FINAL PROJECT DOCUMENTATION

1. Idea

This project came about due to a conflict that arose in my society between pet and non pet owning residents due to the problem of improper disposal of dog poop by dog walkers despite the availability of tools that could do so on the market.

After naturalistic observation of 12 dog walkers, i collected the following data:

	ON PHONE	PICKER	NO PICKER/GAR BAGE BAG	NOTHING
OWNER-4	1	3	1	0
HELP-8	5	2	2	4

2. Problem Statement

To sanitarily dispose of dog fecal matter left behind by dog walkers to promote an environment of coexistence between dogs and humans.

3. Constraints

i) There would have to be proper maintenance and cleaning of the vehicle to maintain a level of sanitation
ii) Users will have to be wary of the range of connection between the controller and the car.

4. Brainstorming

i) Dog Harness Alarm

This would be a mechanism placed on the dogs harness that would detect when the dog was about to defecate and alarm the walker via a buzzer placed on the leash.

ii) Phone App to Observe Surroundings

To create an app that observes the surroundings through the camera of the phone to check if the dog is defecating or not.(I observed that most dogwalkers were operating their phone while walking their dog)

iii) Poop Picking Vehicle

A poop picking vehicle similar to a RC car that automatically gathers poop twice a day
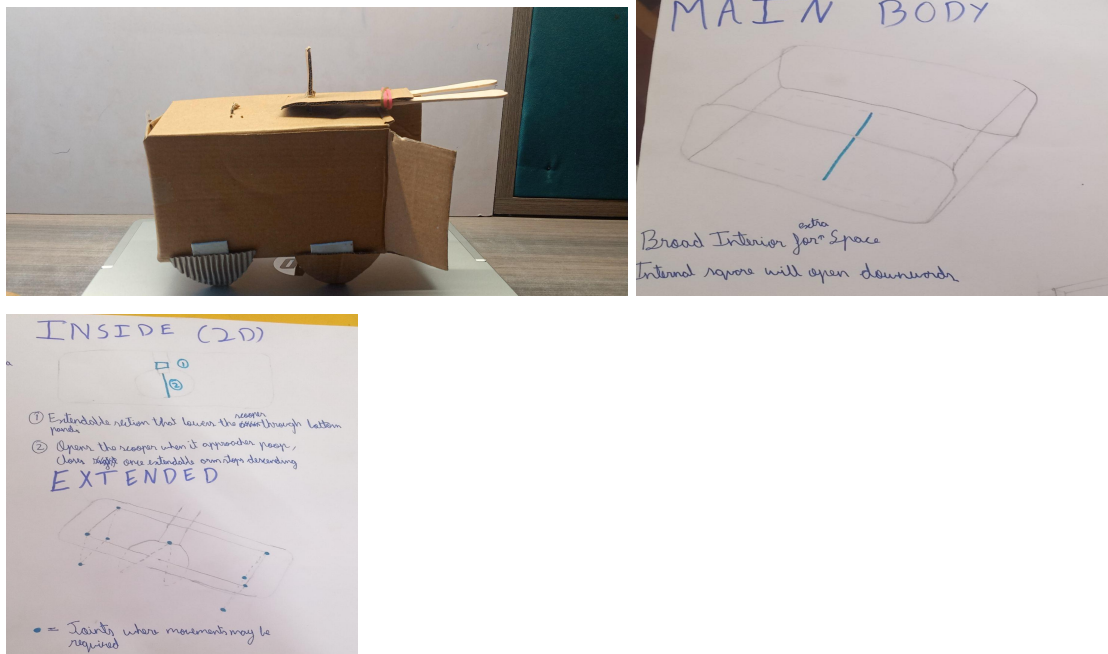
iv) Incentivization

To create an incentivization plan for dog walkers to dispose of their dog's poop.

5. Final Solution

The final solution that we decided to pursue was a remote controlled car that would be able to pick up the poop with a scooping/raking mechanism.

I started with 2 potential ideas for the design of the car. The first, a front opening car in which the front would descend to form a ramp and a raking mechanism placed on the top of the car would pull the poop into the car. The second idea consisted of a bottom opening car in which a segment of the bottom of the car would collapse and a grabber arm would descend to pick up the poop and pull it up into the car. After some sketching and prototyping, I decided to go ahead with the front opening design.

MAIN BODY

Broad Interior for extra Space
Internal square will open downwards

INSIDE (2D)

① Extendable section that lowers the scooper through bottom panels
② Opens the scooper when it approaches poop, Close once extendable arm/legs descending

EXTENDED

● = Joints where movements may be required

I started by designing the main hinged box that would be the main body of the car and tried to minimize the size of the box to increase mobility while maximizing the inner space to have a lot of volume.
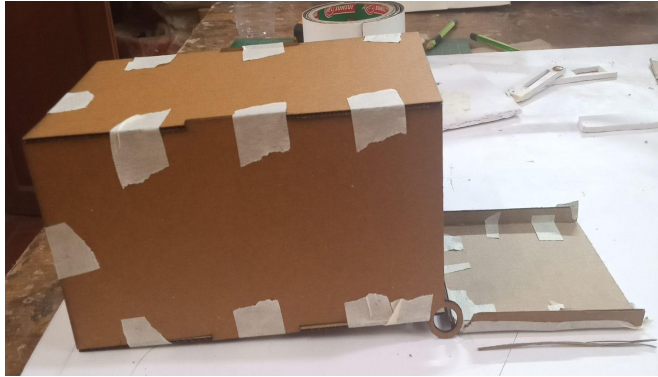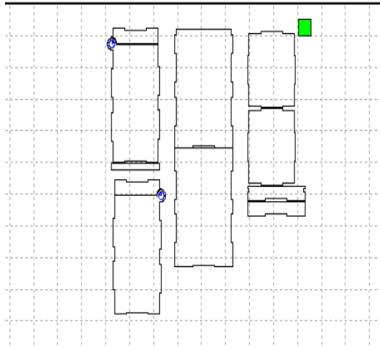
I then started designing the mechanism that would move the rake to pull the poop in. Since increasing the number of motors would increase the complexity of the project, I tried to use 1 motor to have both the linear and rotational motor, however, after trying to design a mechanism for this, I decided that 2 motors would be simpler to design and not that complex to create. I started with a sunboard prototype and after it worked, i designed the mechanism to be laser cut from plywood. The first iteration could achieve the 2 types of motion ,however, it was very jerky due to the weight so i decided to reduce the overall material on the rake by adding filets and holes wherever possible.
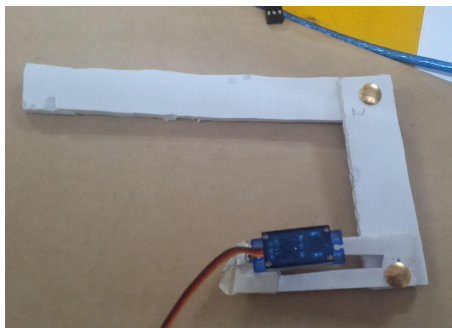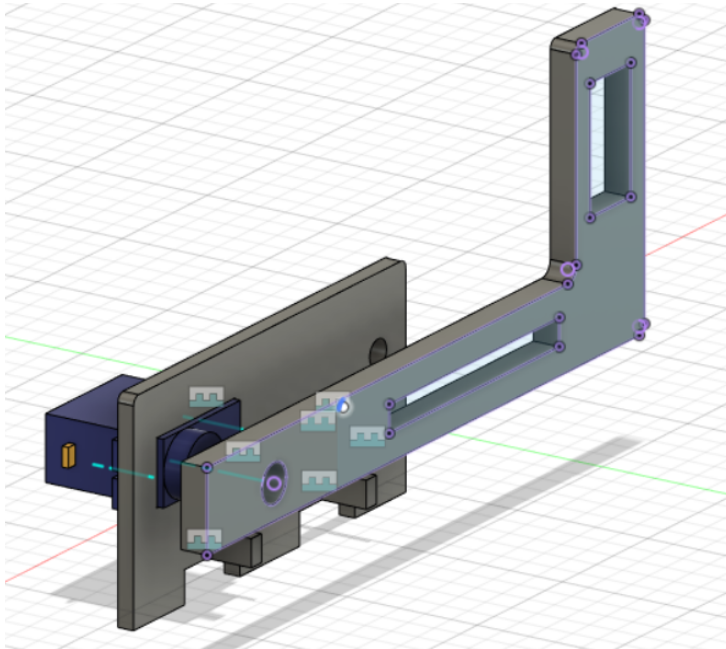
I then worked on programming the motors to work in sync with each other in the proper order. (Arduino code pictures)

```
vo linear_servo;
vo rotational_servo;

pos_up = 120;
pos_down = 40;
pos_forward = 180;
pos_backward = 0;

int init_pos_linear = 180;
int init_pos_rotational = 120;

id setup() {
linear_servo.attach(10);
rotational_servo.attach(9);
linear_servo.write(pos_backward);
rotational_servo.write(pos_up);
Serial.begin(9600);

id loop() {
forward();
down();
backward();
up();
delay(2000);

id backward() {
for (int i = pos_backward; i <= pos_forward; i++) {
linear_servo.write(i);
delay(20);
Serial.print("forward ");
Serial.println(i);
}
}

void forward() {
for (int i = pos_forward; i >= pos_backward; i--) {
linear_servo.write(i);
delay(20);
Serial.print("backward ");
Serial.println(i);
}
}

void down() {
for (int i = pos_up; i >= pos_down; i--) {
rotational_servo.write(i);
delay(20);
Serial.print("down ");
Serial.println(i);
```

Skills Applied

CAD | Electronics | Design Thinking | Programming | Prototyping | Laser cutting