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Introduction to Electronics

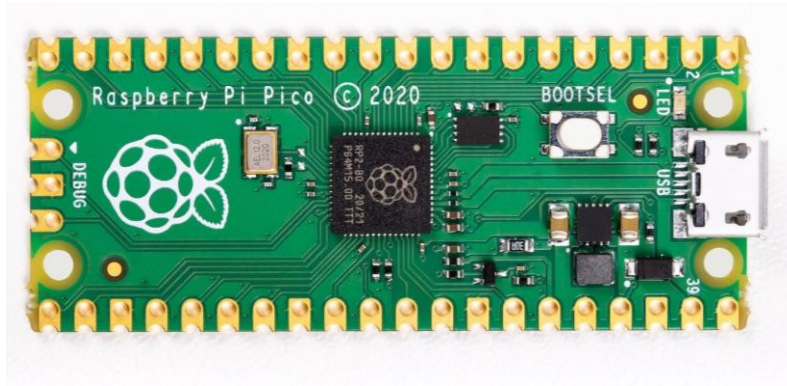


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Electronic Prototyping Boards



Microbit

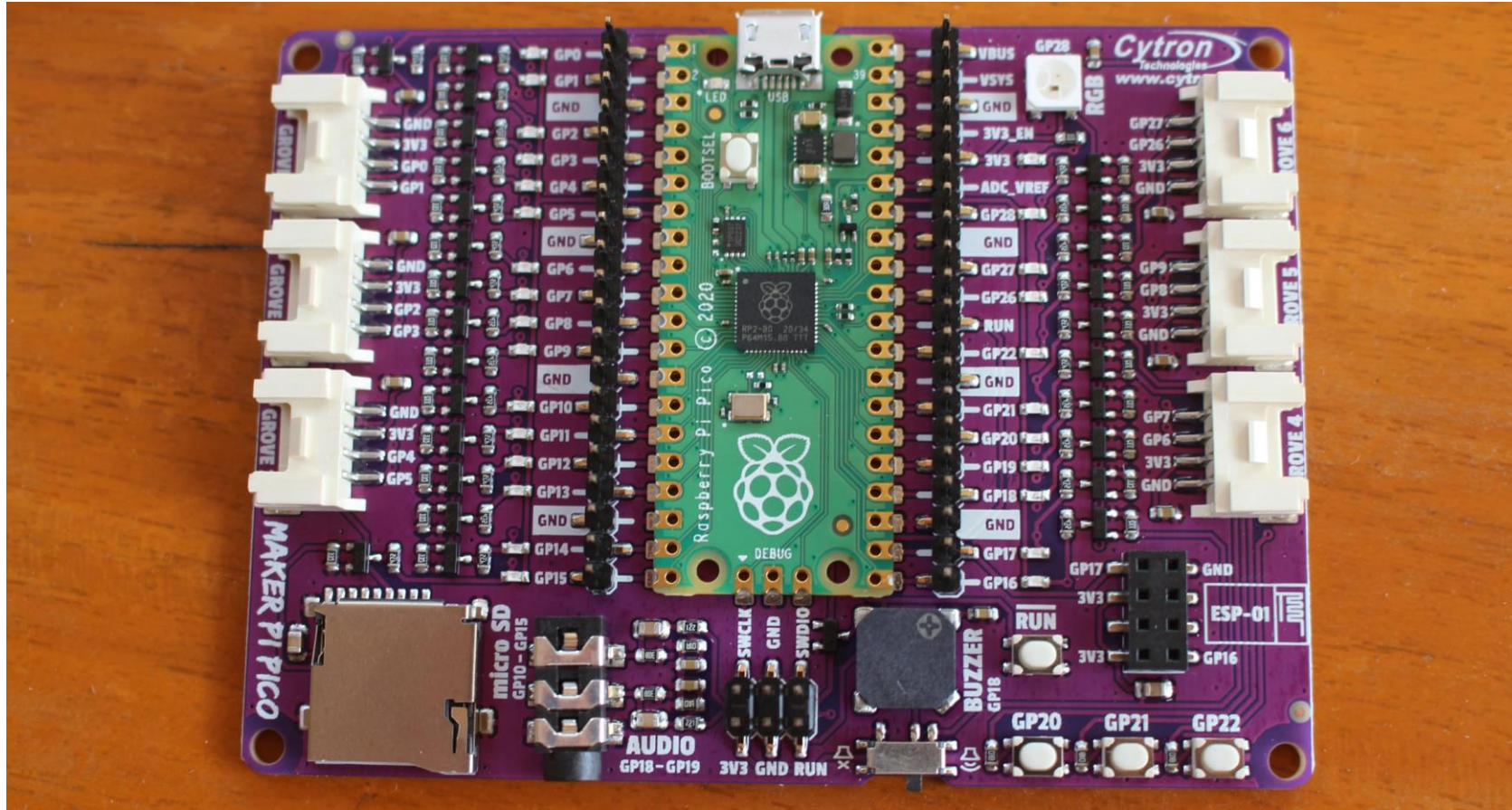


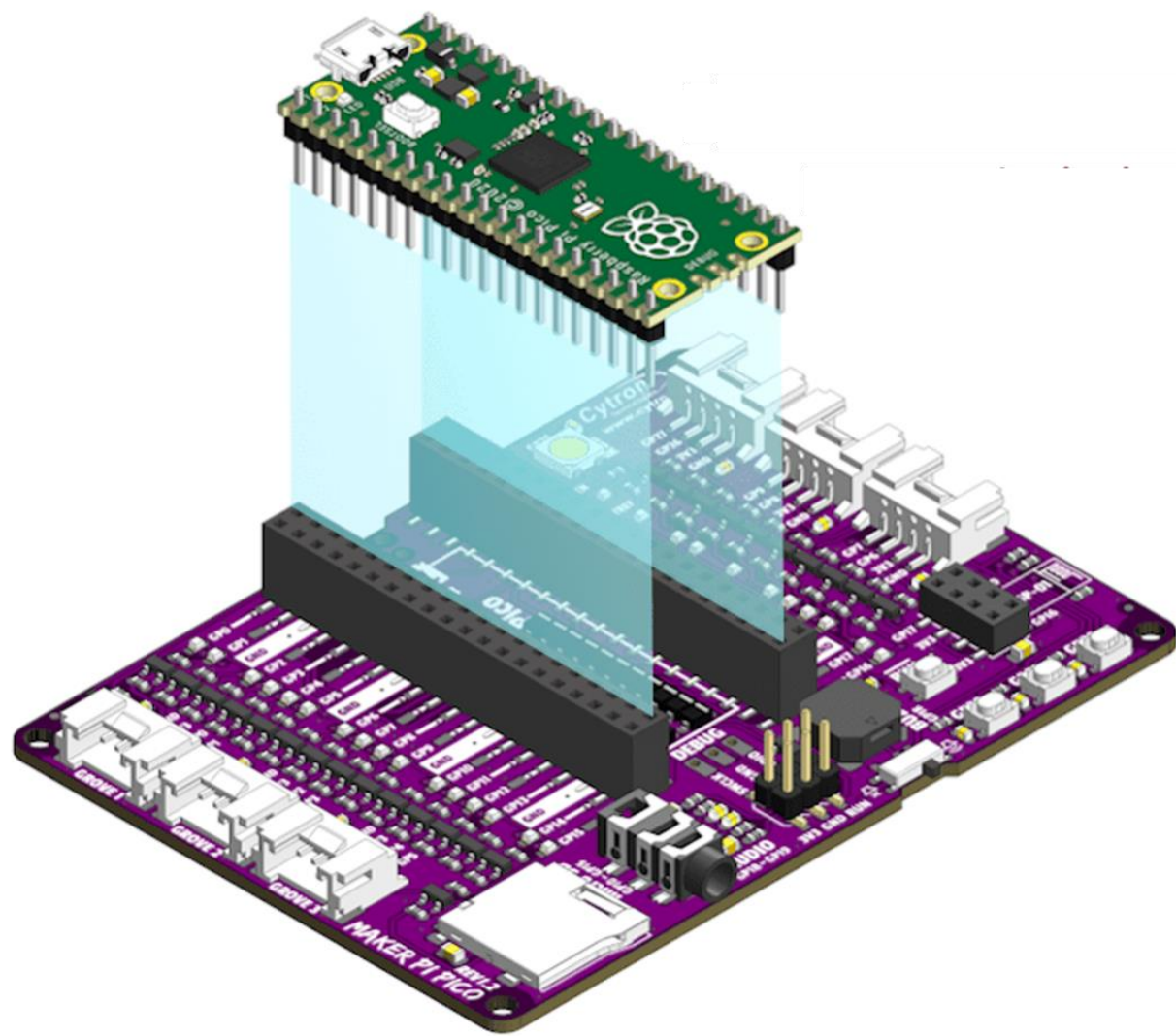
Pico



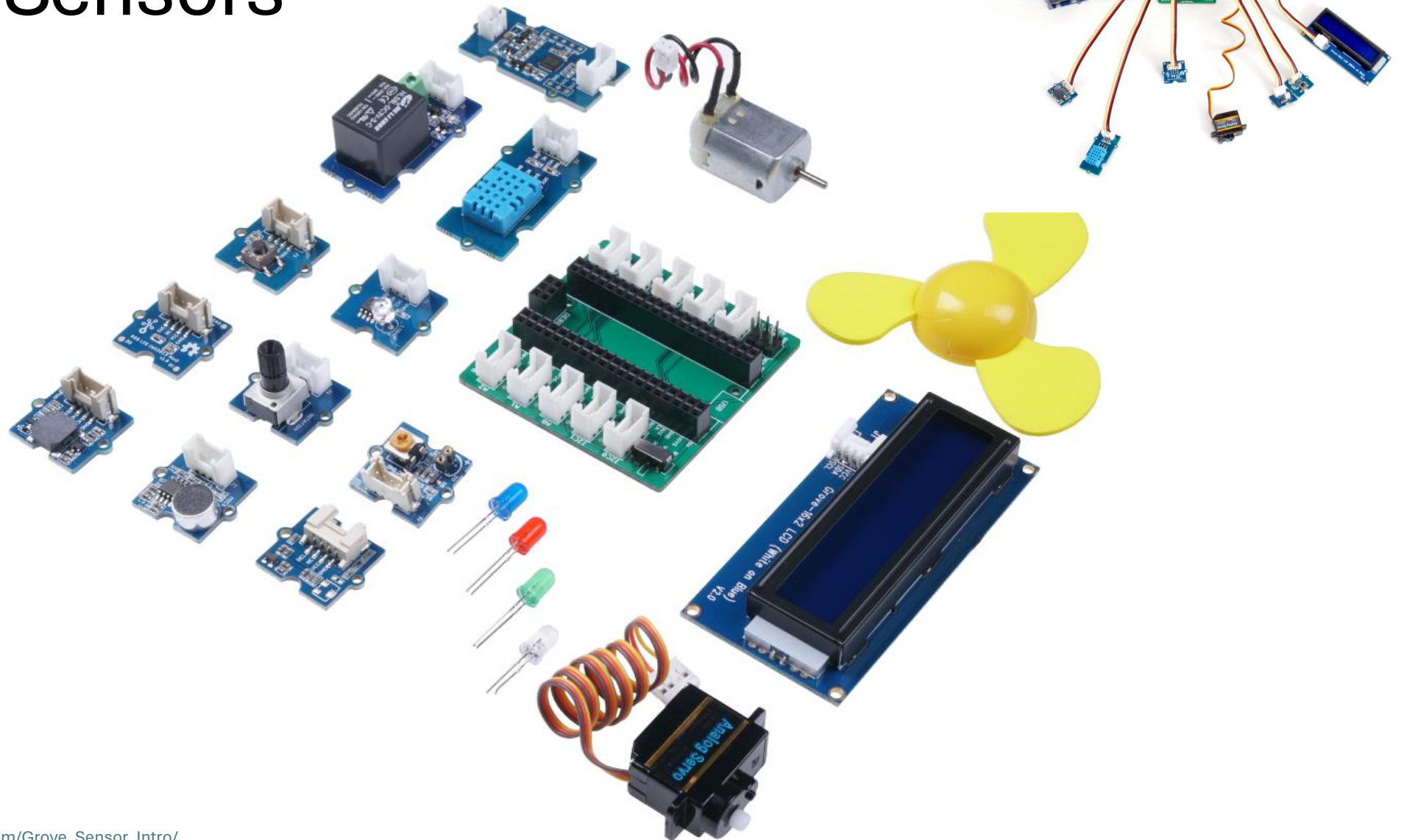
Arduino

Make Pi Pico Board by Cytron



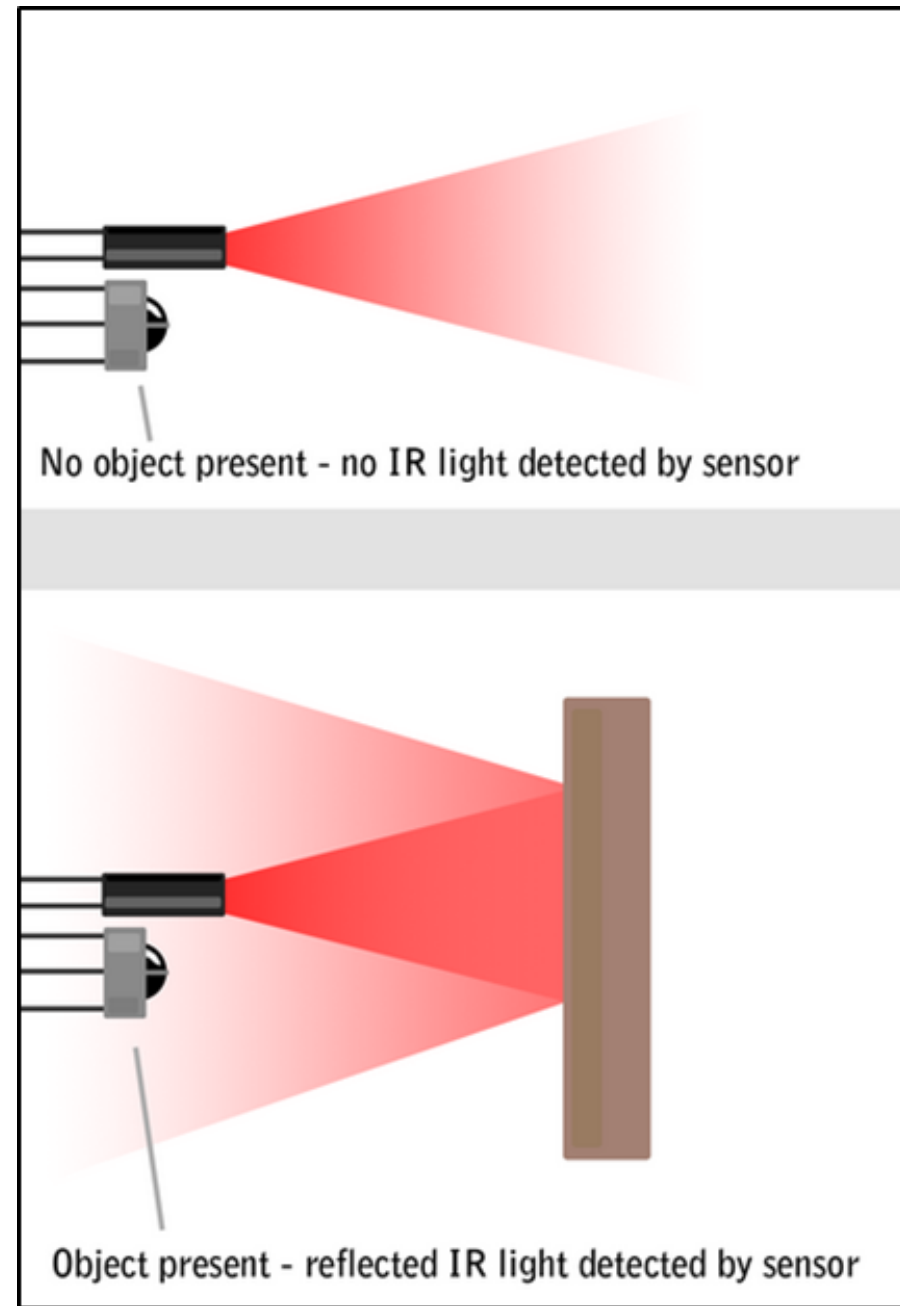


Grove Sensors

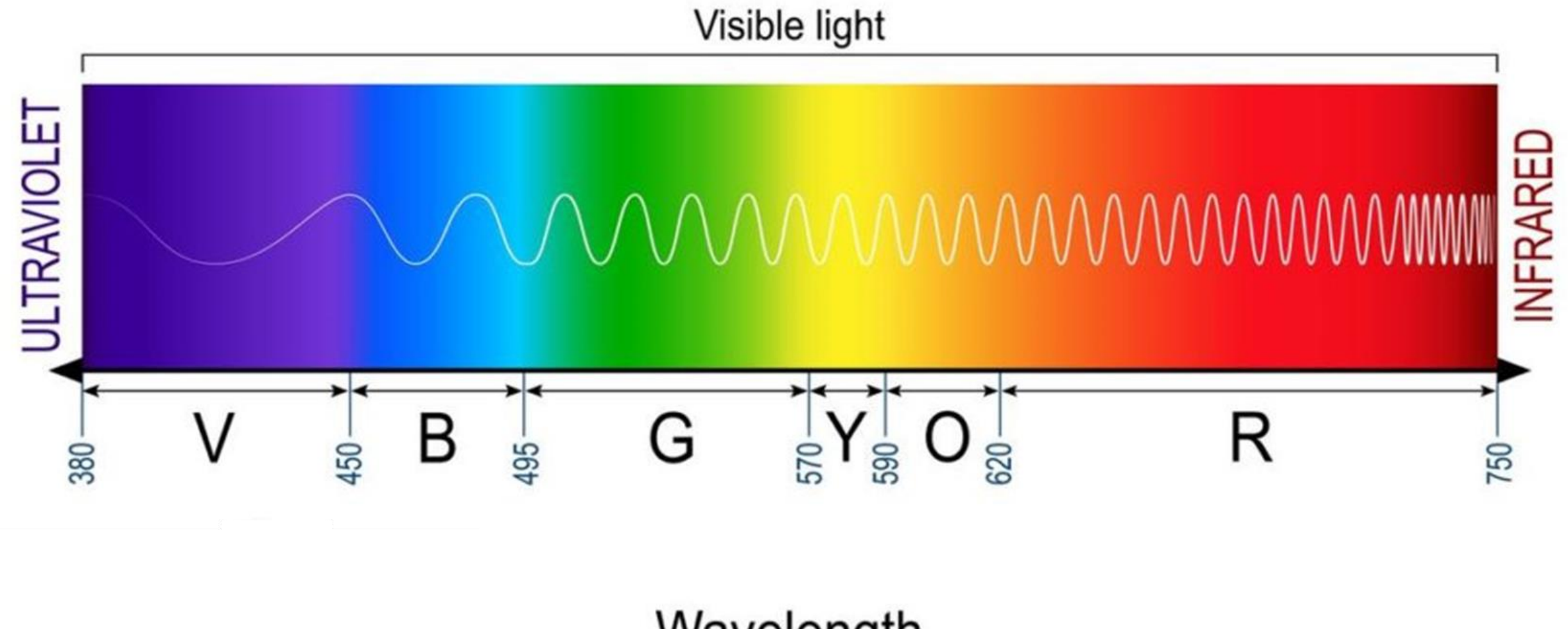


- https://wiki.seeedstudio.com/Grove_Sensor_Intro/

Infrared Sensor



Just Outside the Visible Spectrum



Animals that can see Infrared



1. SALMON



2. PIT VIPER



3. GOLDFISH



4. FOX



5. MOSQUITO



6. VAMPIRE BAT

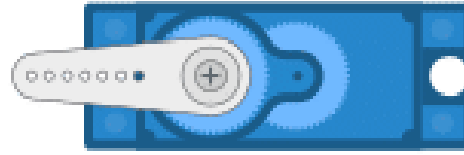


7. WOLF

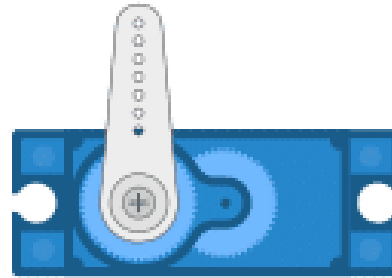


8. BULLFROG

Servos



0 degrees



90 degrees



180 degrees



Robots



Rc cars & boats



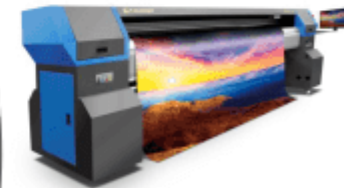
Drones



Packaging Machine



Cutting Machine

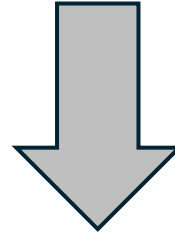


Printing Machine

3 Things Infrared Sensors are good for...

- Stopping robots colliding
- Counting objects on a conveyor belt
- Detecting the presence of intruders.

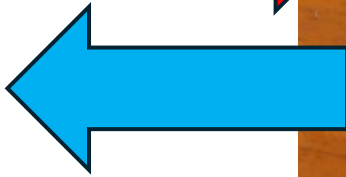
Our Project Today



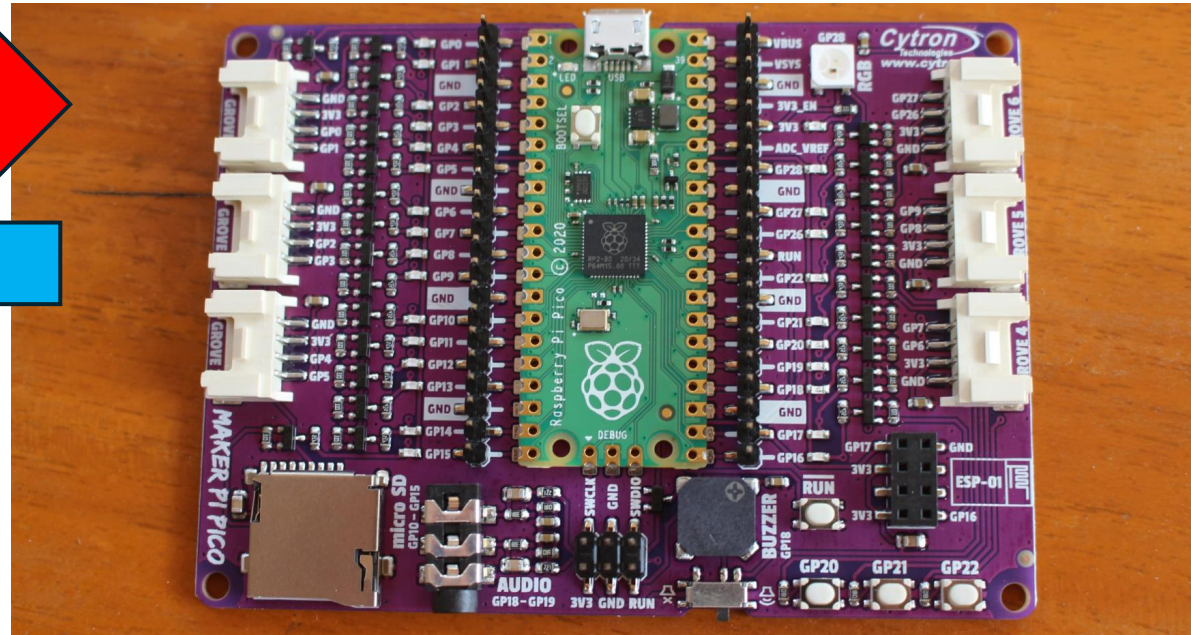
POWER
PC



INPUT



OUTPUT





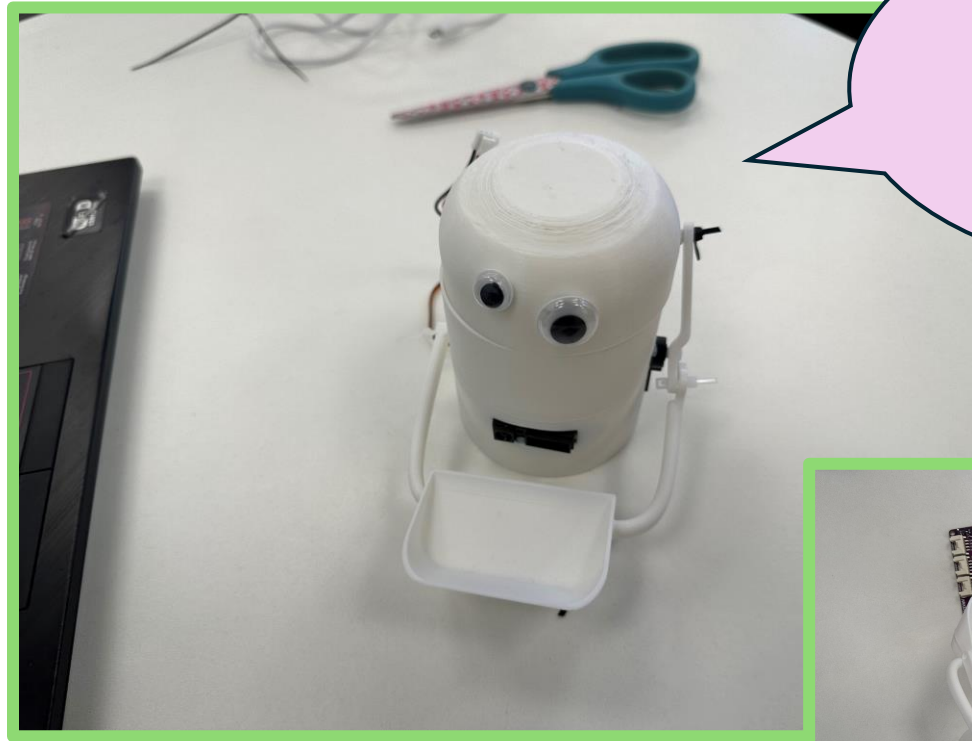
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Build a Simple Robot

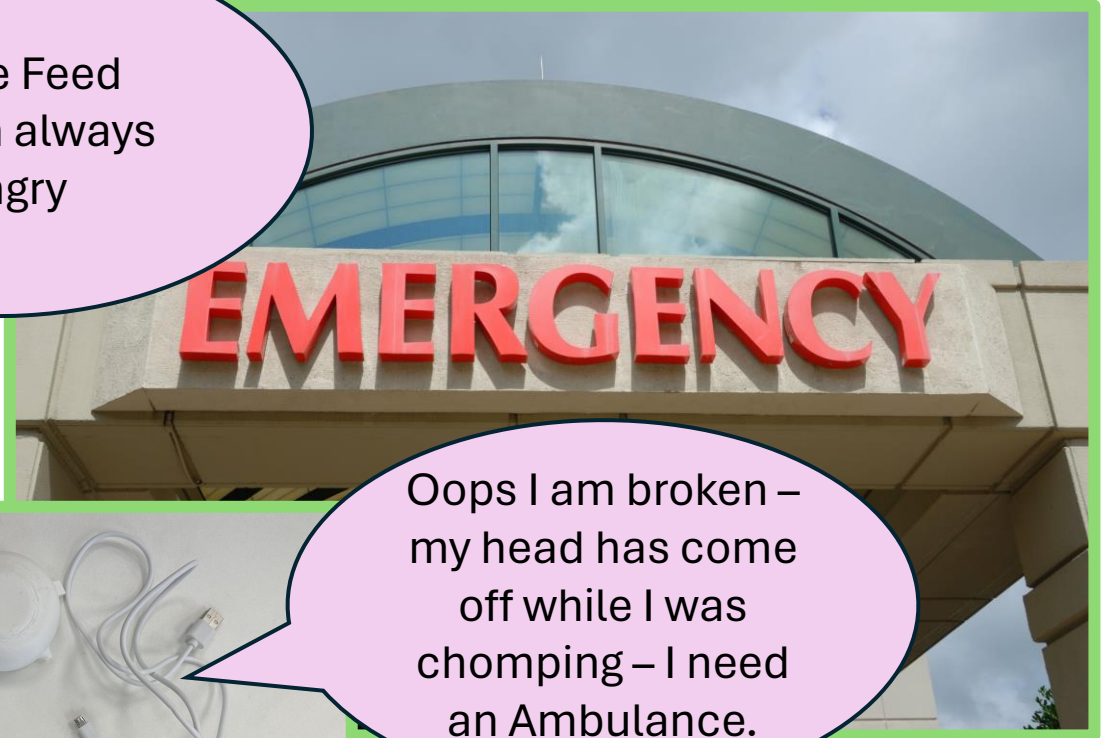


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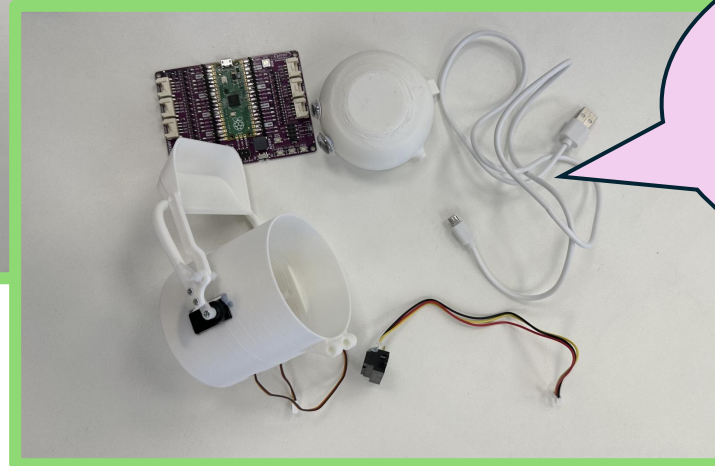
Oh Dear, The Hungry Robot needs a Hospital Can you Fix Him?



Please Feed
Me...I'm always
hungry

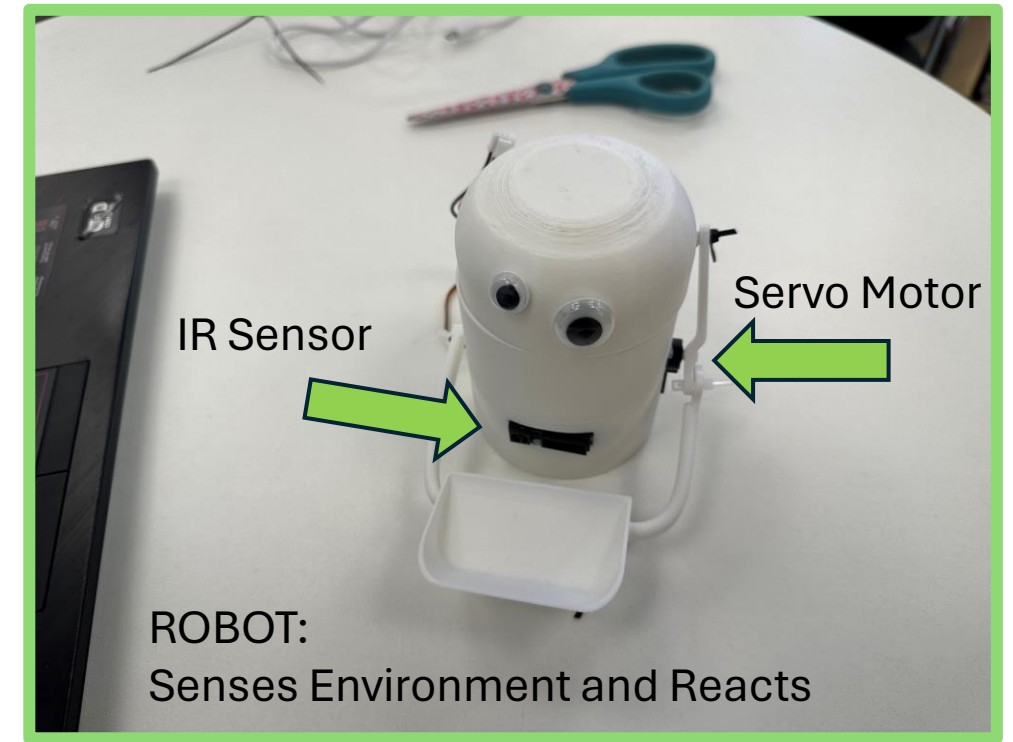


Oops I am broken –
my head has come
off while I was
chomping – I need
an Ambulance.

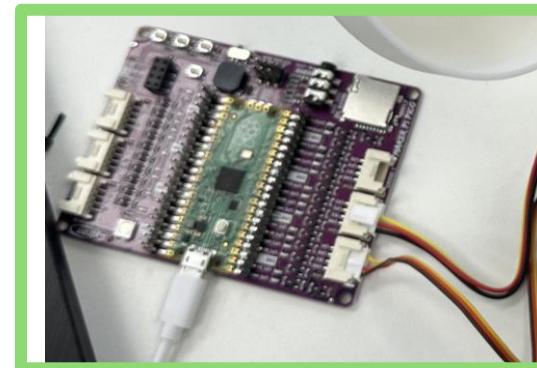


Demo of Hungry Robot

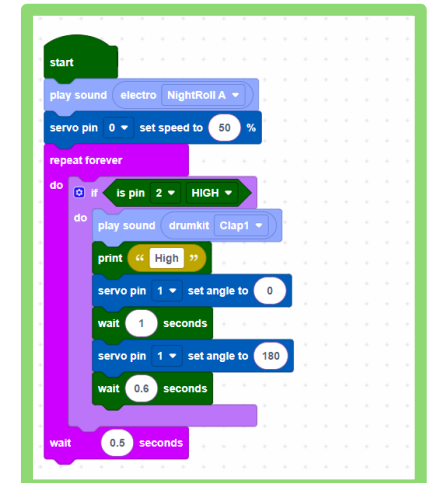
1. **Robot Body with**
 - a. **IR Sensor** to Detect Object
 - b. **Servo Motor** that Moves when Object Detected
2. **Software Program** provides instructions on what to do when object detected – that is move the servo motor
3. **Electronics Board** has the brains to understand the instructions and connects to the Sensor and Servo Motor



HARDWARE:
Pico Electronics Board

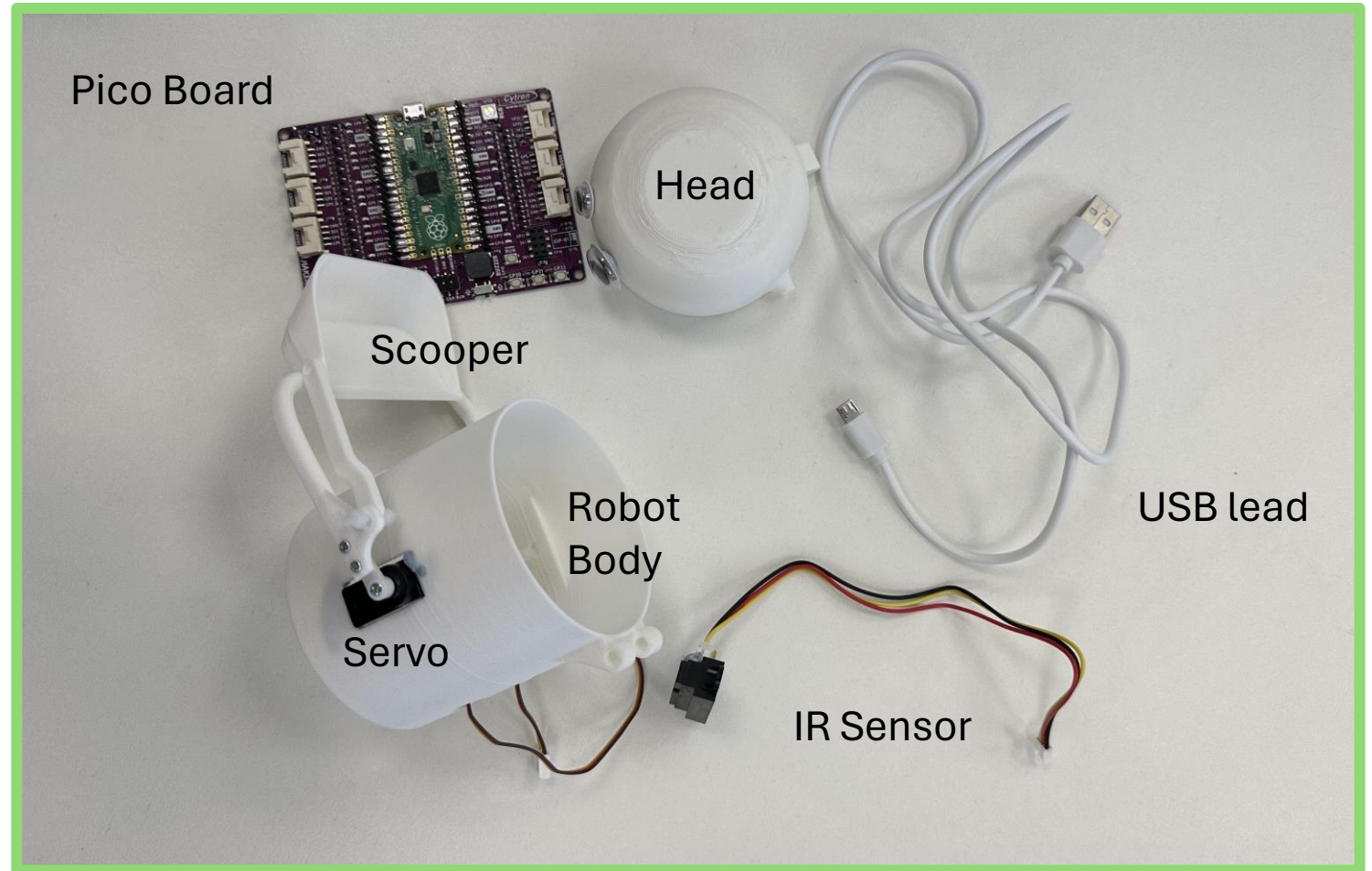


SOFTWARE:
Instructions



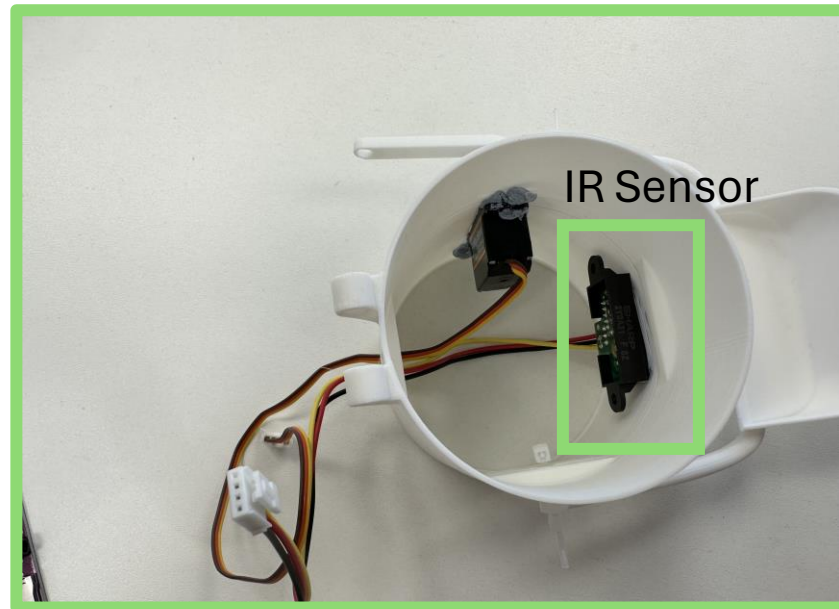
Robot Doctor Engineer Challenge

Can you
mend the
broken
robot?
Have you
the patience
and making
skills?



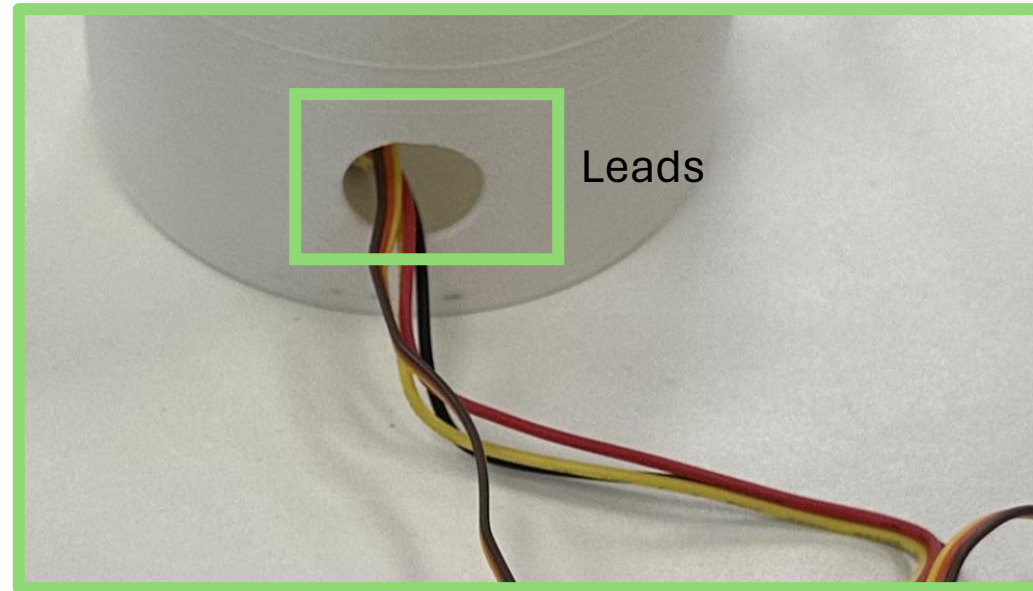
1. Attach the IR Sensor

- Push the IR sensor through the rectangular hole at the front of the robot from the inside. Blue tack will help it stay in position.



2. Pull Leads through Hole

- Pull all leads through the circular hole on the back of the robot body.

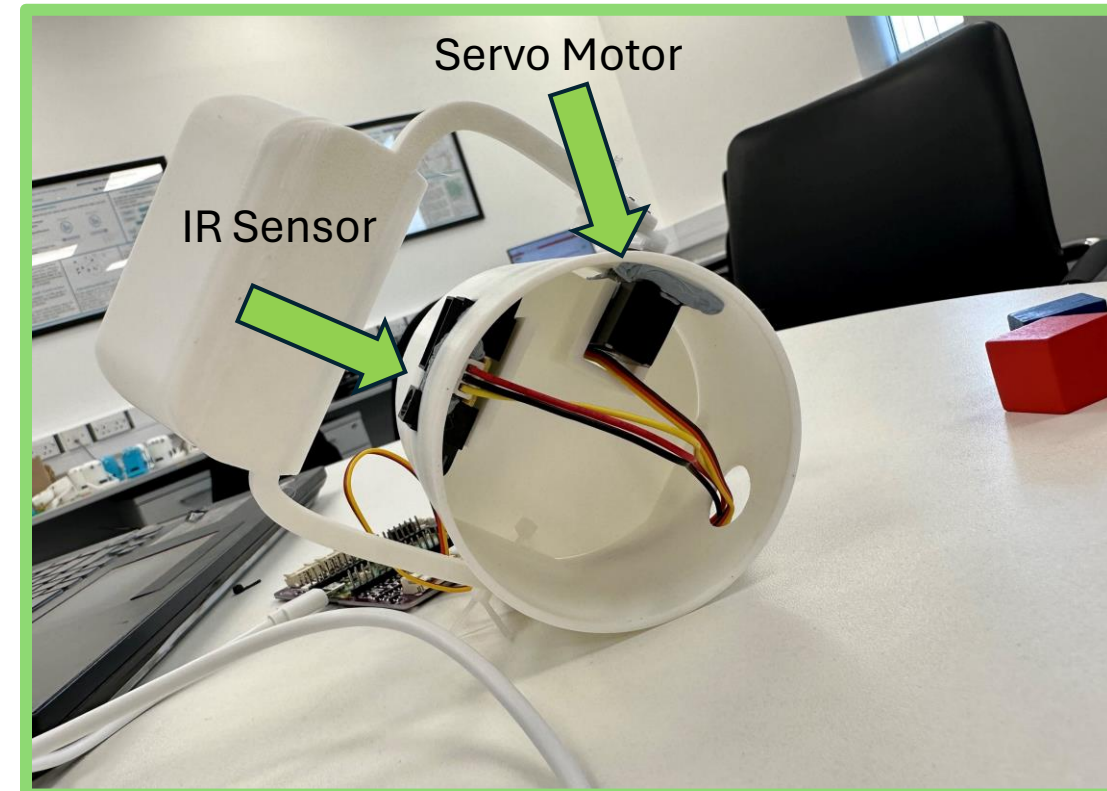


3. Insert White Shelf on Top of Sensors

- Examine the white circular shelf.
- The white shelf sits inside the robot snugly on top of the servo and sensor with the smooth side facing upwards.
- Turn the robot upside down and turn the shelf so that the sensor and servo fit neatly into the spaces provided in the shelf.
- Push down to secure.

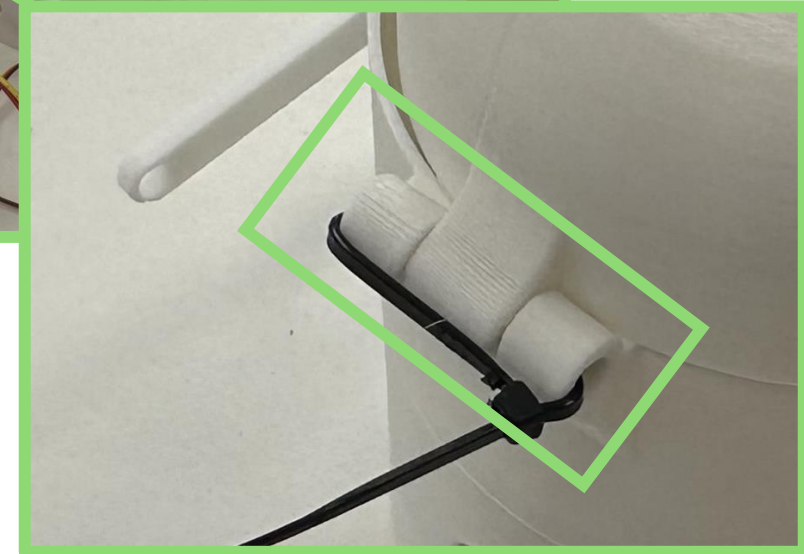
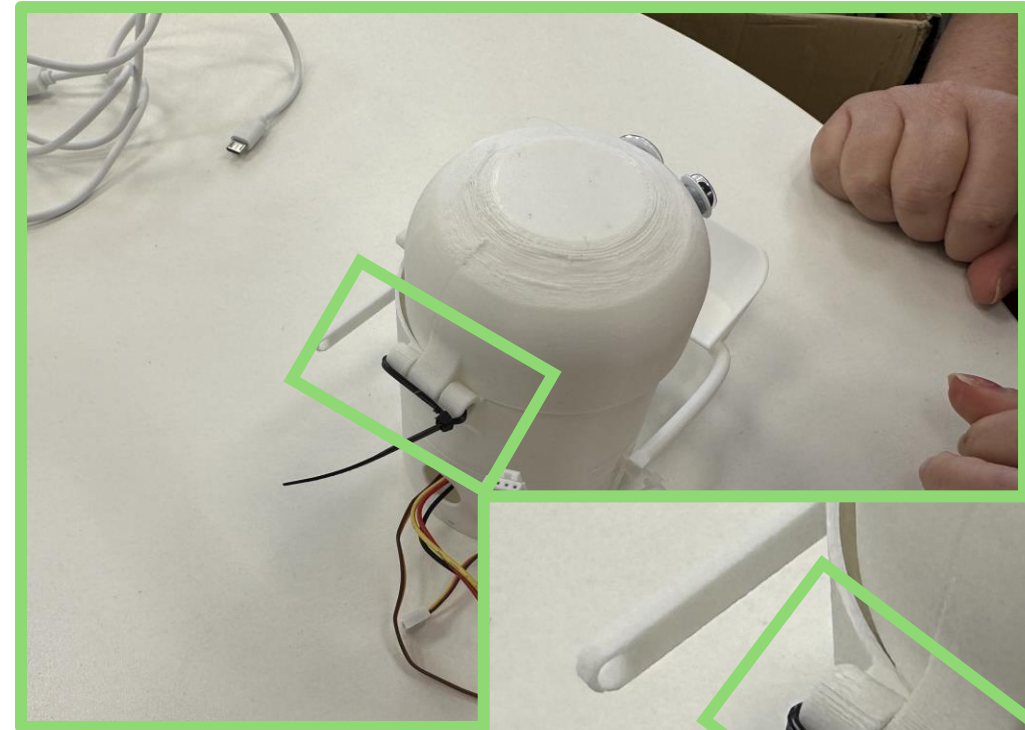


White Shelf



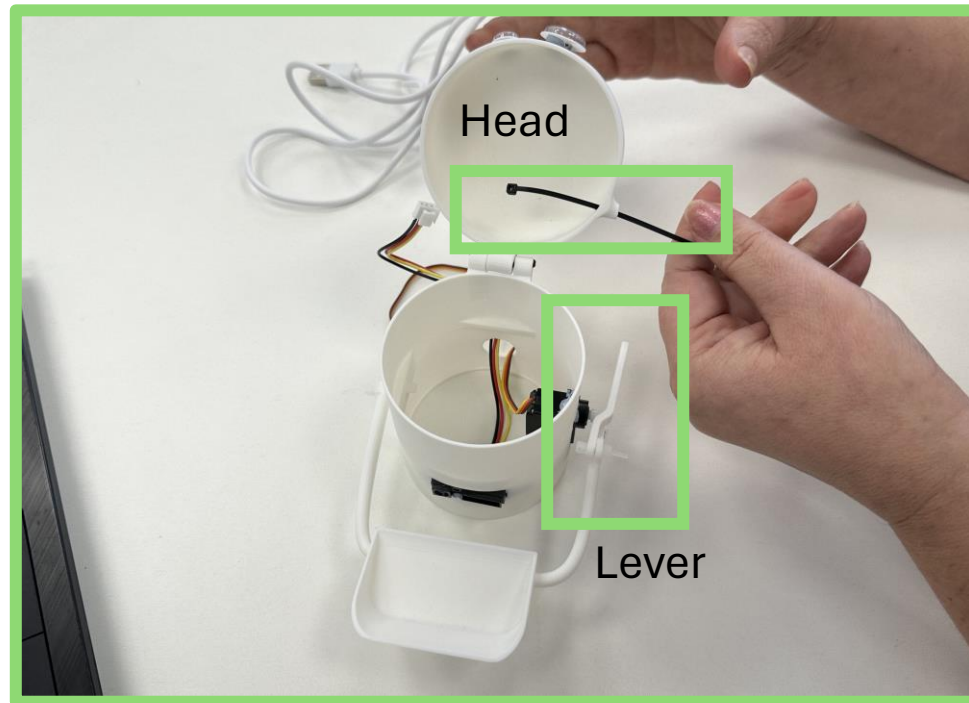
4. Attach the Head to the Body

- Set the head on top of the body so that the hinge is connected (eyes to the front).
- Push one zip tie through the head and the body hinge.
- Bend the end of the zip tie and push the end of the tie through the hole at the top of the tie.
- Pull to secure...you will hear a zipping sound.



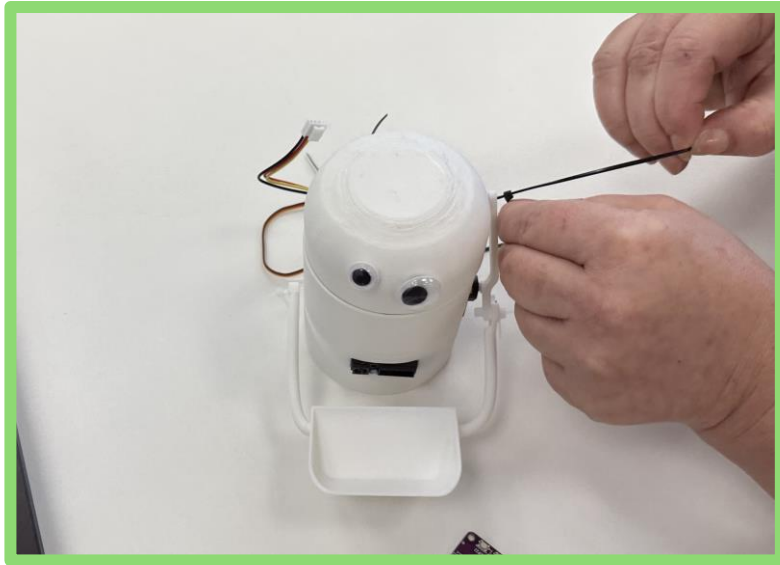
5. Attach Lever

- Pull a zip tie through the hole on the head.
- Also pull it through the hole at the top of the lever above the servo motor.



6. Secure Lever with Zip Tie

- Push the end of the 1st zip tie through the hole of a second zip tie.
- Push the end of the 2nd zip tie all the way down to the lever to secure.



7. Ask Helper to Cut Ties and Check Build

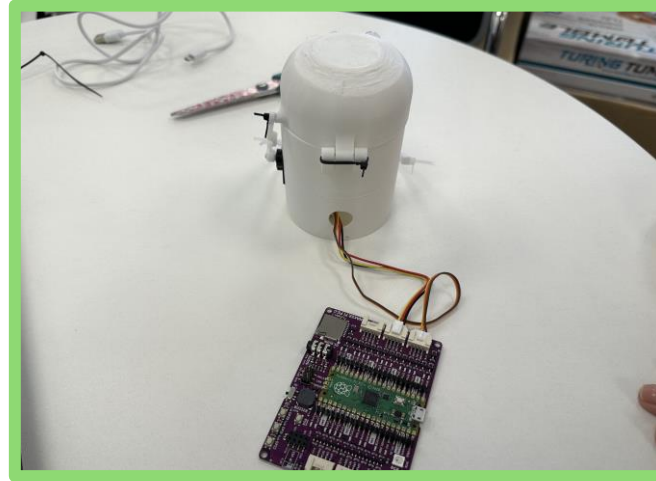
- Helper will make sure they are tight before cutting them



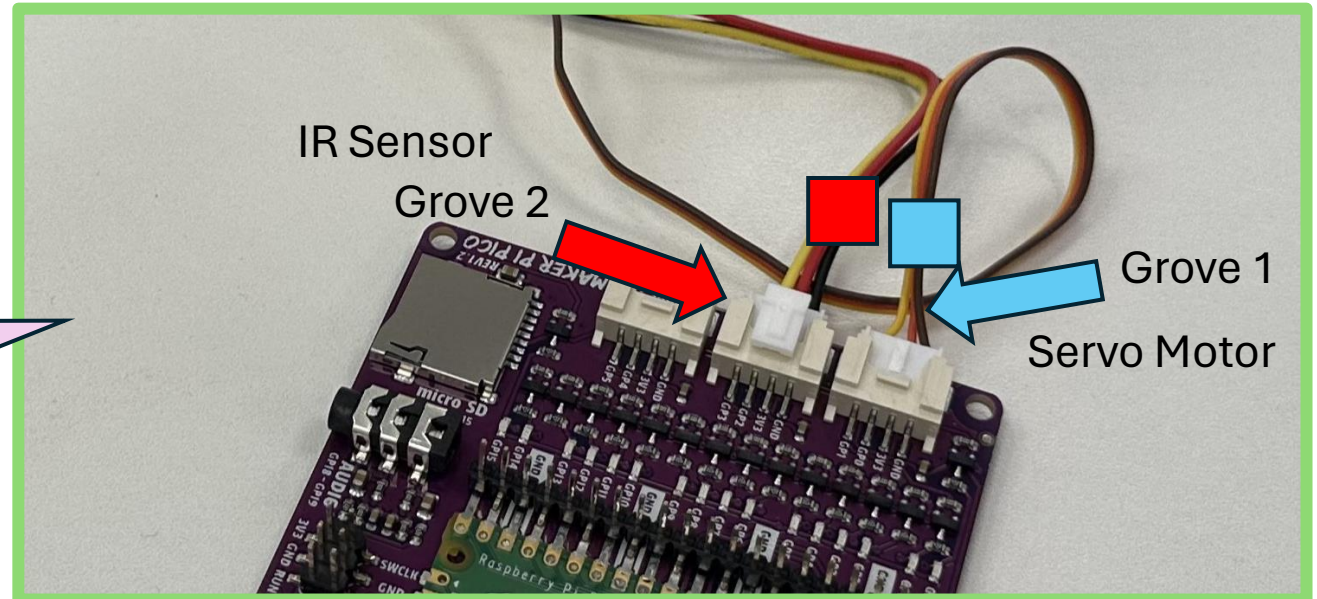
8. Plug the Leads into the Board

Plug the

- Servo Motor, with red tape, into Grove 1
- IR Sensor, with blue tape, into Grove 2



The numbers for the Grove Connectors are written on the edge of the board.





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Test Hardware with Software



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Piper Make Website

9. Go to the following website:

<https://make.playpiper.com/>

10. Click on
Creative Mode



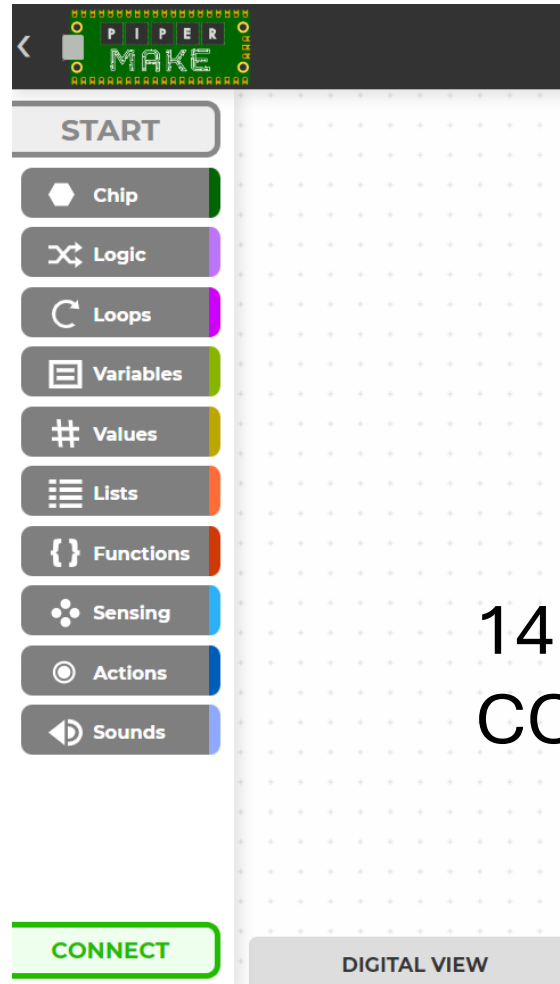
11. Click on
New Project



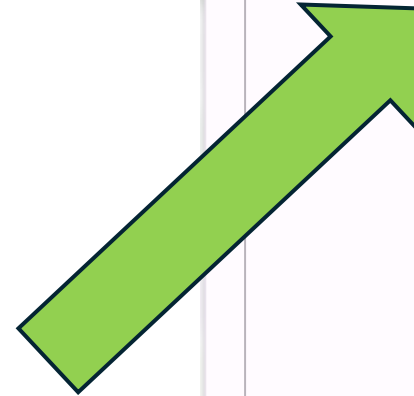
12. Click on the
square on the
right

Connect Your Board

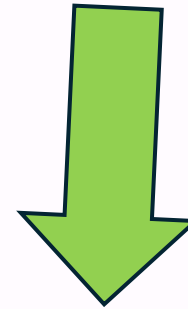
13. Click on Connect





14. Click on COM PORT

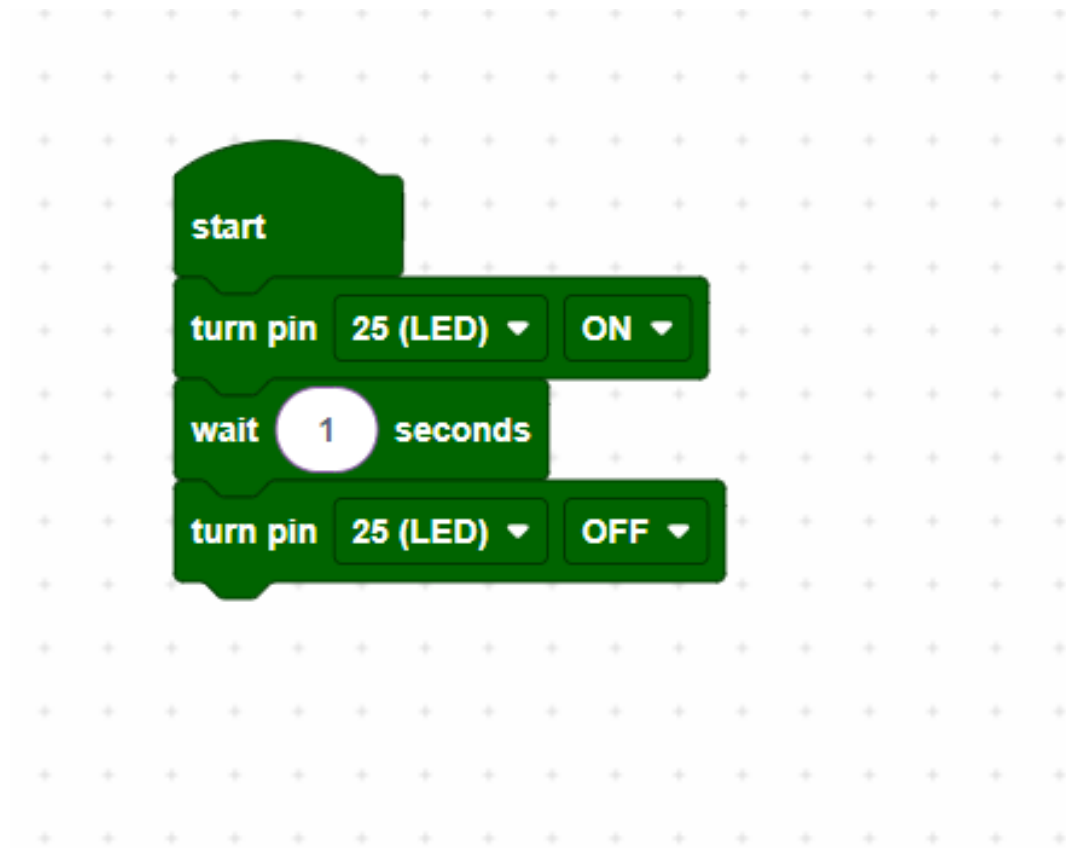


15. Click on Connect




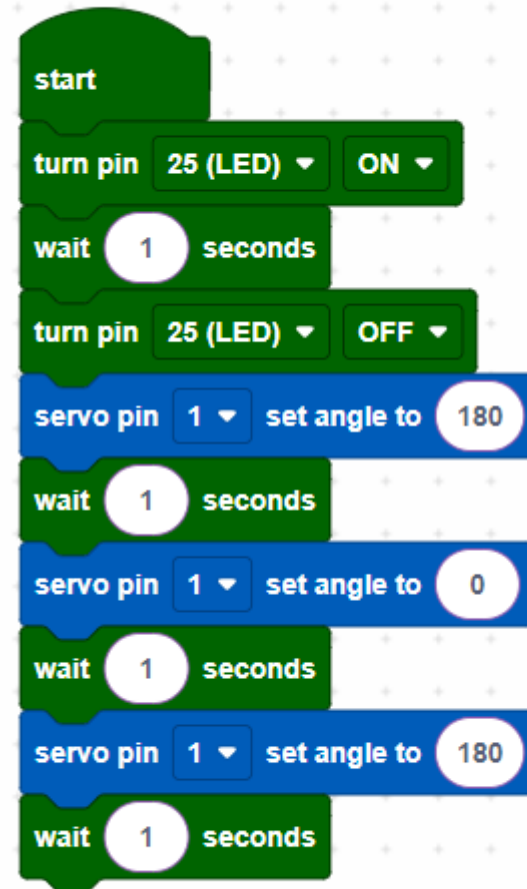
16. Test Board – Blink an LED

- Create this program with block code.
- Hint: You can find the instructions in the Green Chip Section  Chip
- Click on Start to Run your Program

- Does the LED on the Pico turn in and off?



17. Test Servo – Move Up and Down

- Add extra instructions as shown
- Hint: You can find extra instructions in the Blue Actions Section 
- Click on Start to Run your Program
- Does the scooper move up and down?

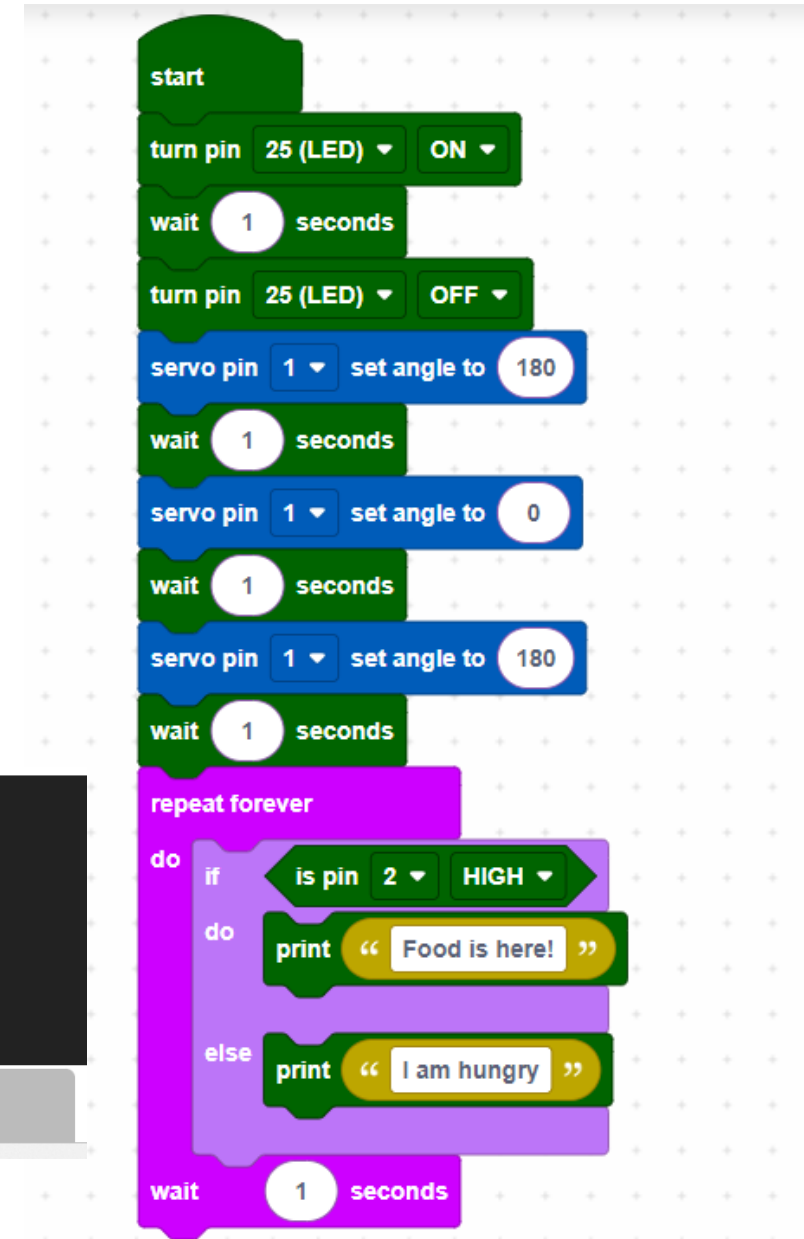
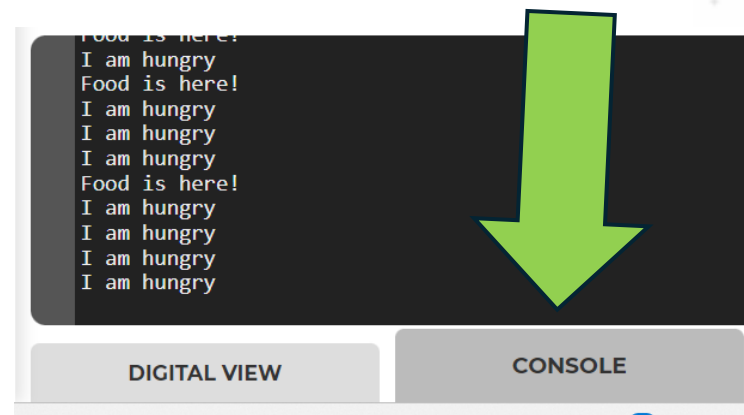


18. Test IR Sensor

- Add extra instructions inside a loop that runs forever as shown opposite.
- Hint: You can find extra instructions in the Logic and Loops Sections



- Change the seconds in the loop to 1.
- Click on Start to Run your Program
- Click on Console to see the printing.
- Put a block in front of the detector.
- Does it work as expected?



Use the blue tack to adjust the IR sensor so that it is pointing slightly up if it is constantly being triggered.



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Your Challenges



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Challenges

1.
I would like the robot to eat blocks I place on the scooper so it looks like I am feeding the robot.

2.
I would like the robot to use sounds demonstrating when it is eating and full so that it is more interactive and good for my blind friend.

3.
I would like the robot to greet me when it is turned on so I can connect emotionally with my robot.

4.
I would like the robot to tell me how many blocks it has eaten.

5.
I would like the robot to play some music when I press the button on the board.

6.
I would like the robot to stop eating when it is full (maybe 5 blocks) so that its like a real person.

7.
I would like to open the robot head by pressing a button on the board to empty the robot easily.

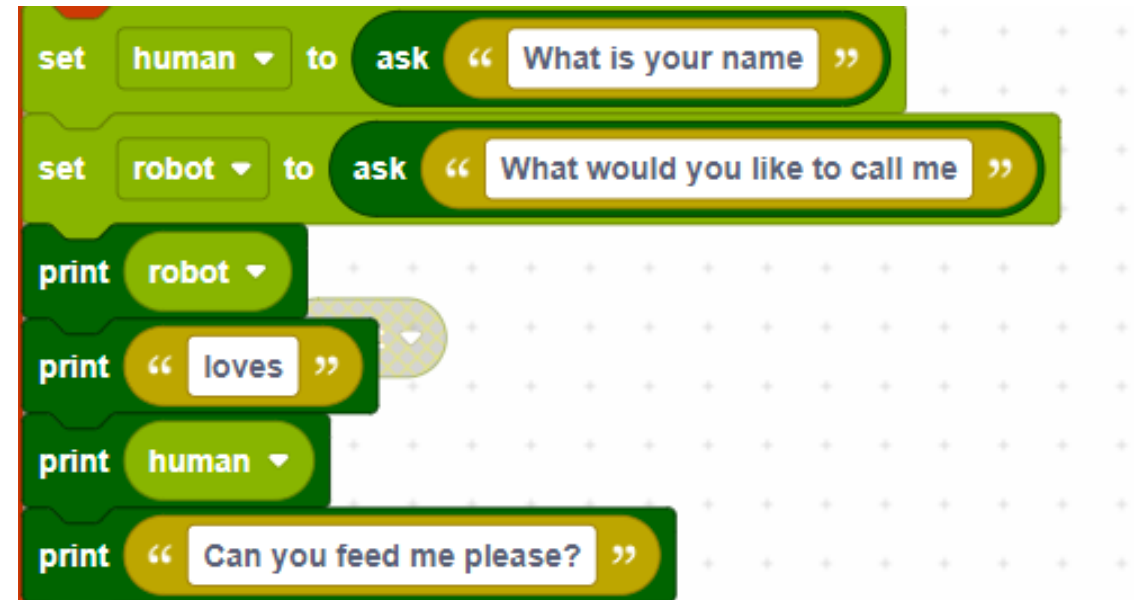
8.
I would like the robot to.....

Asking for User Input

1. Create variables called human and robot to hold the name of the robot and human



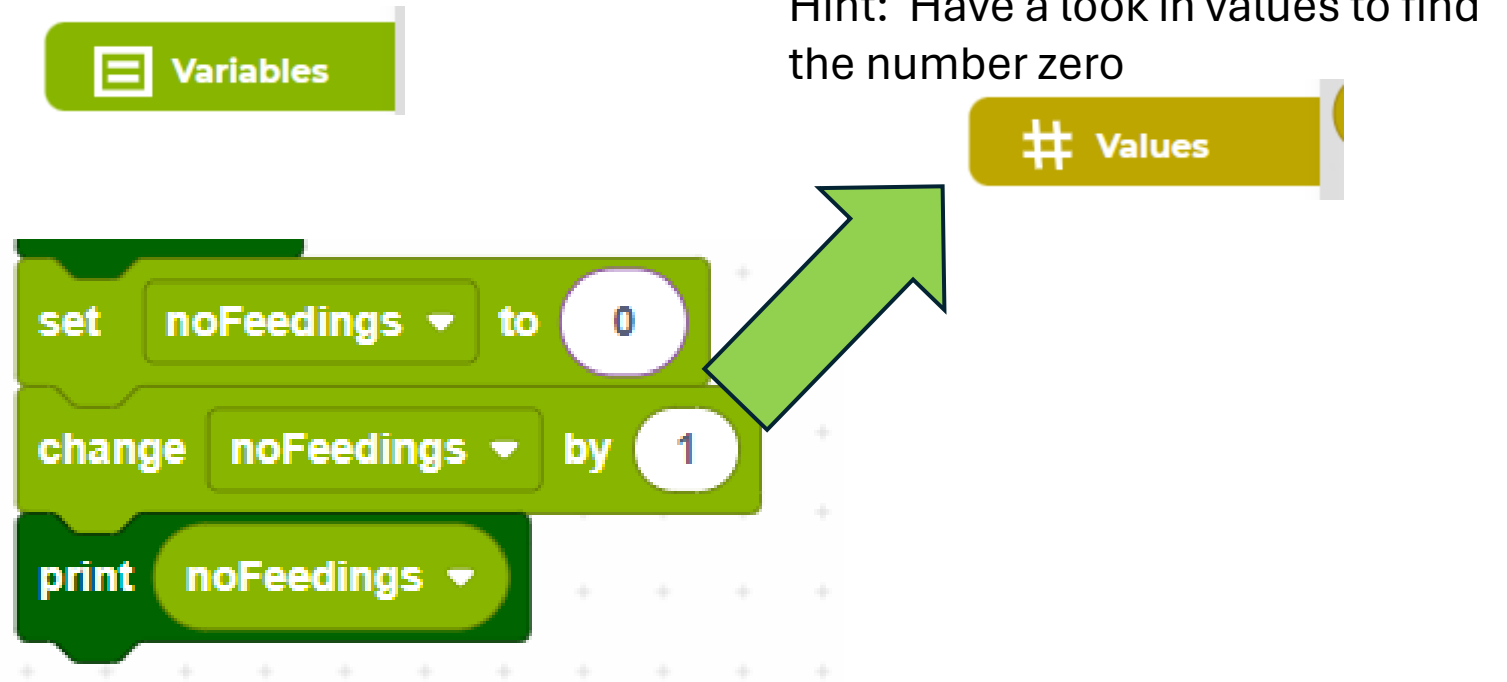
2. Add the code opposite at the start of the program
3. View the printing in the console.



Using Variables

- Create a variable called noFeedings
- Add the following code to test it out?
- Can you use this to count the number of feedings?

Hint: Have a look in values to find the number zero

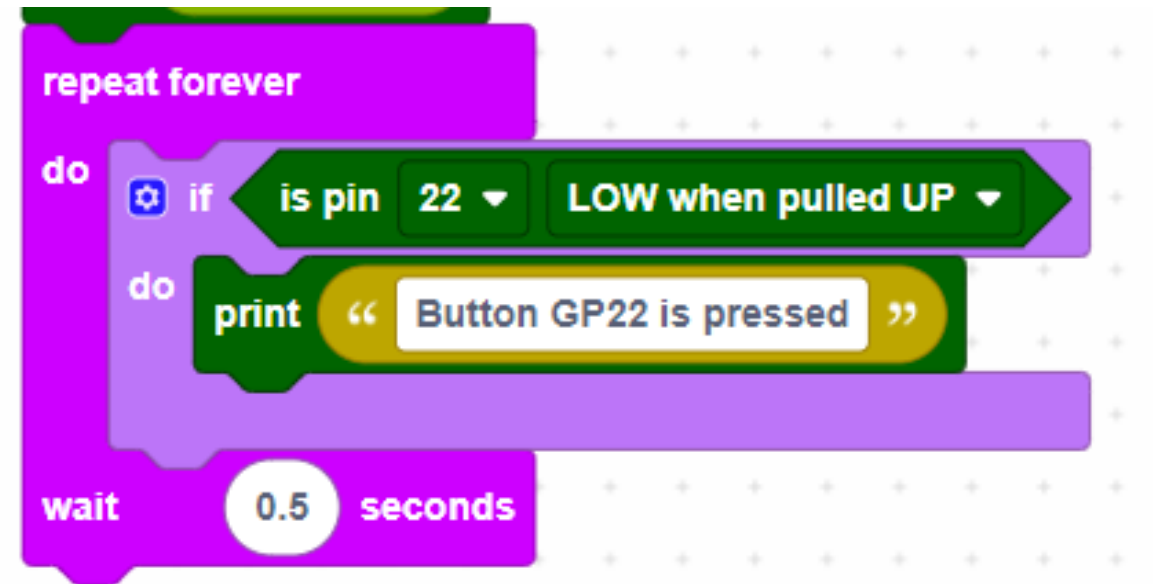


The image shows a Scratch workspace. At the top left is a green 'Variables' button with a list icon. Below it are three green code blocks: 'set noFeedings to 0', 'change noFeedings by 1', and 'print noFeedings'. To the right of the code is a green arrow pointing towards the 'Values' monitor. At the top right is a yellow 'Values' button with a hash icon. The 'Values' monitor is partially visible on the right edge of the frame.

How to use the GP22 button

Some example code is provided to show how in the forever loop we are constantly Checking if the button is pressed.

If we press the button can you add some sounds?



Some code snippets

```
if is pin 22 LOW when pulled UP
do
  print emoji 🙄
  print "I pressed the button"
  if closed?
  do
    play sound electro Flight C
    print human without new line
    print "Empty me carefully, please!"
```

```
to amihungry?
  if noFeedings ≥ maxNoFeedings
  do
    set hungry? to false
  return hungry?
```

```
repeat forever
do
  if is pin 2 HIGH and closed?
  do
    play sound instrument piano pitch note A4 length duration eighth
    print "Ah, Food is served!"
    print emoji 🙄
```

```
to greetings
  set human to ask "What is your name"
  set robot to ask "What would you like to call me"
  print create text with robot
  print create text with item emoji 🙄 repeated 10 times human
  print "Can you feed me please?"
```

```
to openMouth
  servo pin 1 set angle to 0
  set closed? to false
  wait 0.5 seconds
```

```
to eat
  openMouth
  closeMouth
  change noFeedings by 1
```

```
to closeMouth
  servo pin 1 set angle to 180
  set closed? to true
  wait 0.5 seconds
```

```
do
  eat
  print "That was so yummy, Thank you so much."
  print emoji 🙄
  print create text with "1 am now"
  print map value noFeedings from range 0 : maxNoFeedings to 0 : 100
  print "% full."
  play sound instrument piano pitch map value noFeedings from range 0 : maxNoFeedings to 500 : 2000 length duration eighth
else
  print "I am absolutely stuffed, I can't eat another bit..."
```



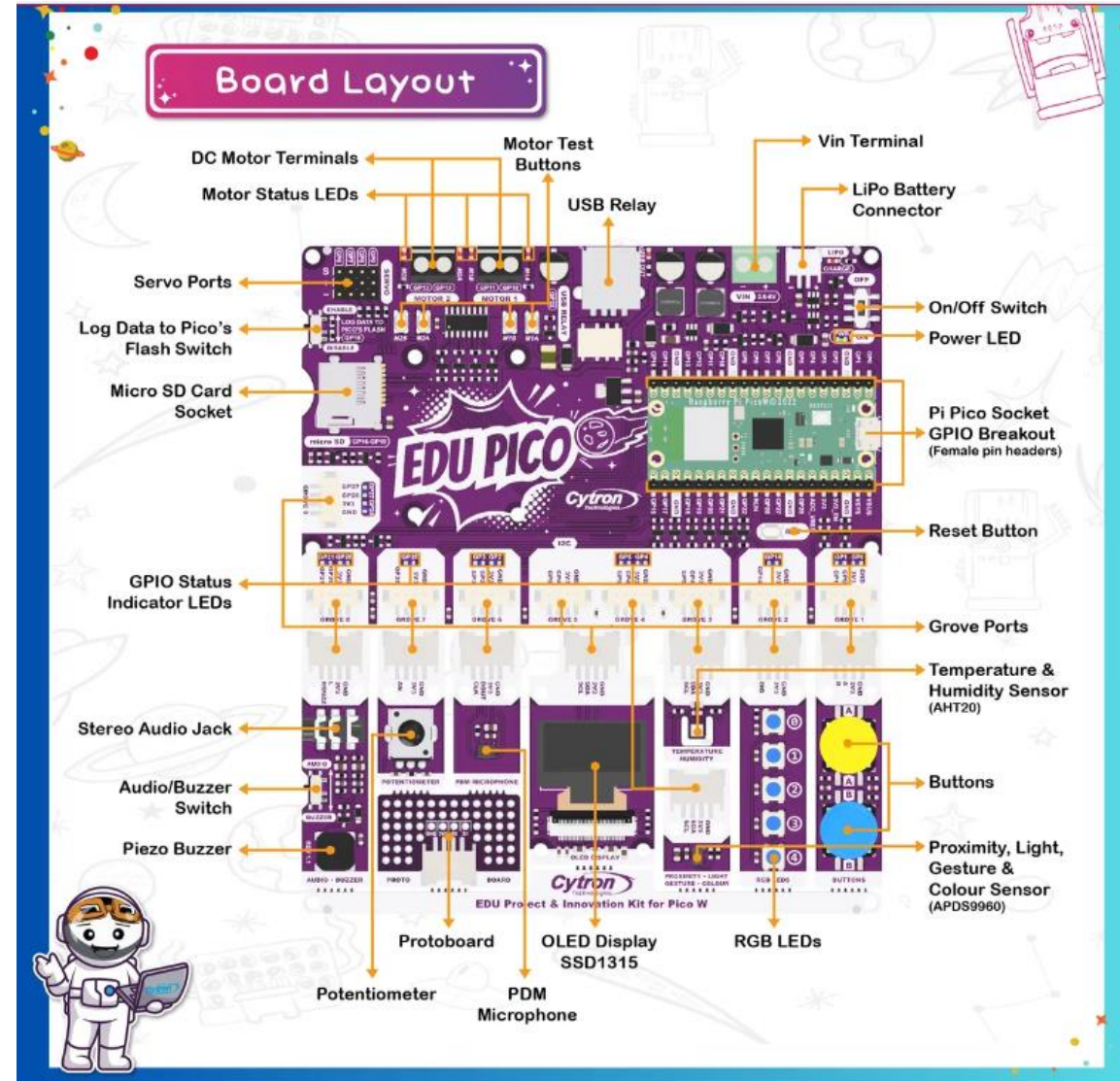

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Extras



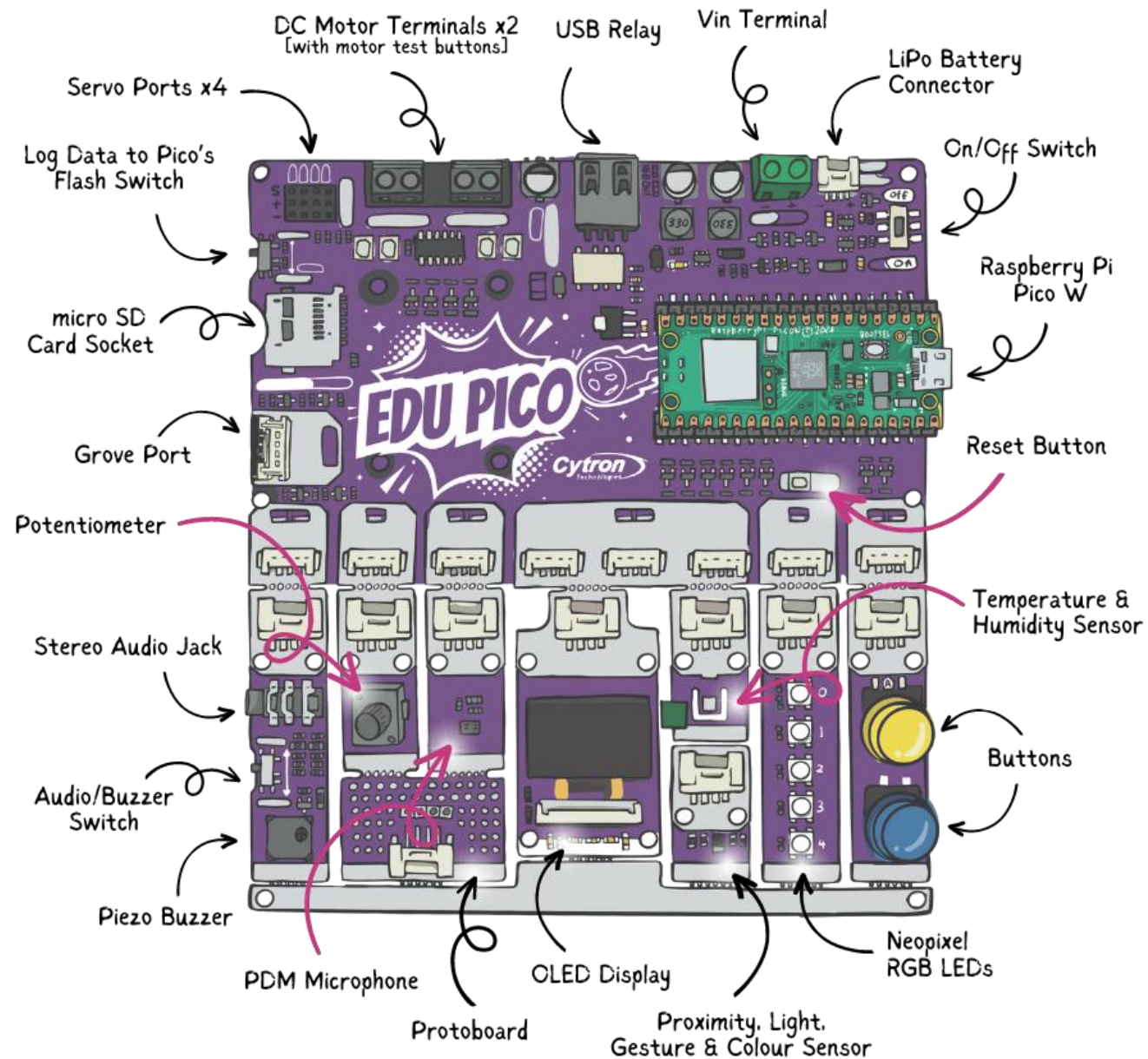
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Edu Pico Board



- https://sites.google.com/cytron.io/edupico-resource-hub/home_1







Simulate IoT Projects in Your Browser

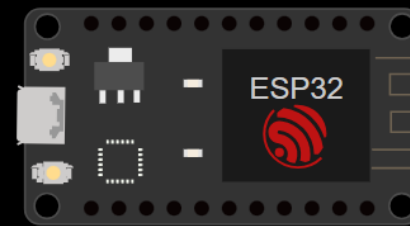
[Discord Community](#)

[LinkedIn Group](#)

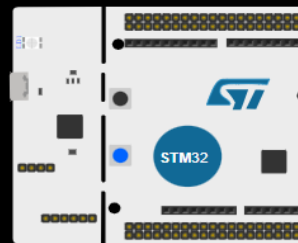
Simulate with Wokwi Online



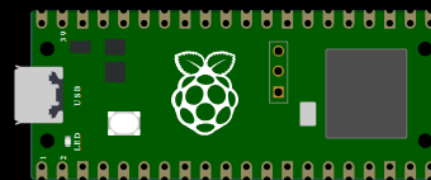
Arduino (Uno, Mega, Nano)



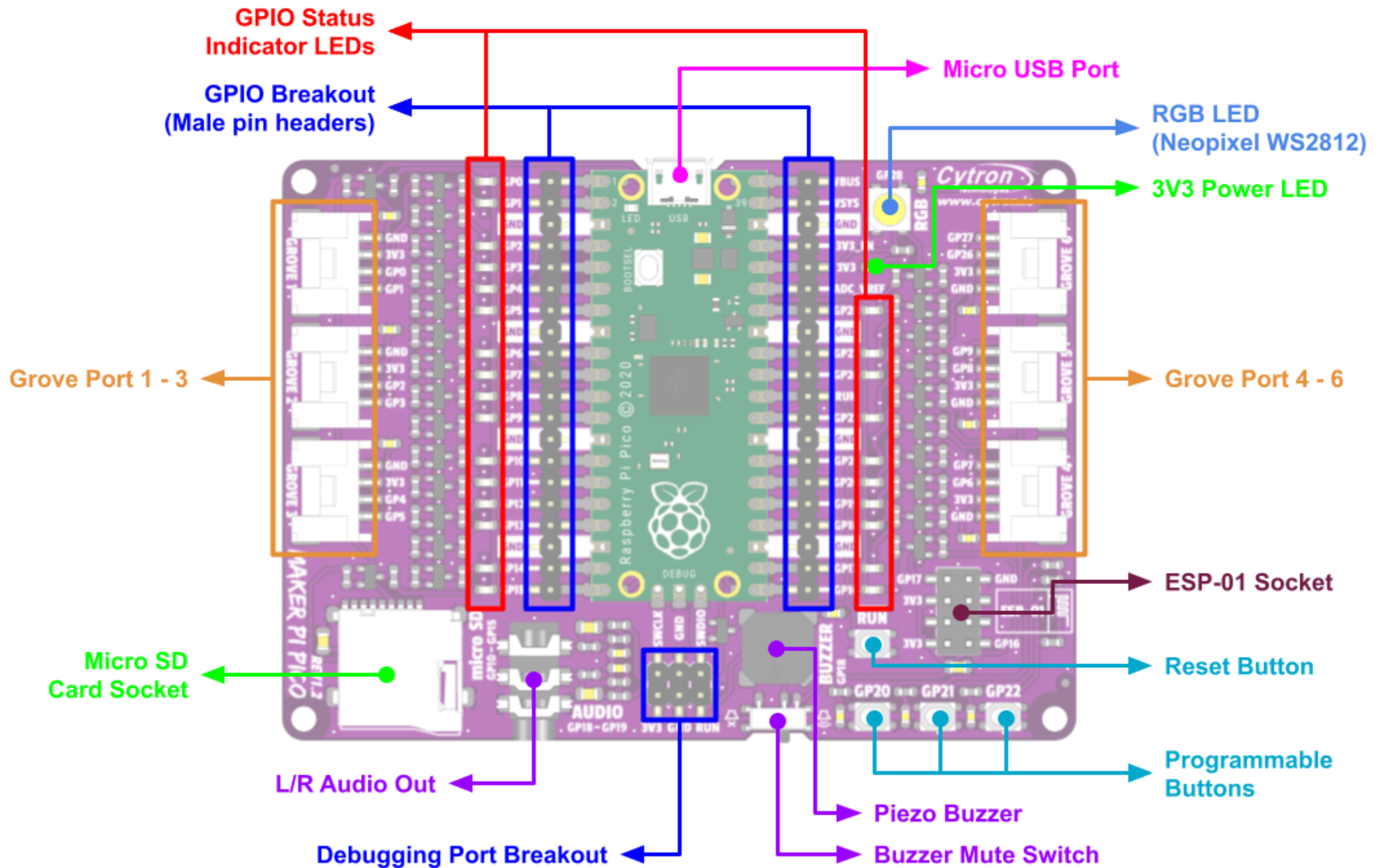
ESP32



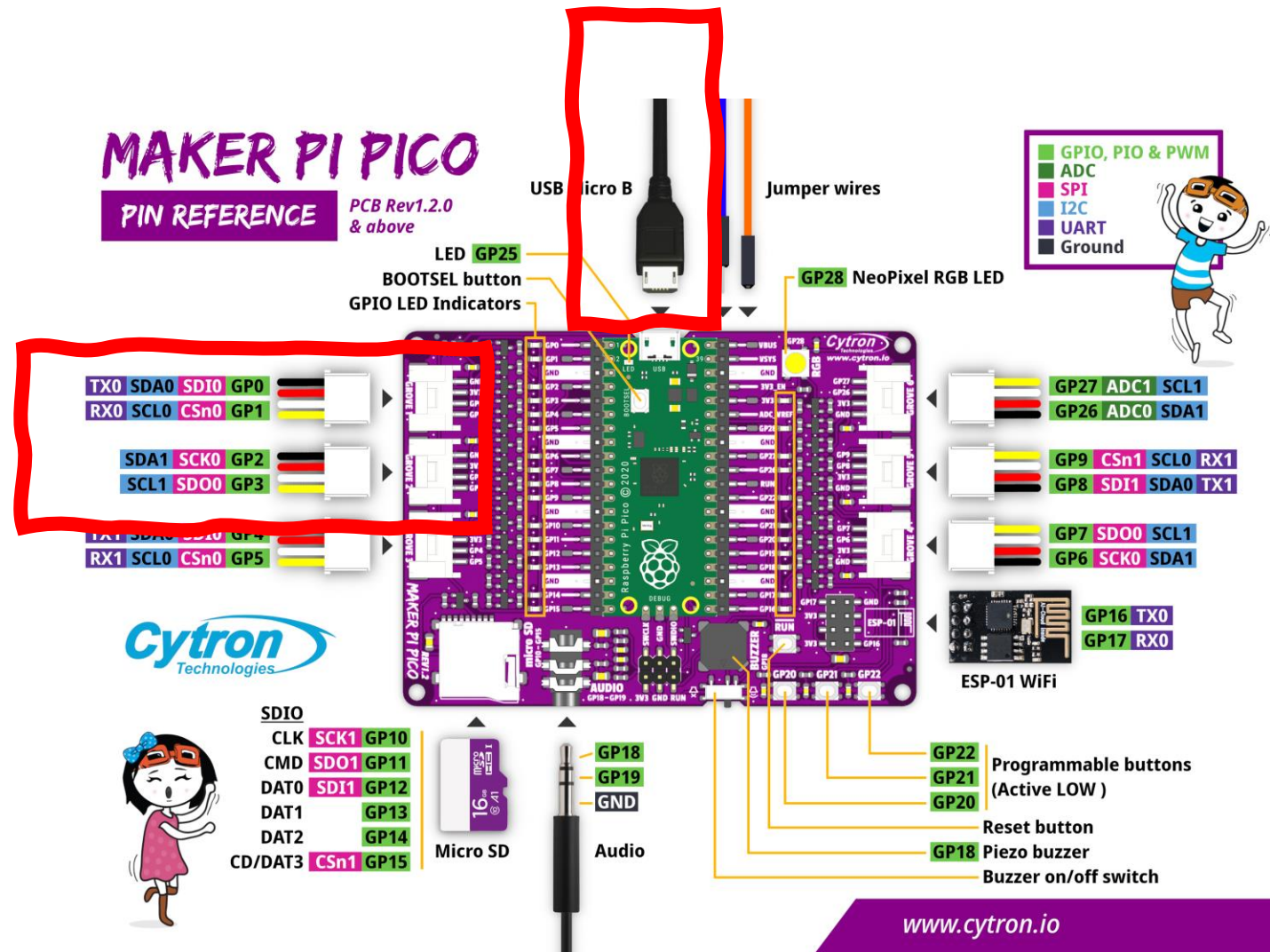
STM32



Pi Pico



What we are using.



Link to Make Piper Large Project

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