lifestyle. Individuals can sort their recyclables within their own home without any more work than previously. This can be a great help to environmental movements—after all, the less people have to change in their own lives to bring change to their community, the more likely that change is to happen.