SASTA OLIPHANT SCIENCE AWARDS

Prize Winner

Programming, Apps & Robotics

Year R-2

Luke Newell

Concordia College - St Peters Campus

The Irrigation Bot – Luke Newell

Programming, Apps & Robotics 2025

Aim and scientific purpose

The aim of the entry is to create a simple robot that can assist with the maintenance of plants in an automated way. In this case, by detecting soil moisture. In Luke's own words "it would be great if the plants could be watered automatically, when they need water." The Irrigation Bot will provide a practical solution for ensuring both an economical and environmentally friendly usage of water.

The scientific purpose of the Irrigation Bot is to contribute practical solutions to everyday gardening, particularly in environments that are considered dry or arid and where there is often little rain such as Adelaide. The Irrigation Bot has added purpose and potential to solve the real-world problem of helping a finite water supply last during times of drought and contributing to a lengthier availability of food source for communities.

Potential applications

The Irrigation Bot has wide ranging potential application. It could be used in everyday backyards and community gardens to enable cost effective use of water and ultimately cut the cost of everyday living expenses. It could also be used more broadly in mass production of edible plant life and next-generation farming. A third application could be in growth and maintenance of food source in future colonisation of space and planets.

Type of robot/computer/device to run the program

Luke's Irrigation Bot has been created using Arduino for circuit boards and interface, with code written in C++

Instructions on how to use the Irrigation Bot

Step1: Ensure the water reservoir (water bottle) is close to full. If empty, unscrew the cap and fill with water then screw cap back on

Step 2: Ensure the Irrigation Bots right “arm” (sensor arm) is raised

Step 3: Ensure the Irrigation Bots left “arm” (water pipe arm) is raised

Step 4: Use the red turn dial anticlockwise to gently lower the right arm into soil

Step 5: Use the blue turn dial to gently lower the right arm into the same soil/plant pot

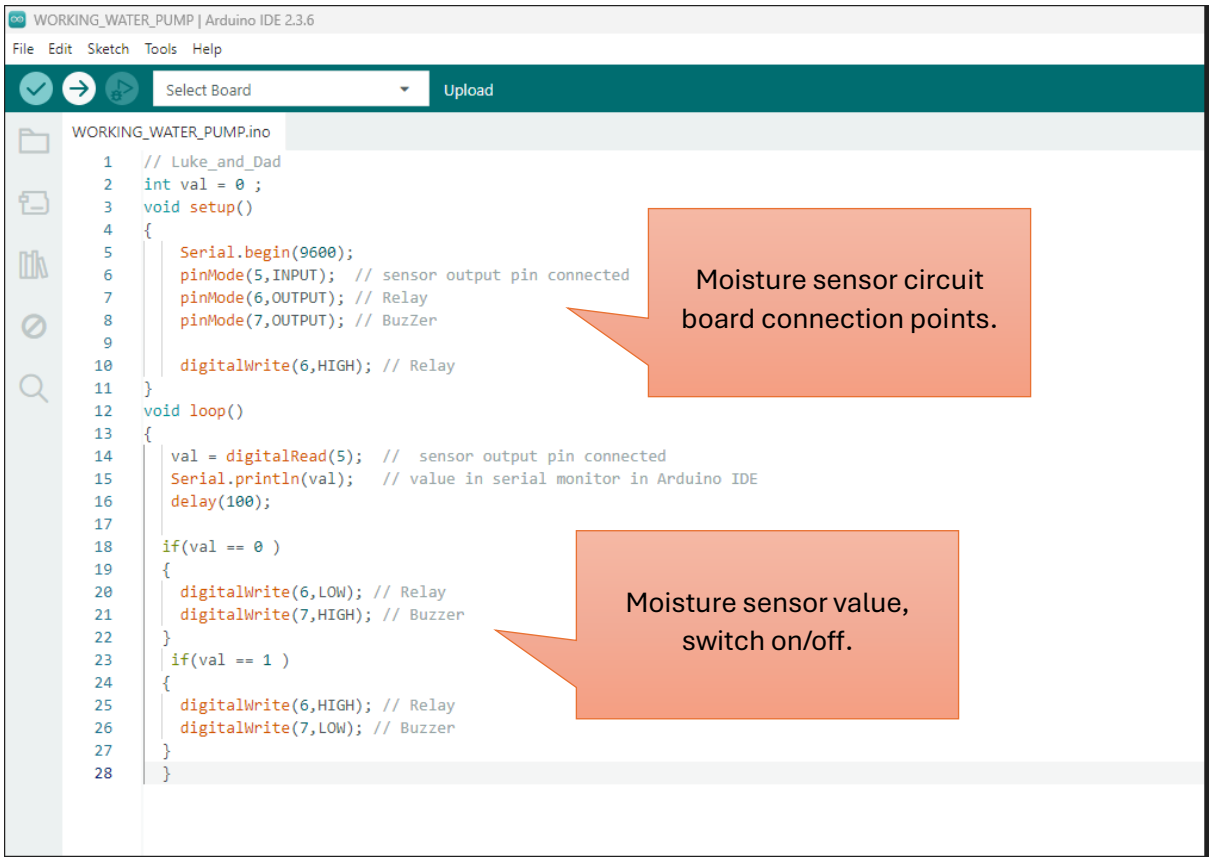
Step 6: Activate the sensor by turning the on/off switch (on top of the robot) from off to on position

Step 7: When the sensor detects the soil is moist enough, the water pump will automatically turn off

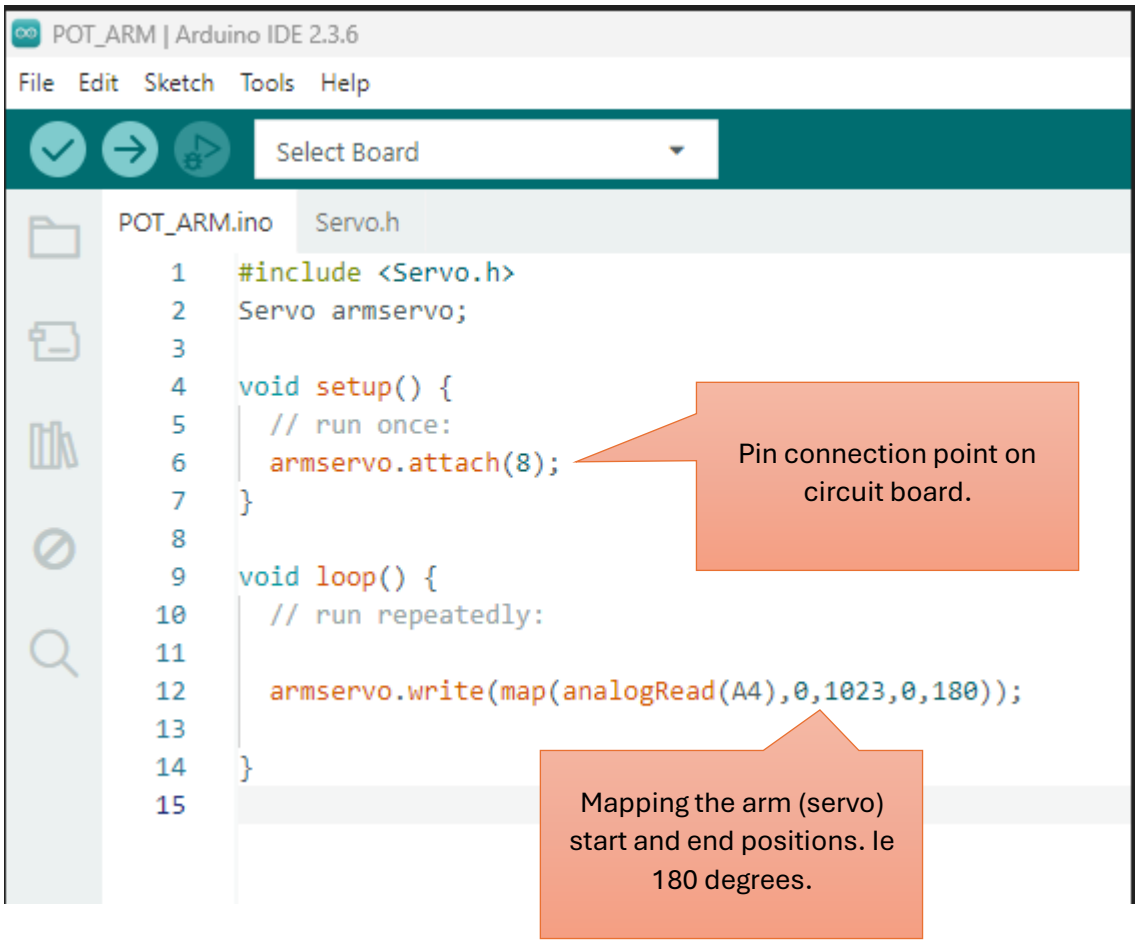
Step 8: Once the pump has turned off, switch the sensor to off, and gently raise the sensor arm out of the soil.

A copy of the program and explanation of what the sections do

Robot Sensor and Pump Code:



Robot Arm code:



<u>Acknowledgement of external support</u>

The Irrigation Bot project was Luke's idea. Luke wanted to "have a go" at entering the Oliphant Science Awards for this year, which he found out about during a school assembly. Luke's idea comes from his passion for all things STEM, and a love of gardening and the environment (one of Luke's favourite shows is Gardening Australia Junior).

Luke was involved in the design of the project, picking the materials, testing, wiring, making the arms and adding the wheels (please refer to the attached PowerPoint slideshow for photos and YouTube videos of Luke and his dad testing etc).

Luke's dad (Ty) was responsible for the overall technical design concept and actual programming, and physical creation of the mechanics (eg; how to get the programming and mechanics to make the robot work)
Luke's mum (Penny) wrote the report. Luke has provided some diagrams and a written page on his involvement (please see attached PowerPoint document).

Video Links

1.Making the pump with moisture sensor switch *(page 4 of PowerPoint)*

https://www.youtube.com/watch?v=nIZRapirZLM

2.Wiring the circuit for robot arms *(page 6 of PowerPoint)*

https://www.youtube.com/watch?v=b8JzRsOco10

3.Typing code for servo *(page 7 of PowerPoint)*

https://www.youtube.com/watch?v=gBz8rP1rfas

4.Testing the Servo *(page 8 of PowerPoint)*

https://www.youtube.com/watch?v=MVr-QdW669Y

5.Robot servo arm test *(page 10 of PowerPoint)*

https://www.youtube.com/watch?v=3HvhG8_8Ewc

6.Robot wheels *(page 12 of PowerPoint)*

https://www.youtube.com/watch?v=HWEIa0G3-Bc

7.Robot Irrigation test walk through *(page 14 of PowerPoint)*

https://www.youtube.com/watch?v=AHmTspX2kOY

8.The Irrigation Robot test *(page 15 of PowerPoint)*

https://www.youtube.com/watch?v=45gQViRWbqg

Bibliography

Collins, Marybeth. " How AI, Automation & Renewable Energy Are Reshaping the Future of Farming." *E+ELeader*, 3 June 2025, www.environmentenergyleader.com/stories/how-ai-automation-and-renewable-energy-are-reshaping-the-future-of-farming,64168

EAZYTRONIC. (2024). *How to make Automatic Plant Watering System using Arduino UNO and Soil Sensor|Arduino Project* [Video]. YouTube. https://www.youtube.com/watch?v=ciD3ILxgXzU

University of Copenhagen. "Robot helps optimize plants' use of water and nutrients." *University of Copenhagen*, 25 August 2015, https://stateofgreen.com/en/solutions/robot-helps-optimize-plants-use-of-water-and-nutrients/

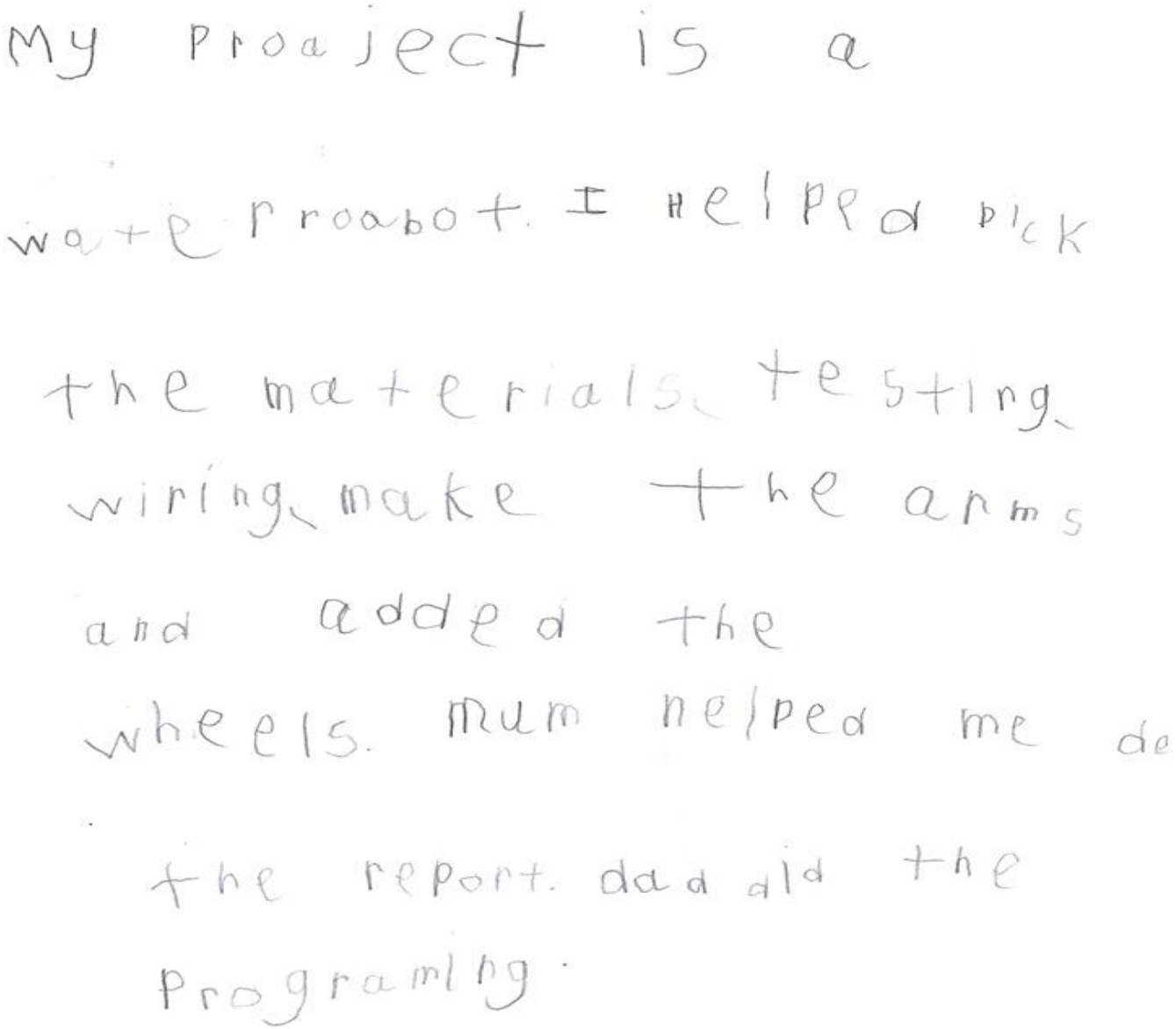
The Irrigation Robot

A project by Luke Newell

About the project

The aim and scientific purpose:
To create a simple robot to assist with economical plant maintenance for sustainable water and food supply

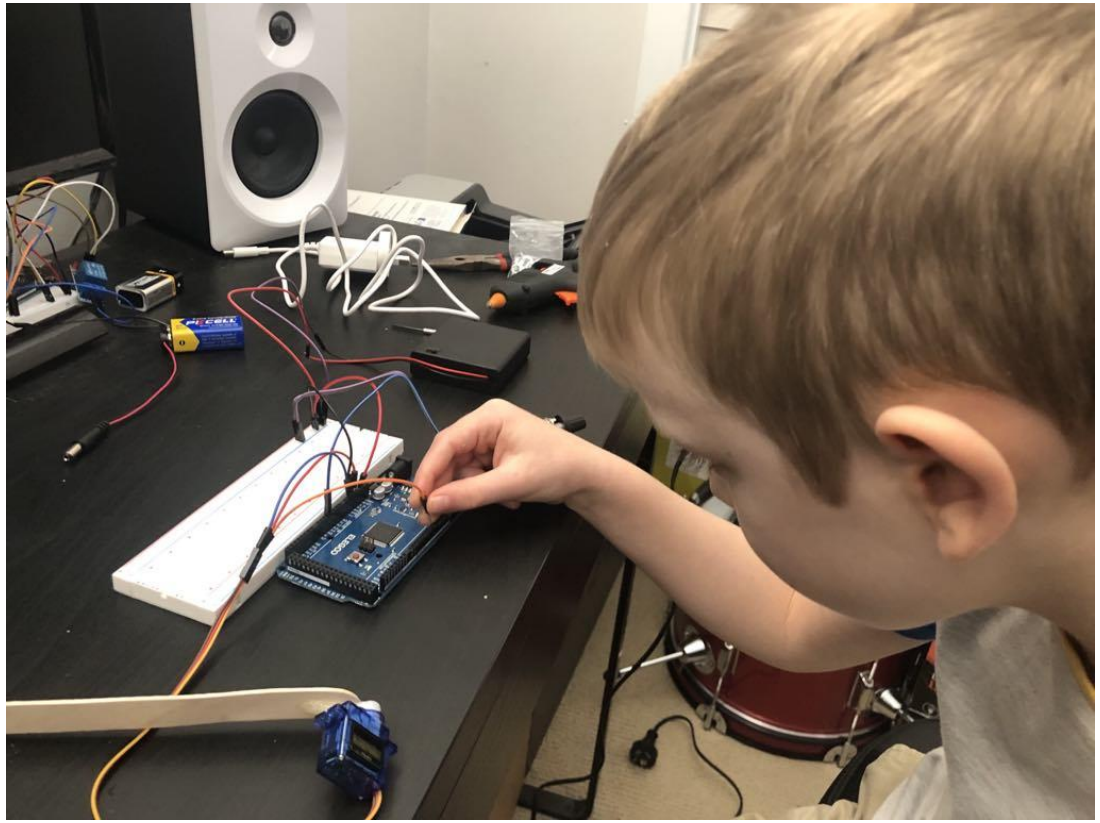
- Luke's words

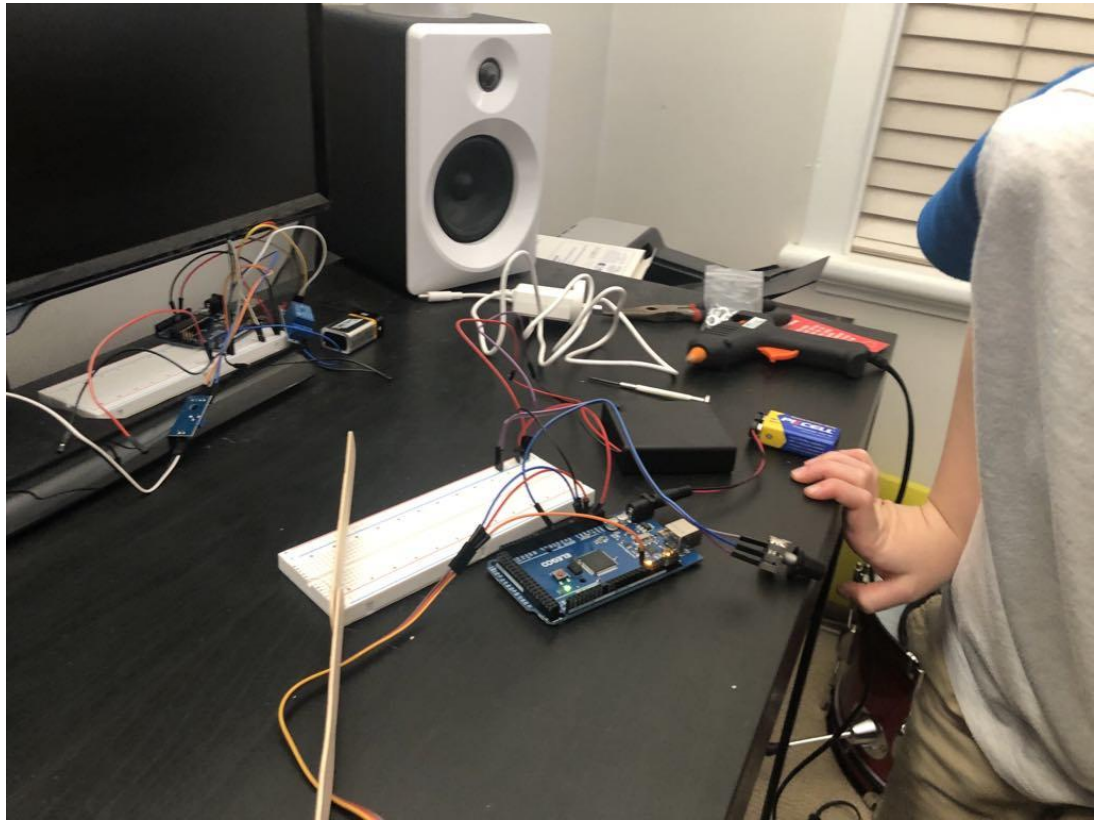


Making the pump with moisture sensor switch

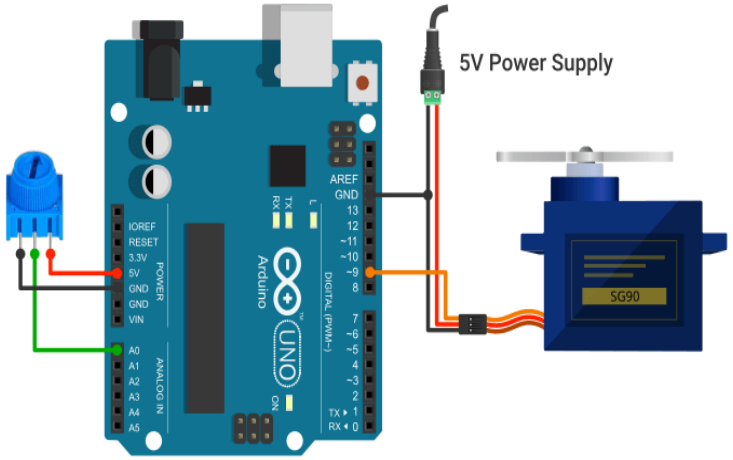
Making the pump with moisture sensor switch

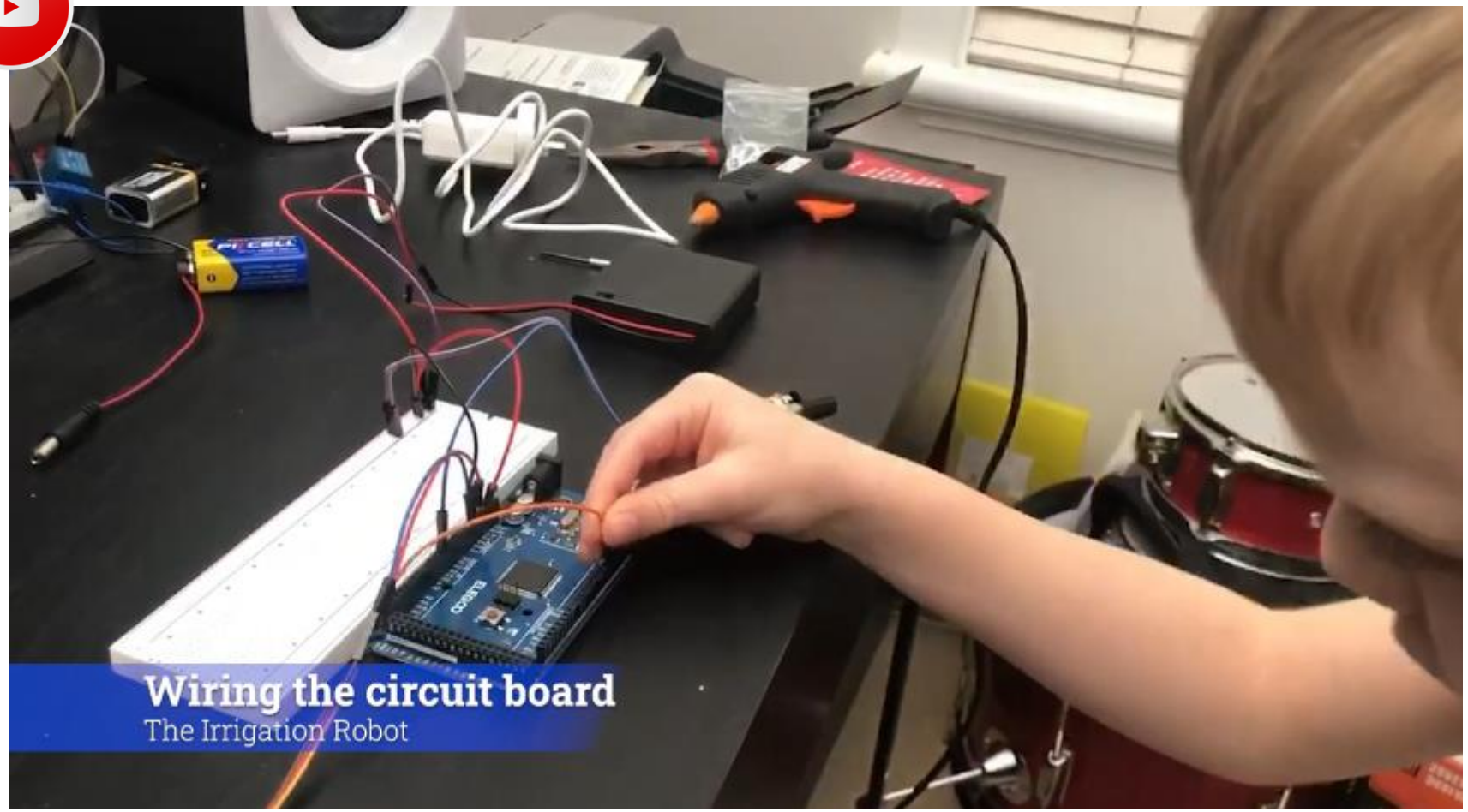
Wiring the Robot arms

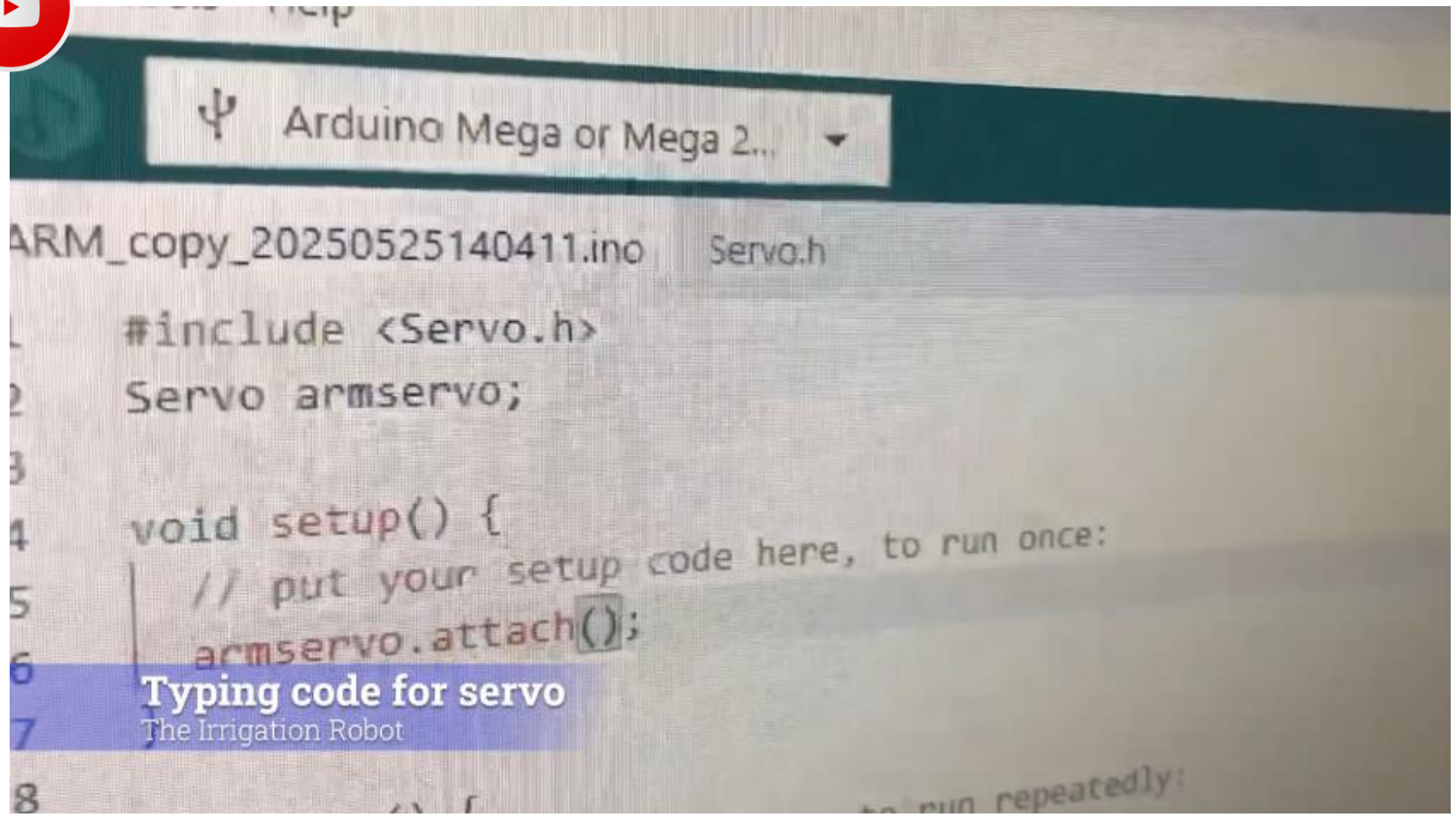




Wiring the Robot arms

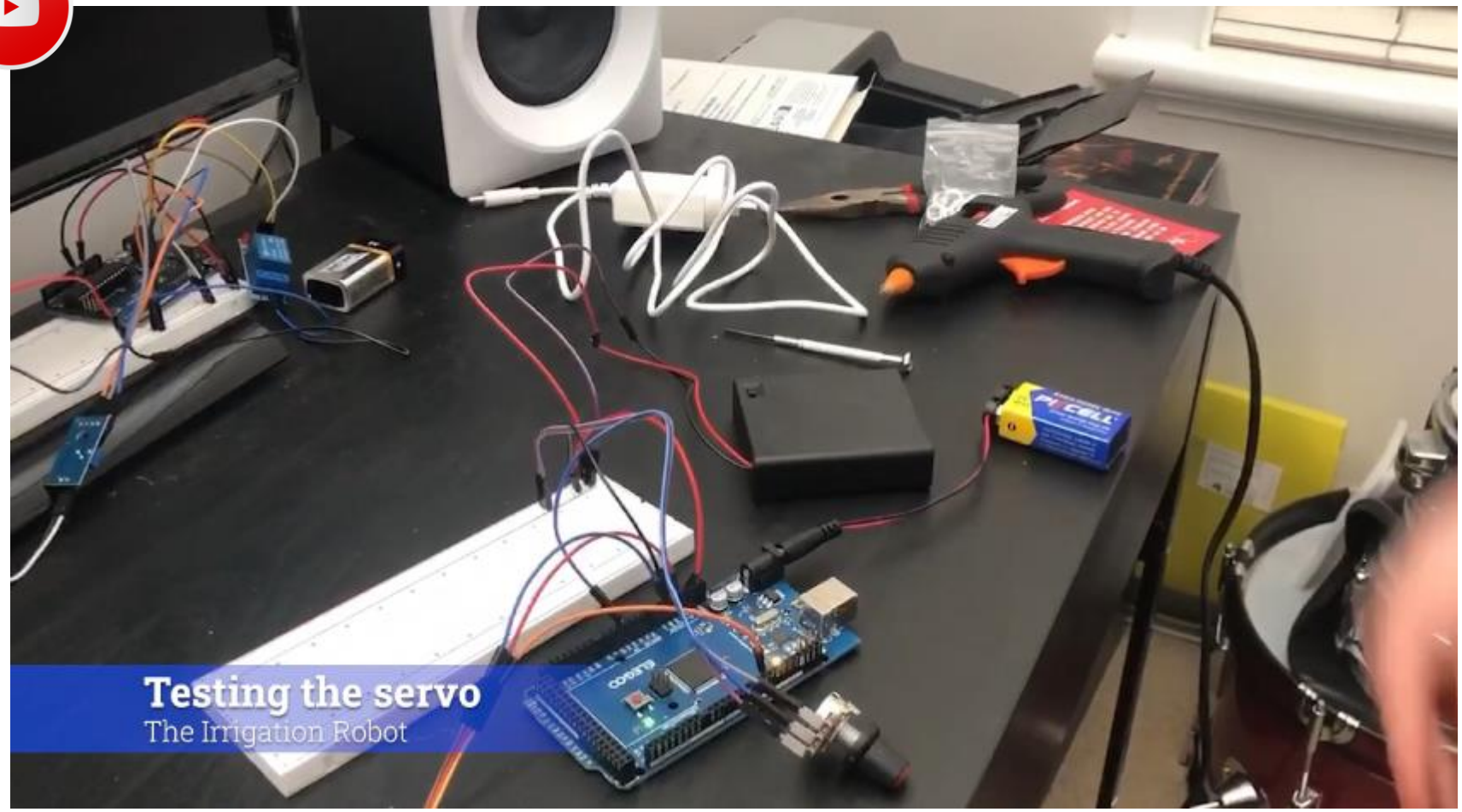




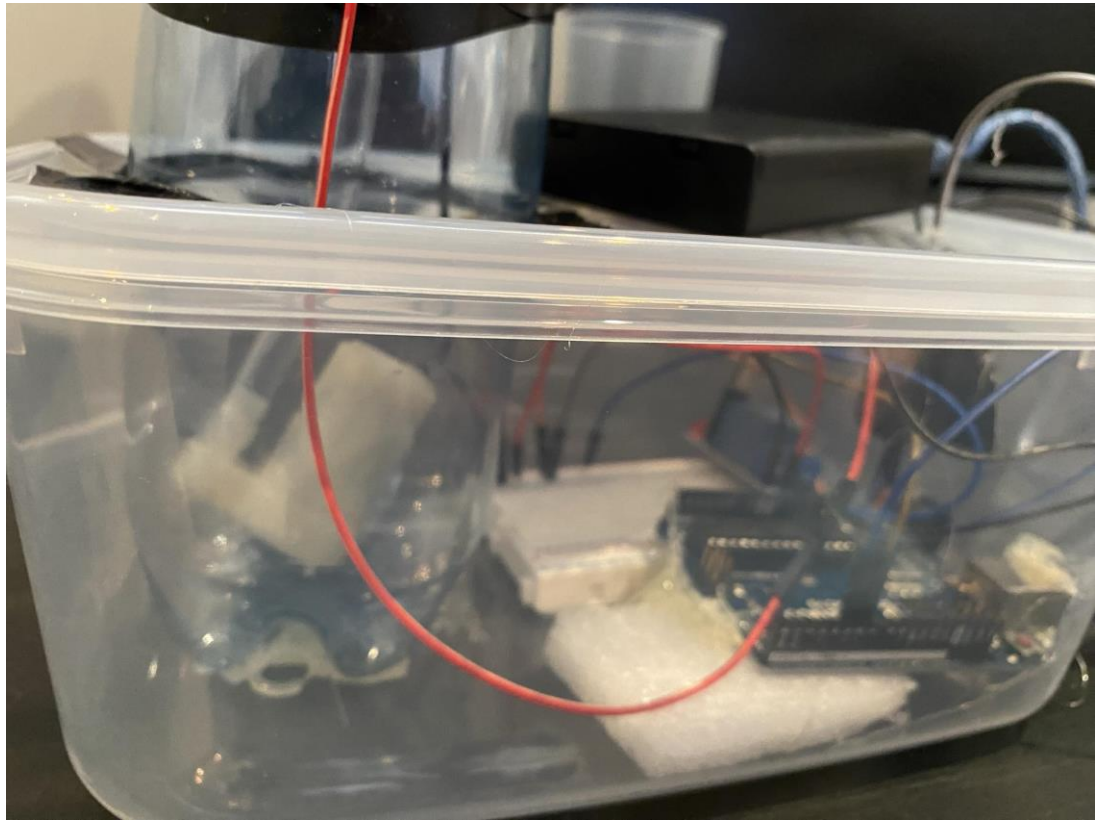

Arduino Mega or Mega 2...
ARM_copy_20250525140411.ino
Servo.h
#include <Servo.h>
Servo armservo;
void setup() {
// put your setup code here, to run once:
armservo.attach();
Typing code for servo
The Irrigation Robot

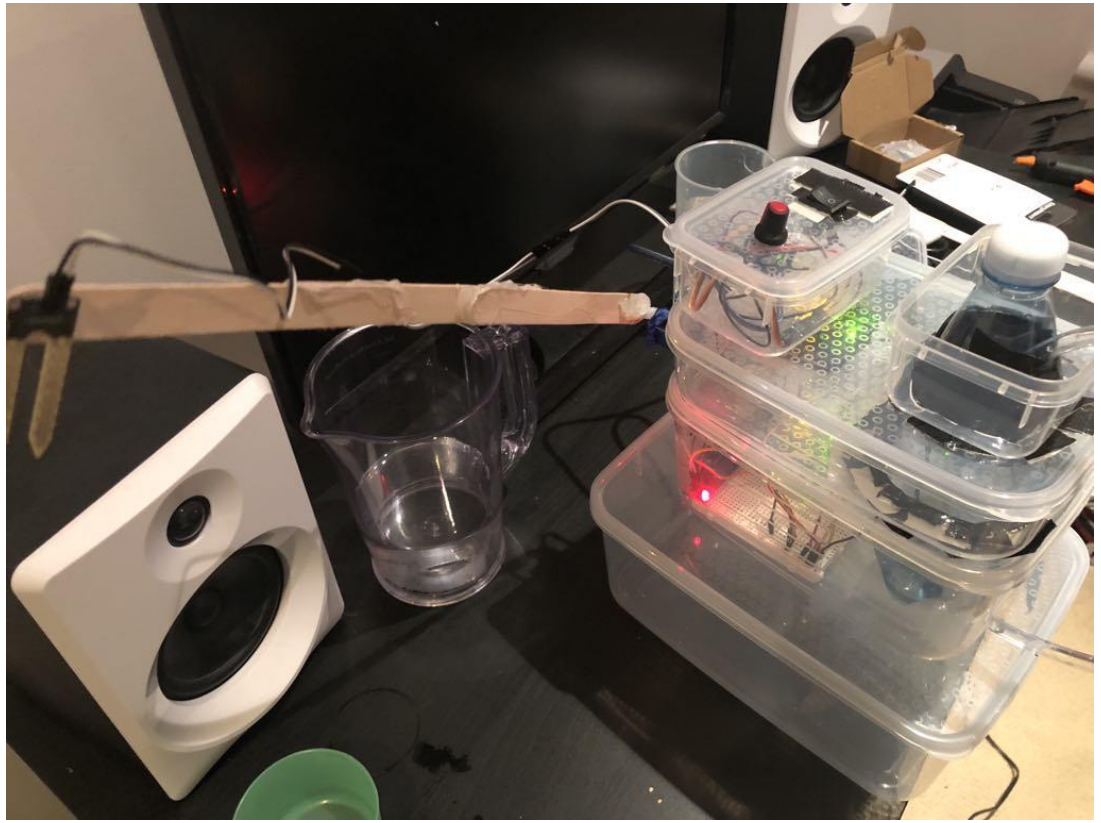
Coding

Testing the servo



Making the Robot arms





Making the Robot arms

Painting, adding the wheels & eyes

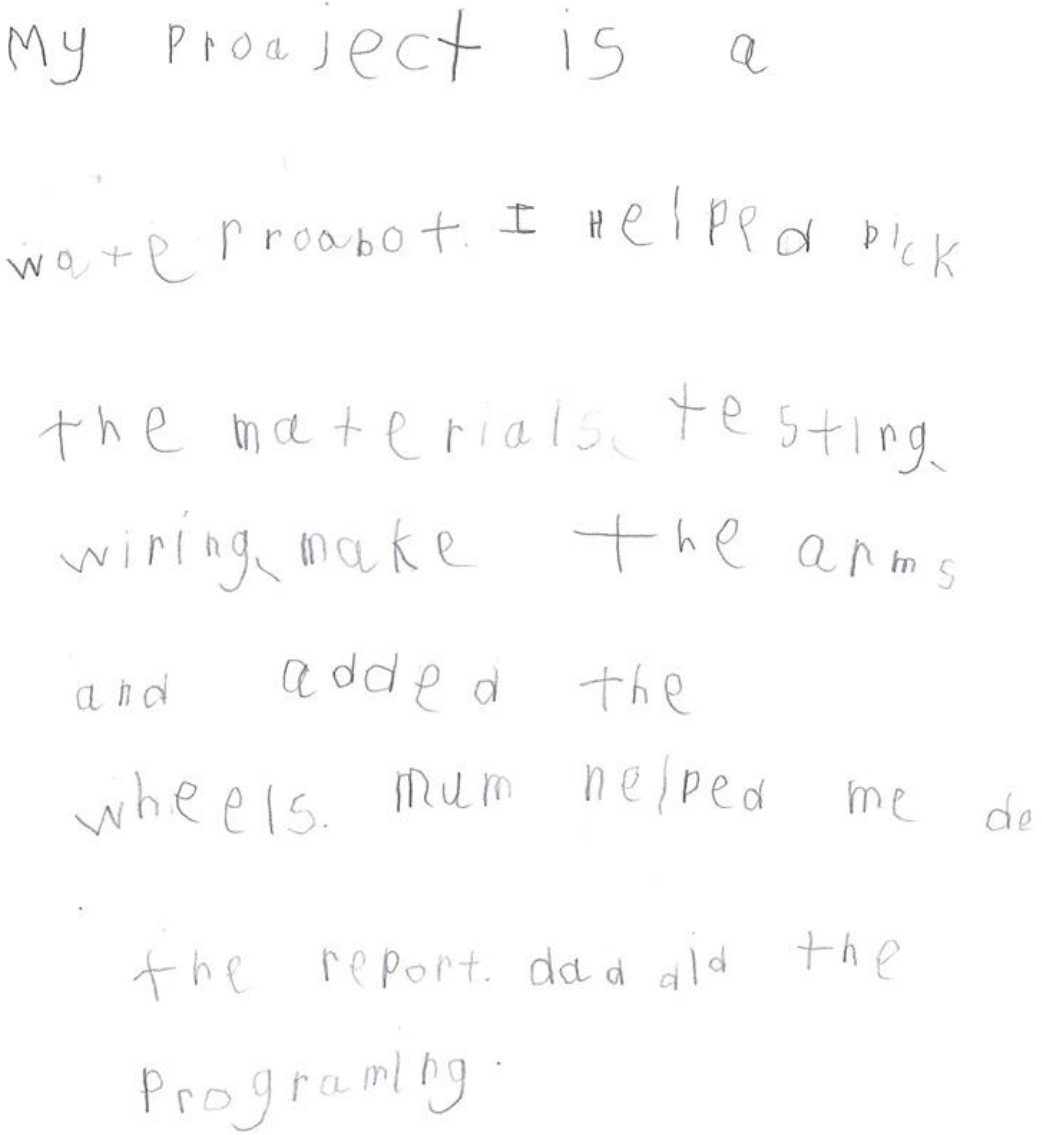
Painting, adding the wheels & eyes

Testing the Irrigation Robot

Testing The Irrigation Robot

Testing the Irrigation Robot

Synopsis



- Issues we faced = power for servo
- Future state: solar, remote controlled via phone app