





Desktop Friend Robot

"A smart and emotional desktop companion robot"

"FIBO Academy 2025"

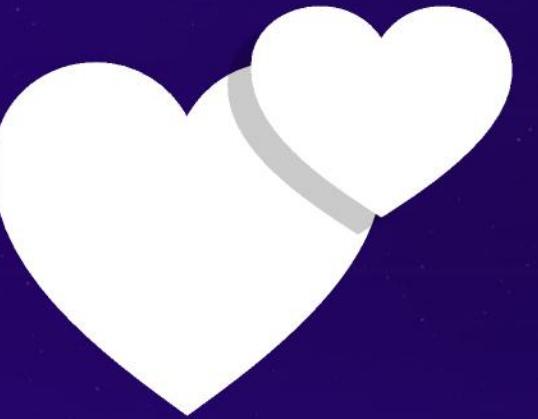
By Cat's Lover Group
(CLG)



Requirement

Desktop Friend Robot

- ⚡ **Stationary robot** designed for desktop users
- 🐾 **Tracks user motion**
- 🙌 Response to interaction
- 😊 Emotions and **Cute**





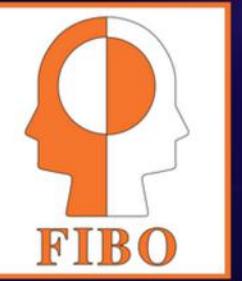
Inspiration



**Whether you living in a dorm, condo,
or a place that doesn't allow pets or you
can not have pet yourself but You can
still crave the presence of a furry friend**



Design Inspiration



Cats around the FIBO area

Purpose & Product Market



What

A **stationary desk robot** that behaves like a **pet**



Who

- Collector
- **Children** (Ages 8 - 12)
- etc.



Where

Area with **desk** and electricity



When

- Working
- Studying
- **Boring**



How

Robot **mimics pet-like actions.**



- Want to meet a need for people who either **can't have pets**
- Want people to have **something with physical interaction** while working at the desk (Friend ❤️)

Design Planning

> w < Cute Emotion

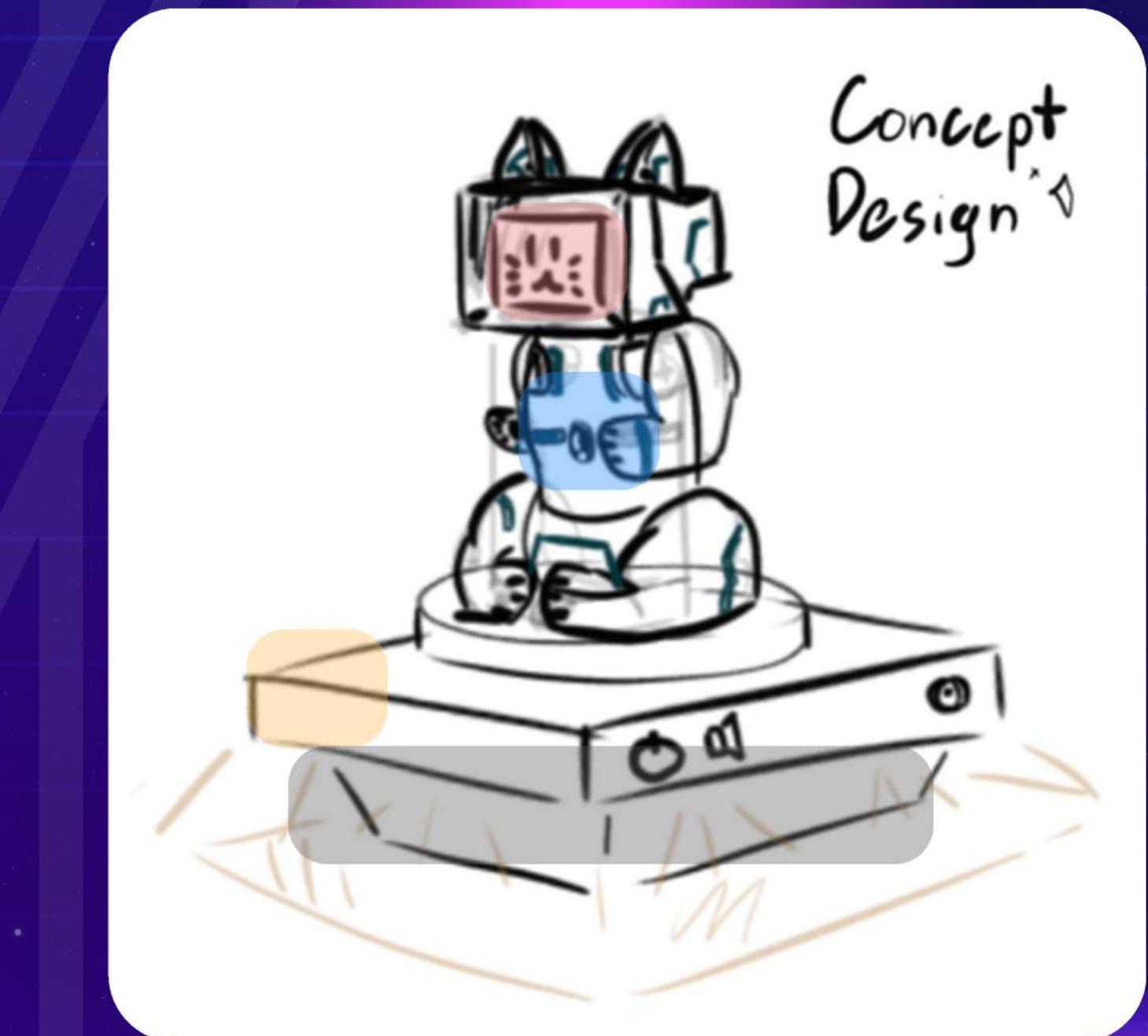
))) Voice Interaction

 Motion Tracking

 Stationary

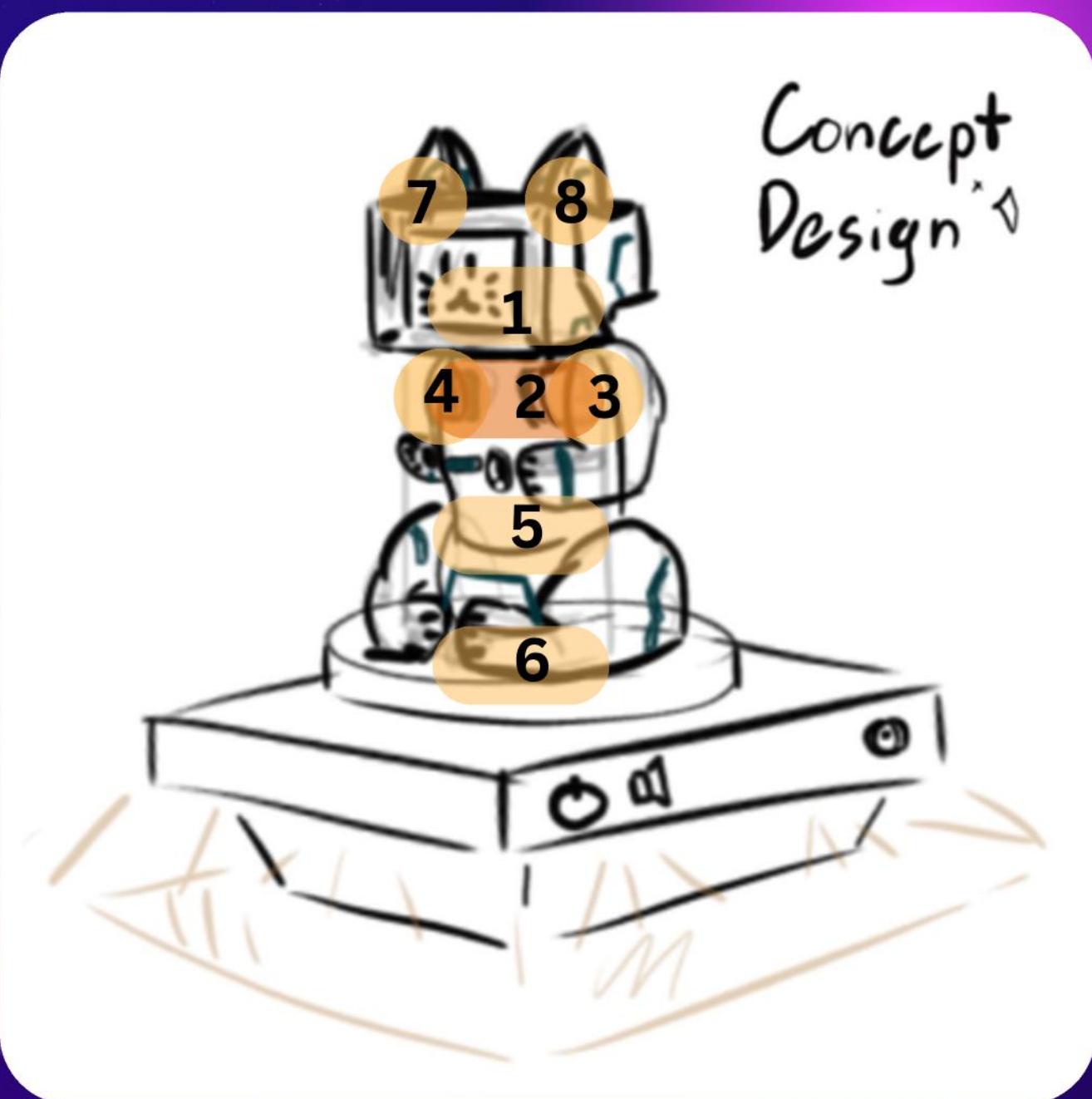
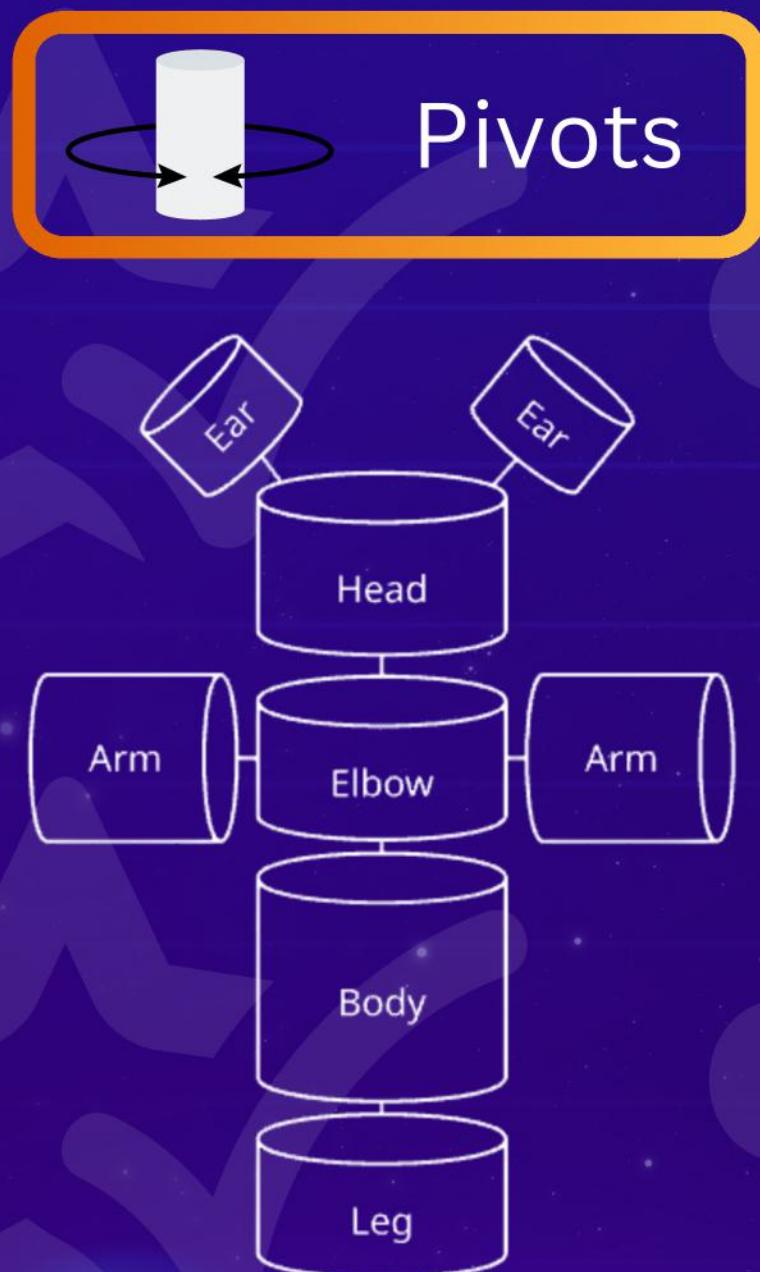


Concept
Design ↗



Features

Desktop Friend Robot



Servo **MG90S**

Pro

- +Cheap
- +Prototype Friendly

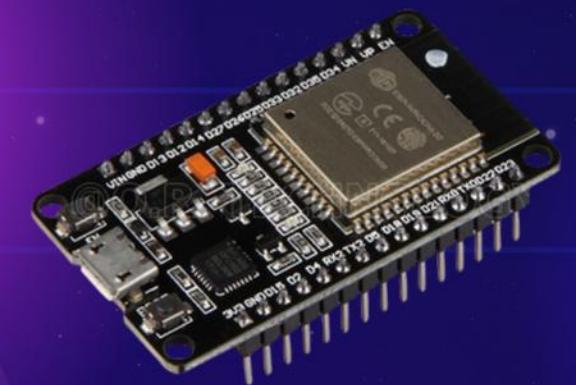
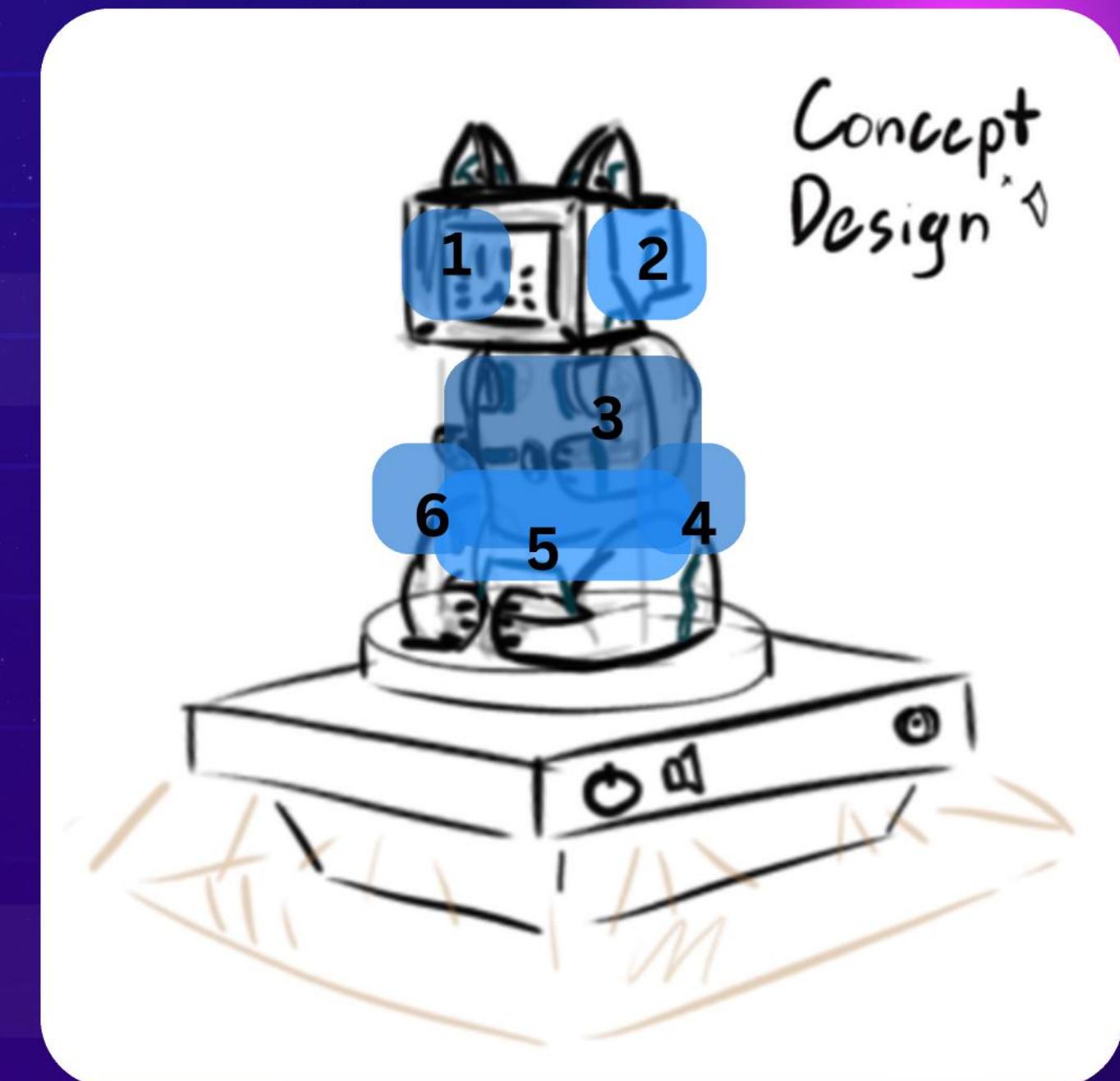
Con

- Noisy
- Unreliable



Features

Desktop Friend Robot



Capacitive
Touch
ESP32

- Pro
- +No Moving Part
 - +More Flexible
- Con
- Can interfere with other sensors
 - Need Specific Condition
 - Very fragile



Features

Desktop Friend Robot



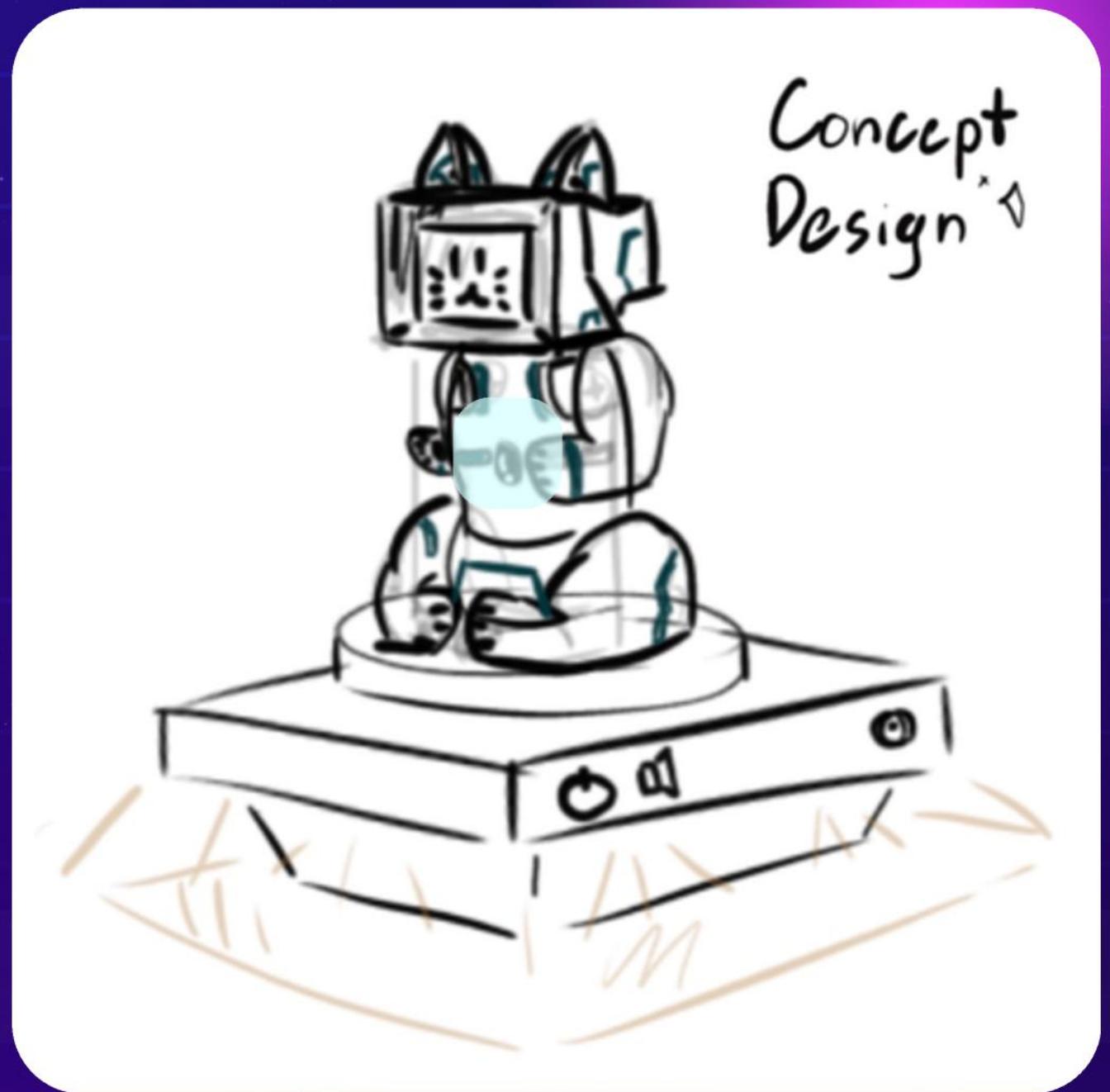
Pivots



Touches



Motion
Tracking



Camera



Fish Eye Lense
5MP IR Camera

(Raspberry Pi Camera)

Pro
+IR capabilities
+Wide angle lens

Con
-Very fragile

Features

Desktop Friend Robot



Pivots



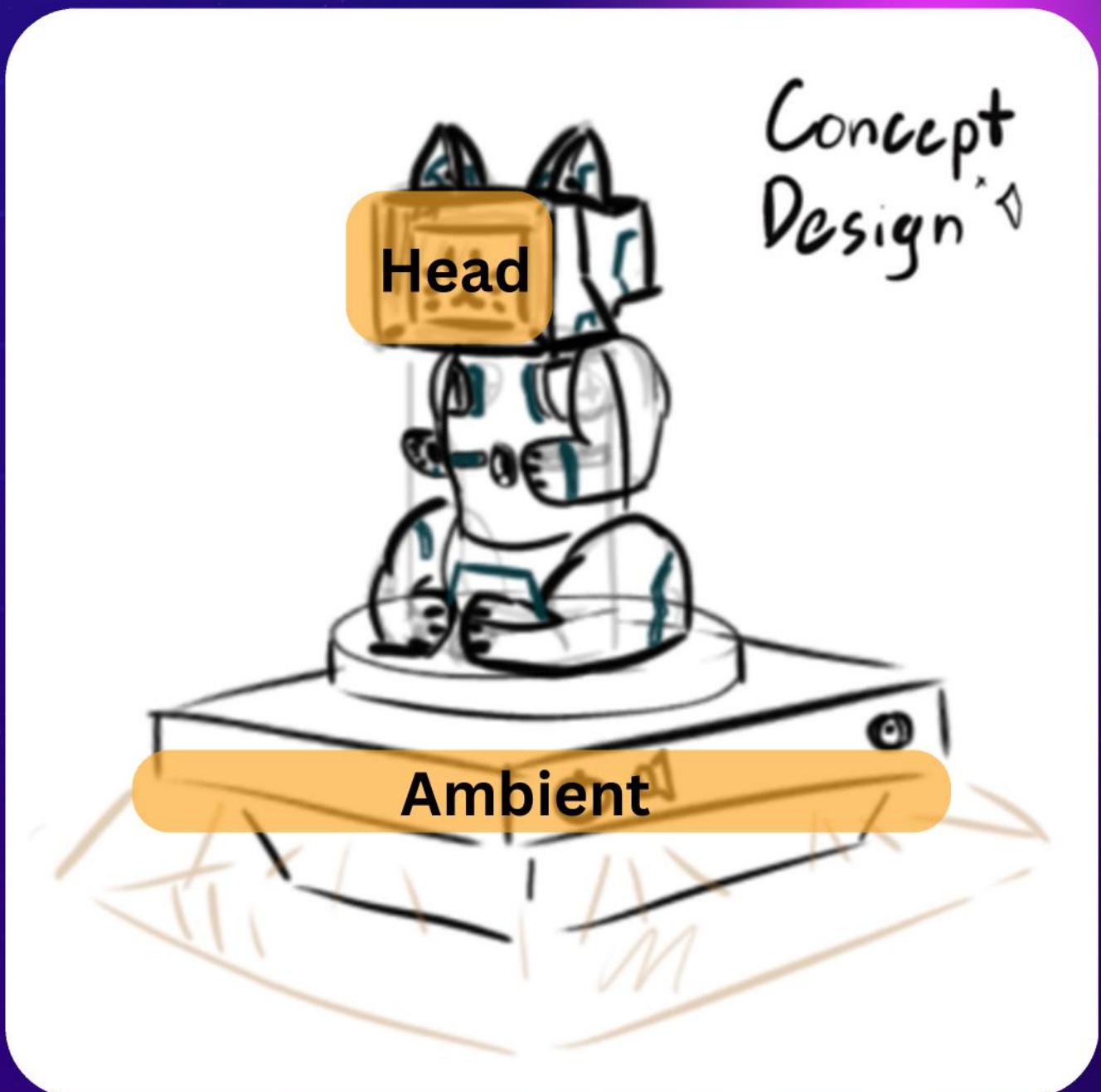
Touches



Motion
Tracking



Ambient light



Ambient light **WS2812B**



Pro

- +Beautiful
- +Modular

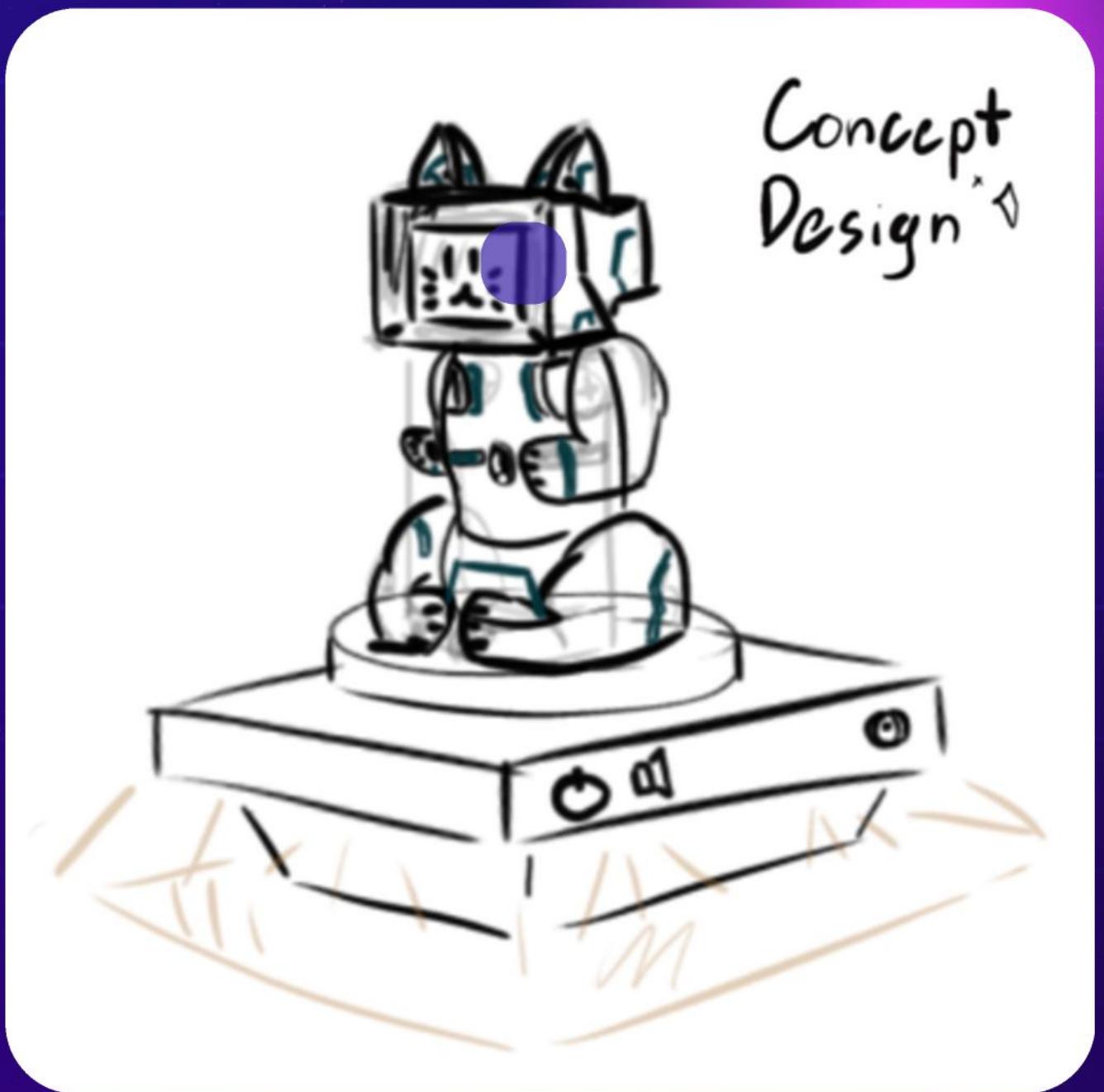
Con

- High Power Consumption
- Very fragile



Features

Desktop Friend Robot



(O) Haptic Touch

Vibrator

316040001
(DigiKey)



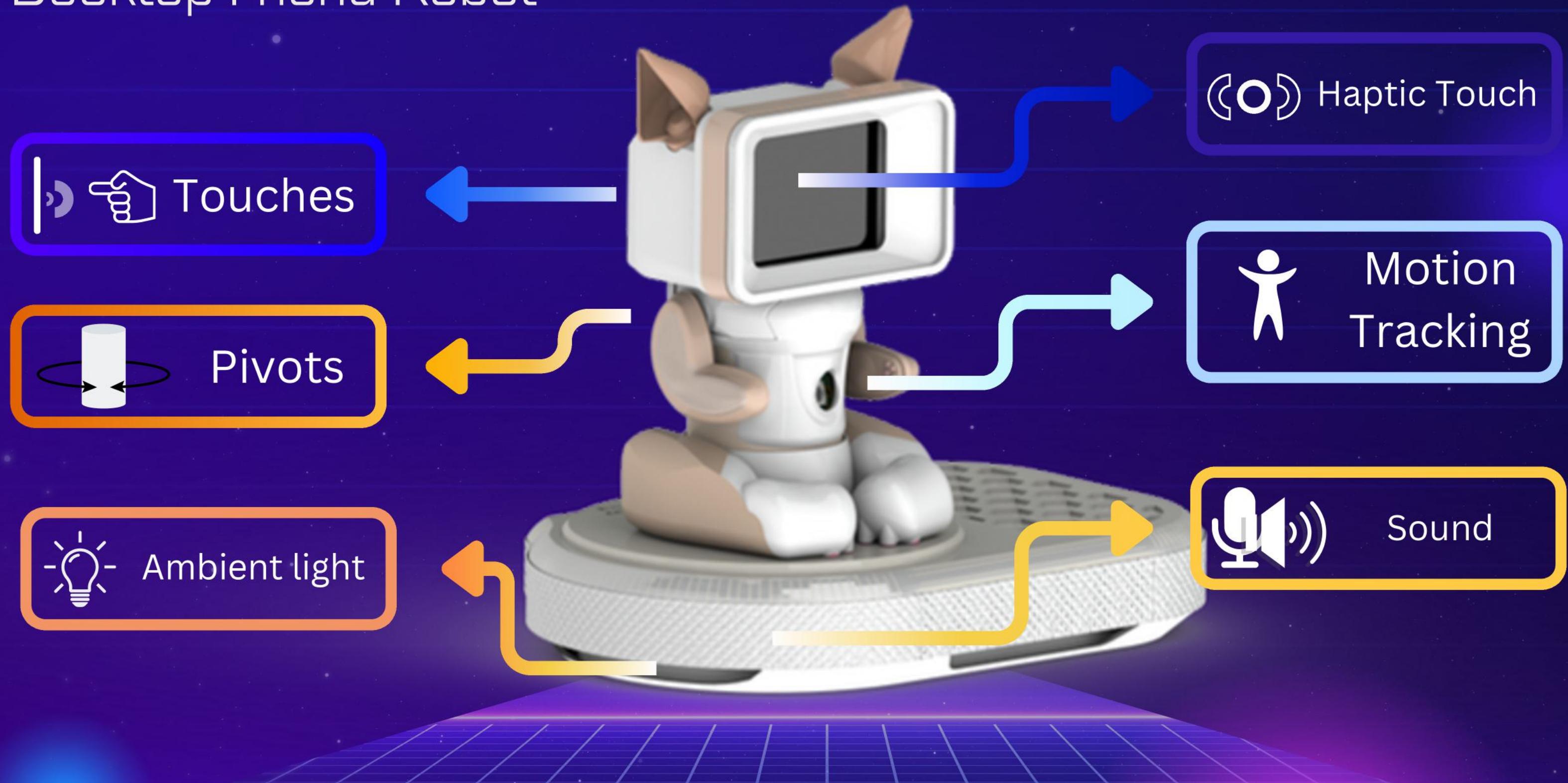
Pro
+Powerful
+Cheap

Con
-Few pattern



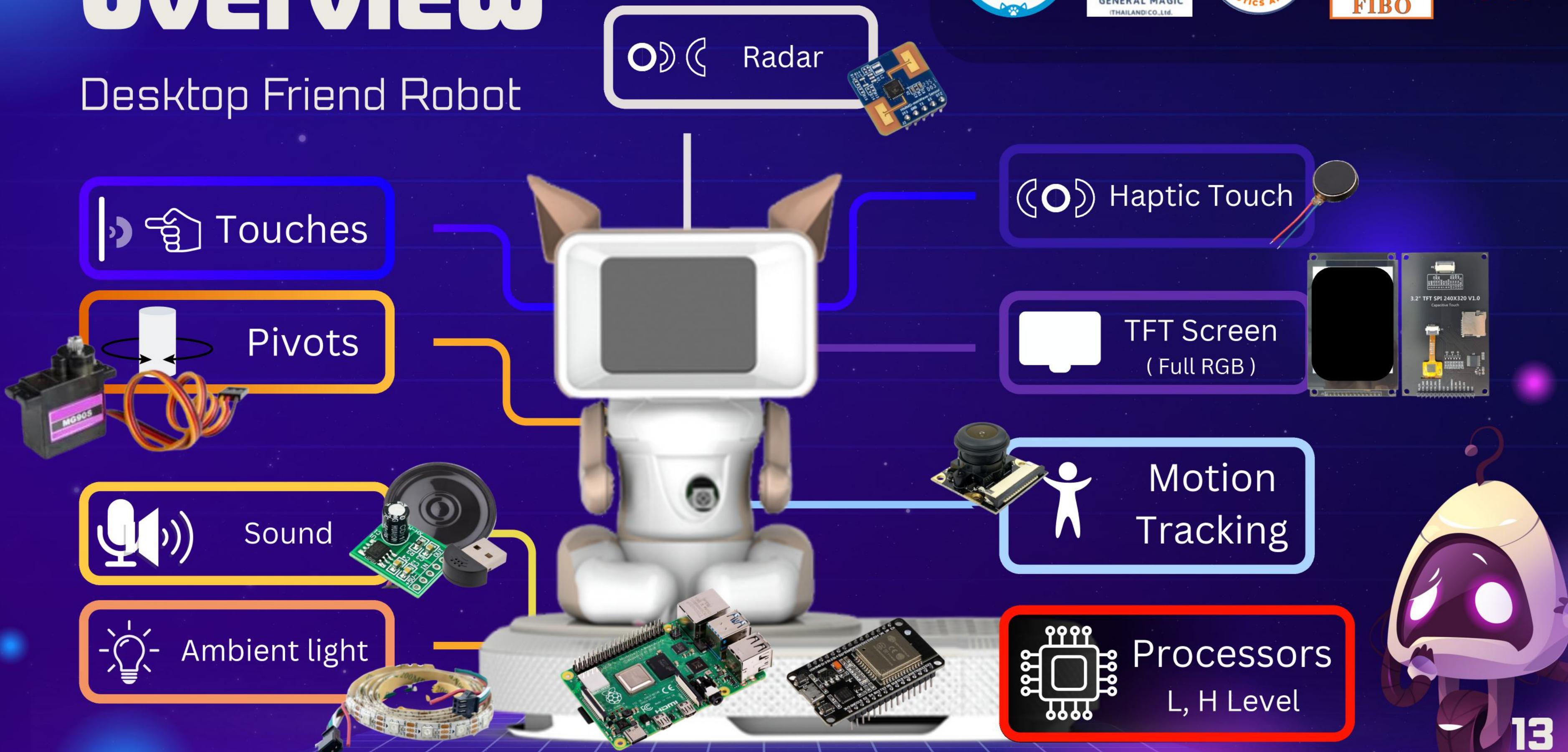
Features

Desktop Friend Robot

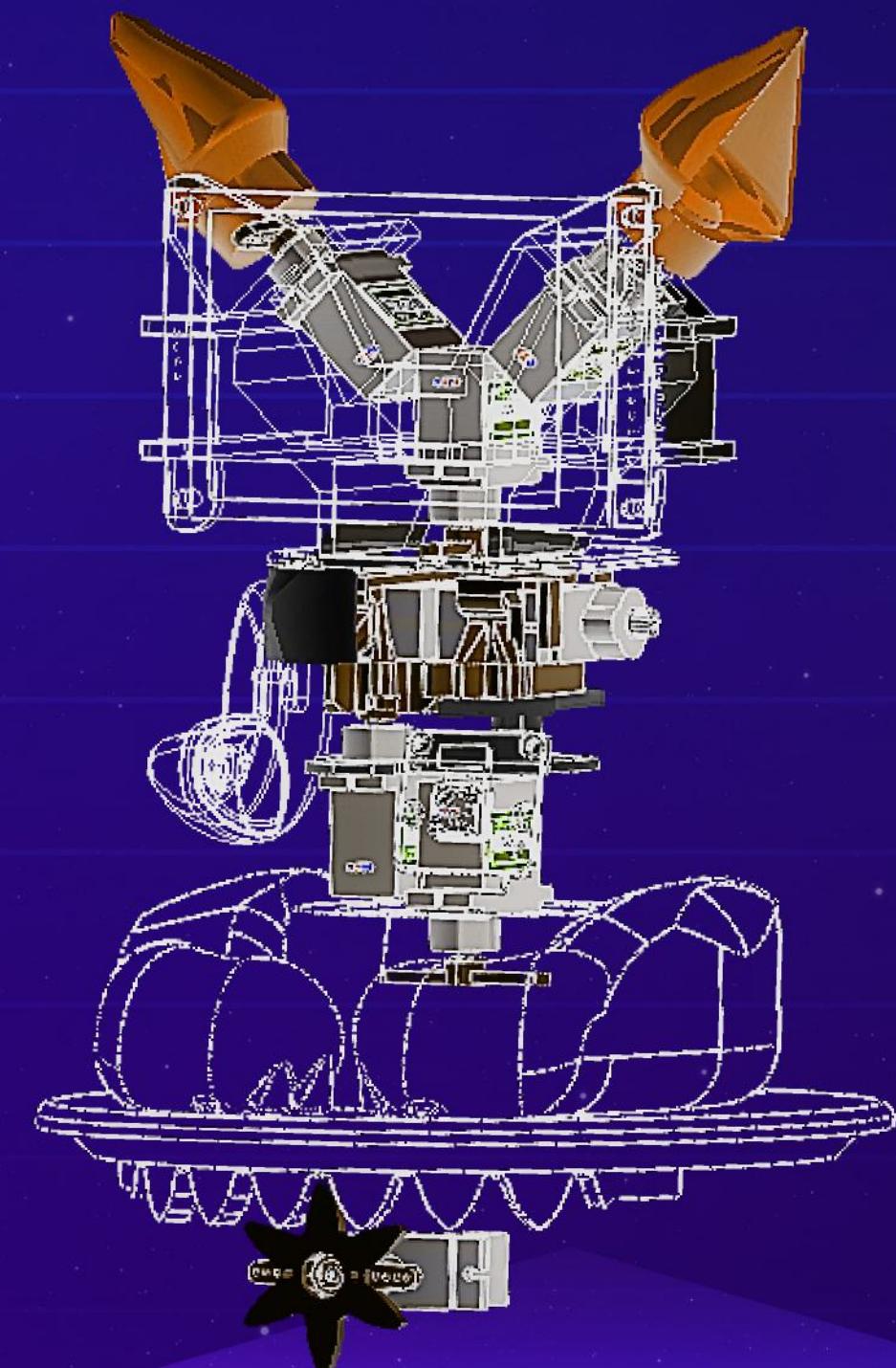
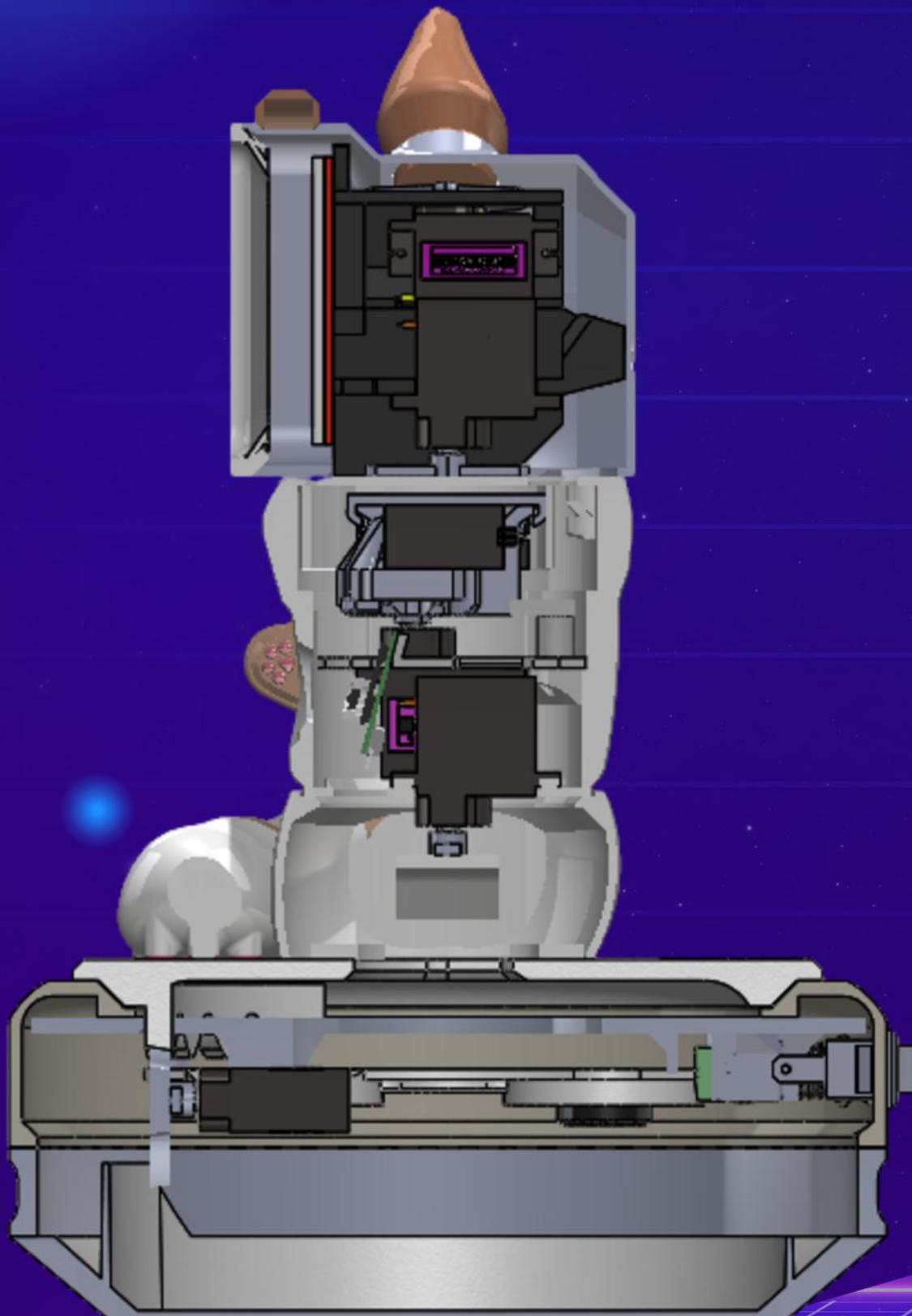


Overview

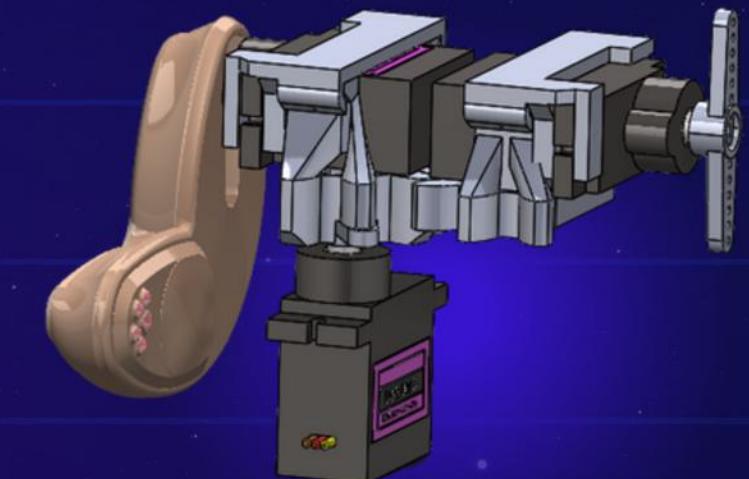
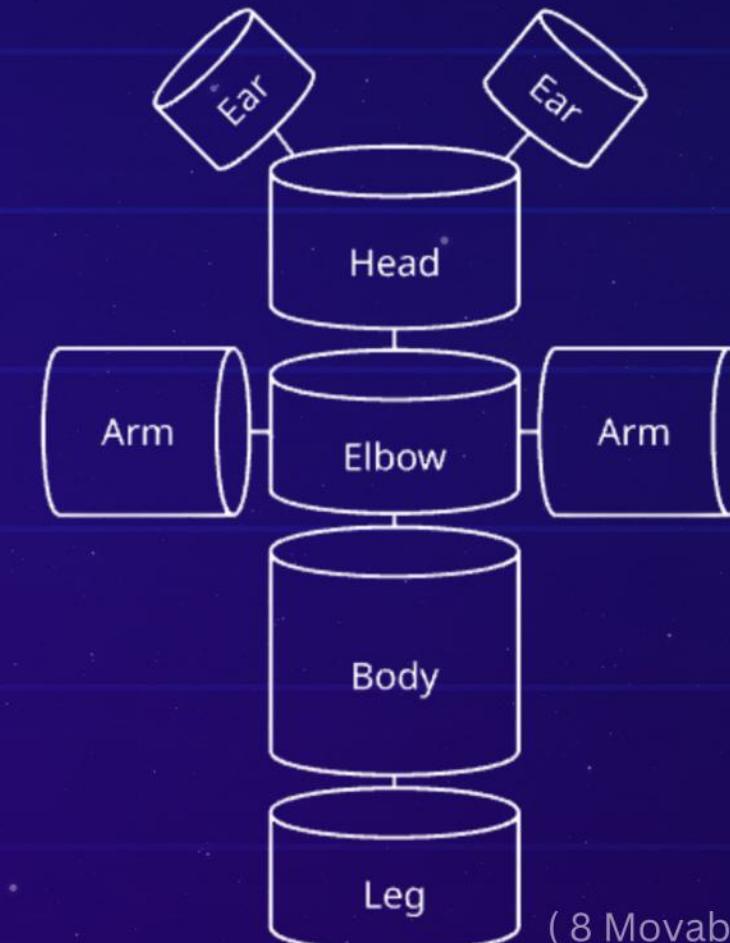
Desktop Friend Robot



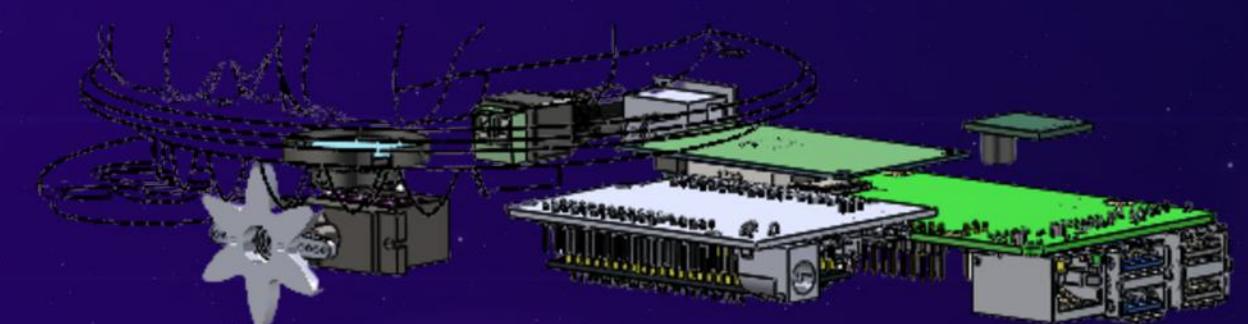
Mechanical and Design



Mechanical



Arm Pivots

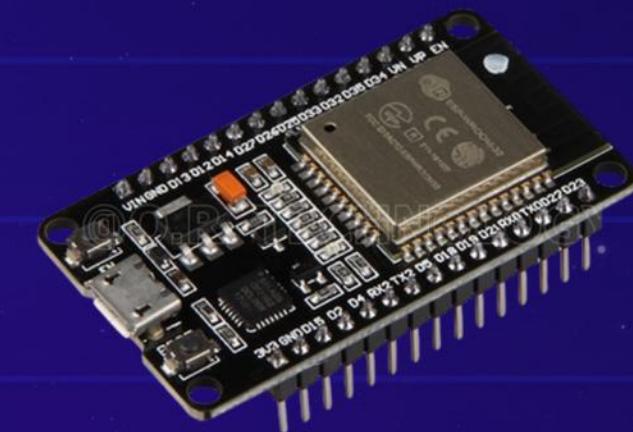


Electronics

System Diagram



**High Level Model B
Raspberry Pi 4**



**Low Level
ESP32 WROOM**



Motion Tracking



Display



Motion & Expression



Sound



Capacitive Touch



Light Strip RGB



Servo



Radar

Communication

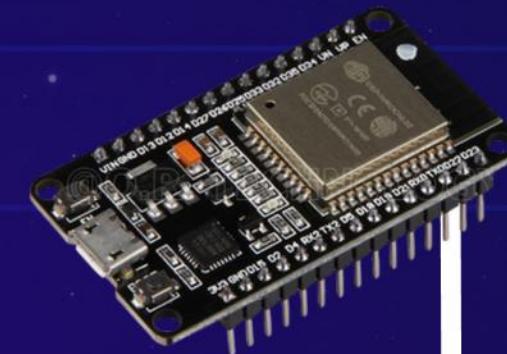


Raspberry Pi



UART

ESP32

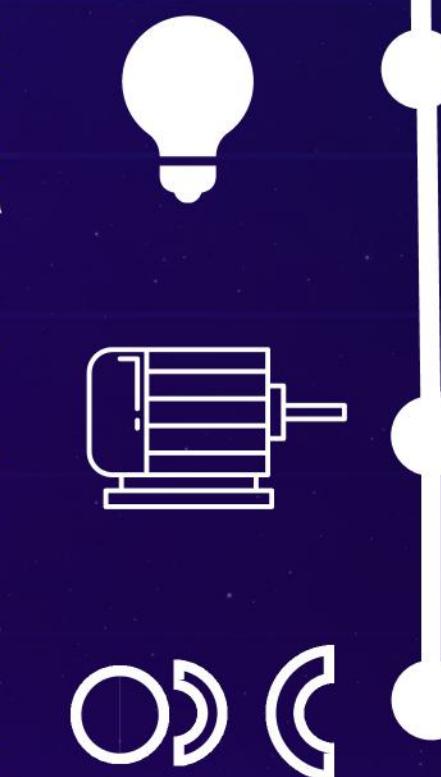


Camera:
SCI

Display:
SPI I²C(Touch)

Light Strip:
NZR

Servo:
PWM



Radar:
Serial

Algorithm

Raspberry Pi

UART (ESP32)
+ MQTT (Local Host)

Information
(Sensors: Touchs, Radar)



Priority First

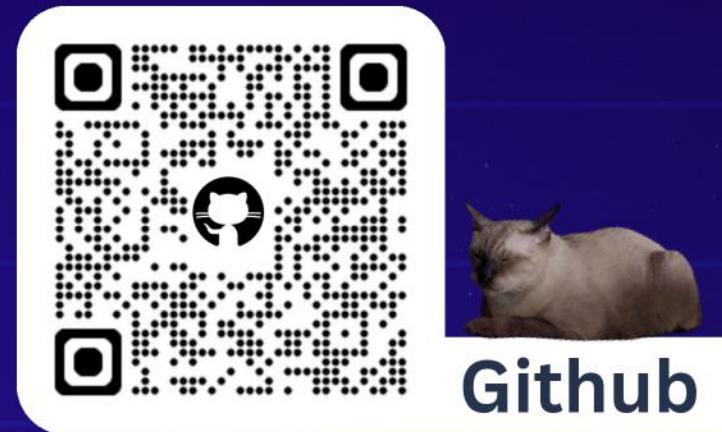
Last

Touching the Head

Display: Happy
Haptic: Activate
Sound: Meow

Radar detected

Movement Near the Face
Display: Dizzy



Raspberry Pi Camera

CNN
(Object Detection)

YOLO 8n

- Optimize
- Reduce Model Size
 - Quantize with ONNX

Error Calculation

Using offset of X to the middle point



As an example only

Error (Padding) Cal.
Error =
 $xPos - (Mid + \Phi)$

Parameter:
xPos
Middle position of the object in x Axis
Mid
Middle position of the screen
 Φ
Adjustment Value



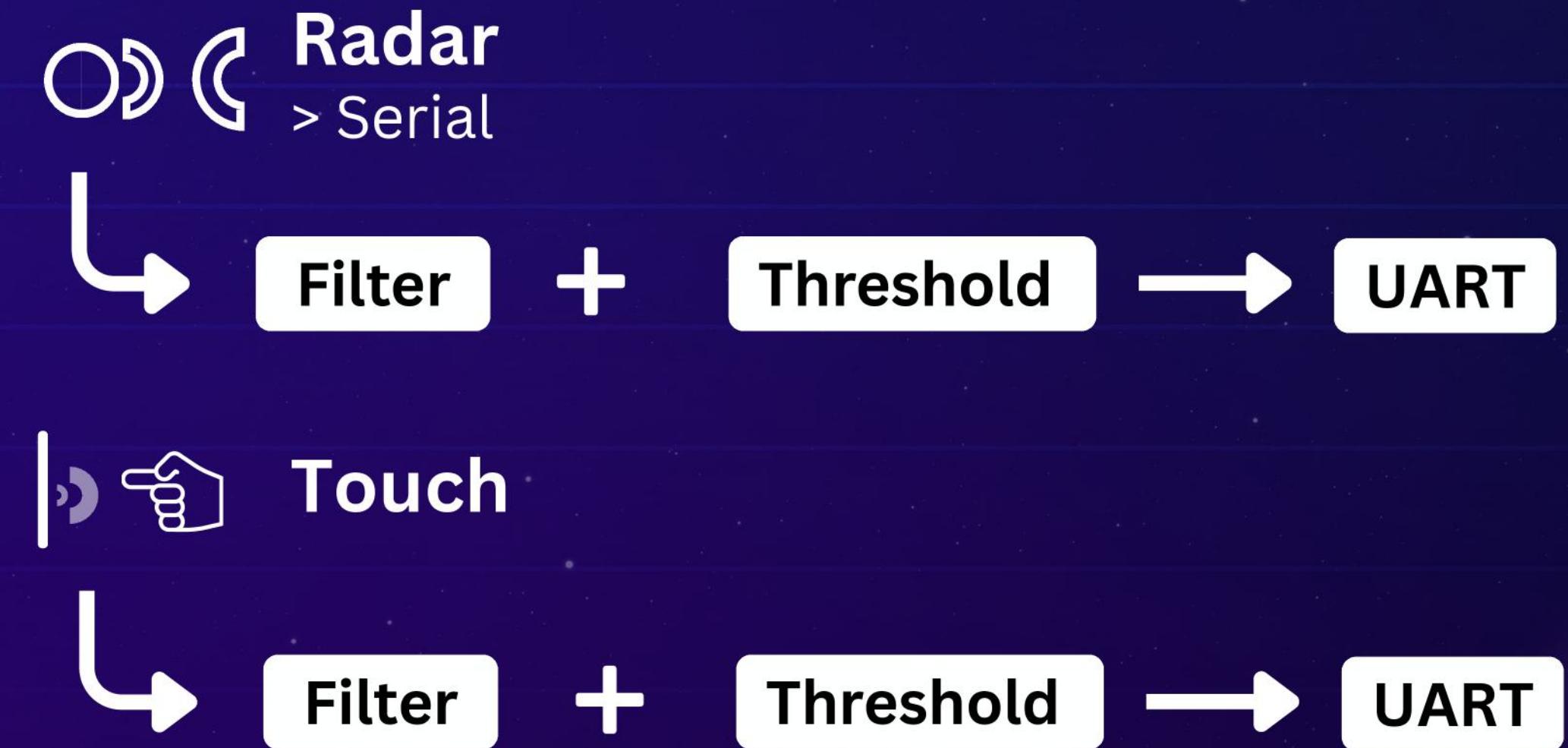
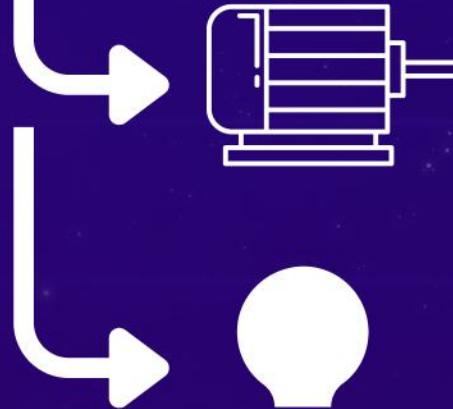
Algorithm

ESP32

UART (Raspberry Pi)

Information

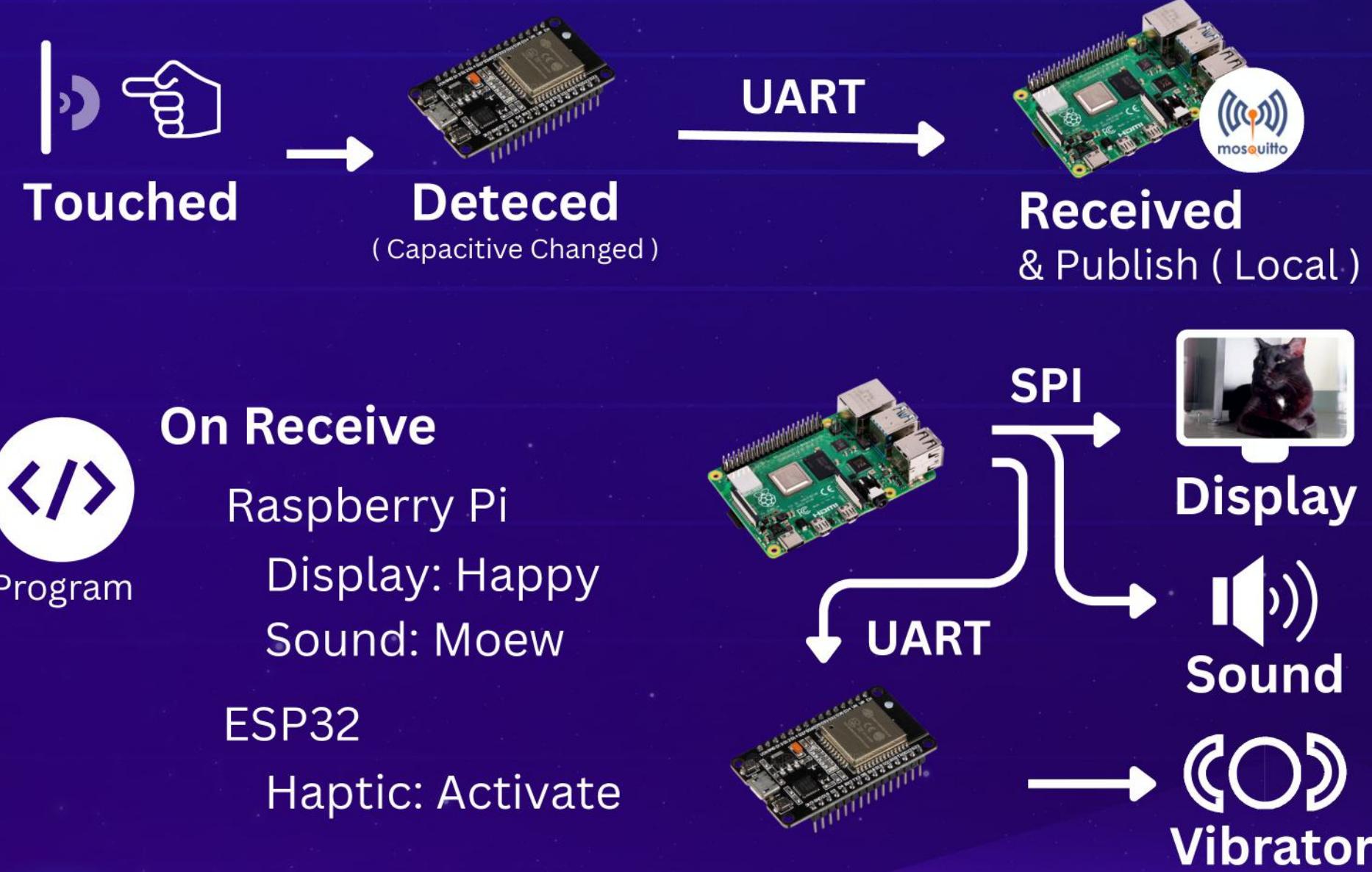
(Command: Light, Servo)



Algorithm

Instance of the Program

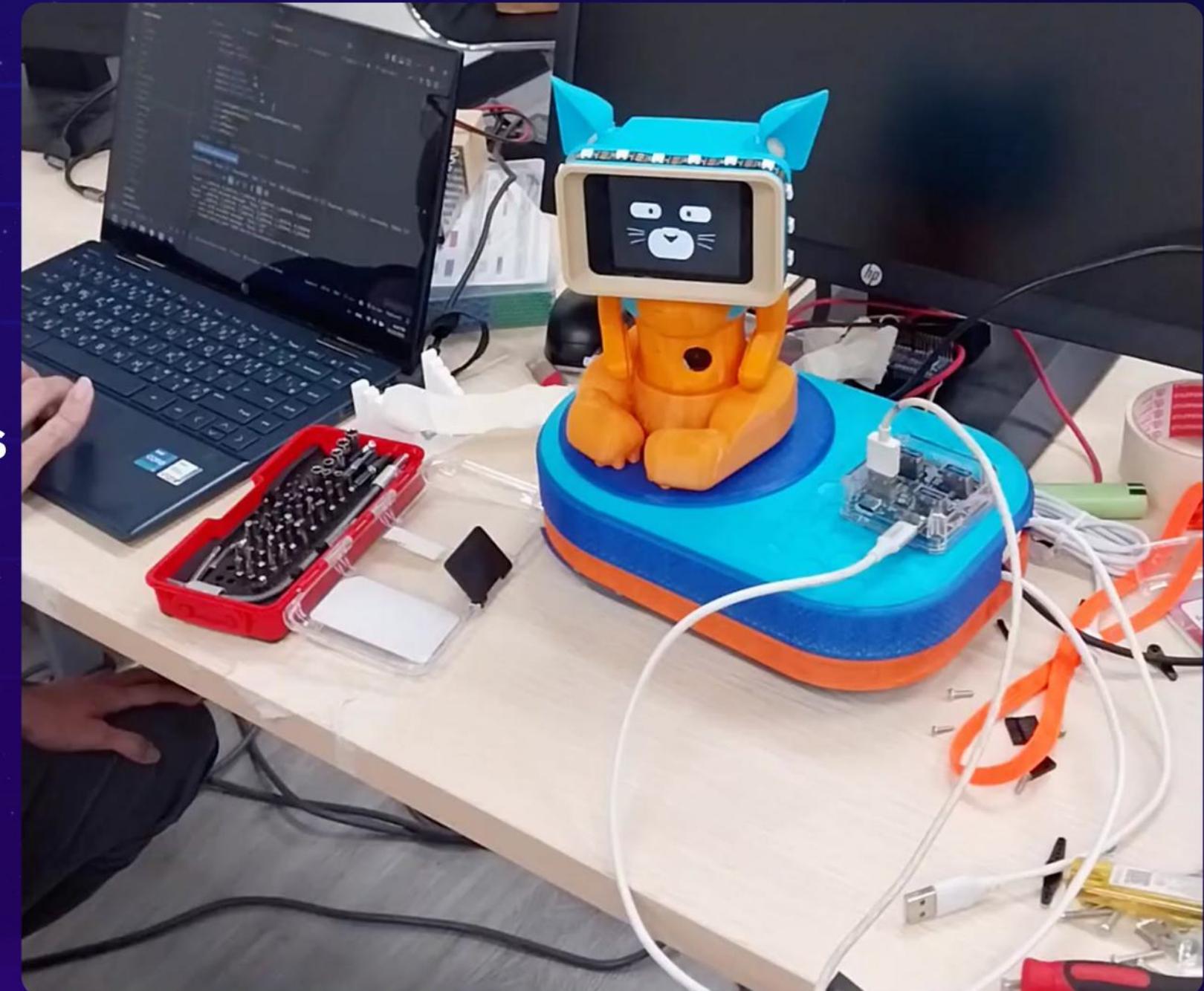
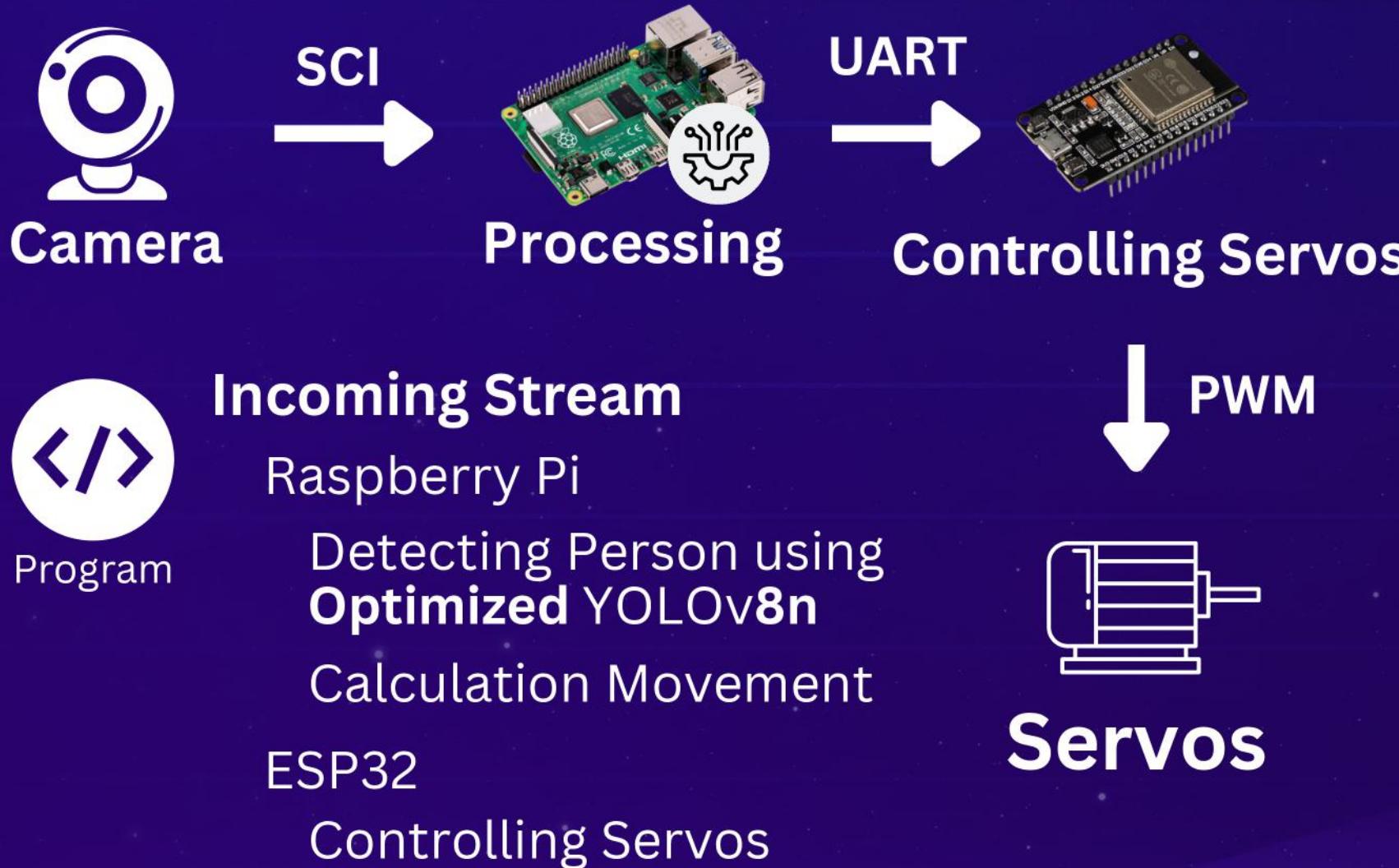
Interaction when **Touching the Head**



Algorithm

Instance of the Program

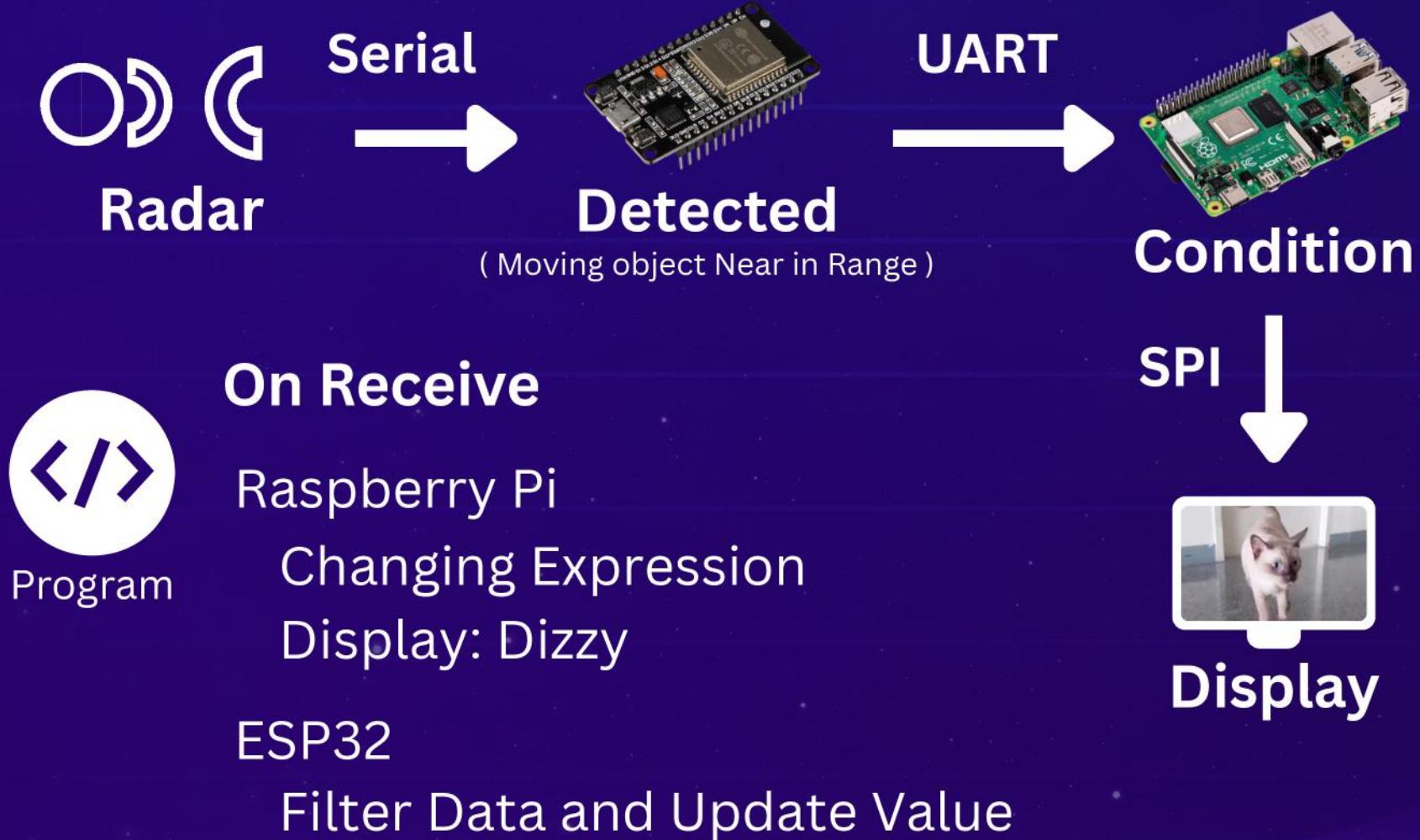
Motion Tracking



Algorithm

Instance of the Program

Interactions with Radar



Algorithm

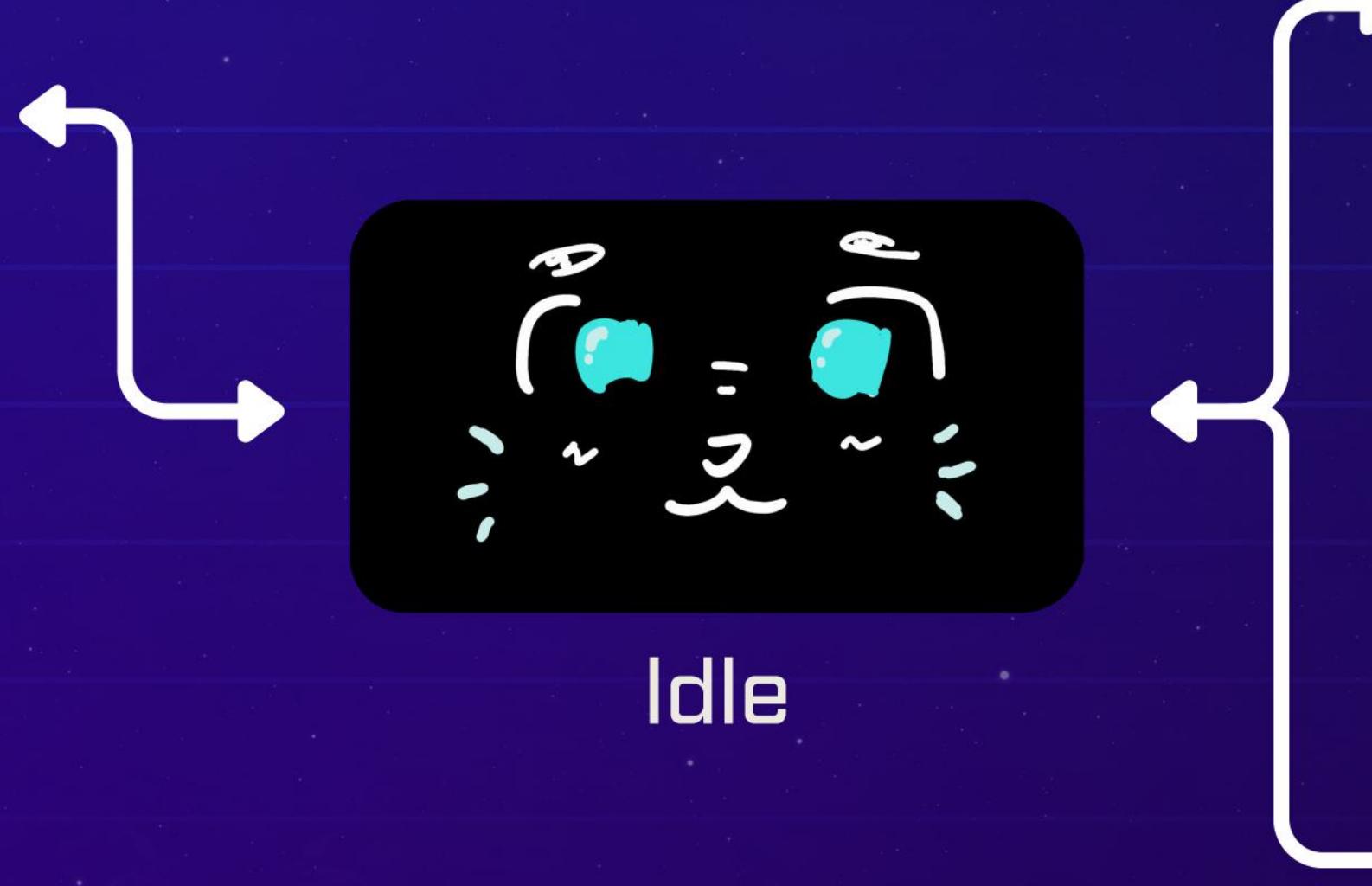
Expression



Sleep

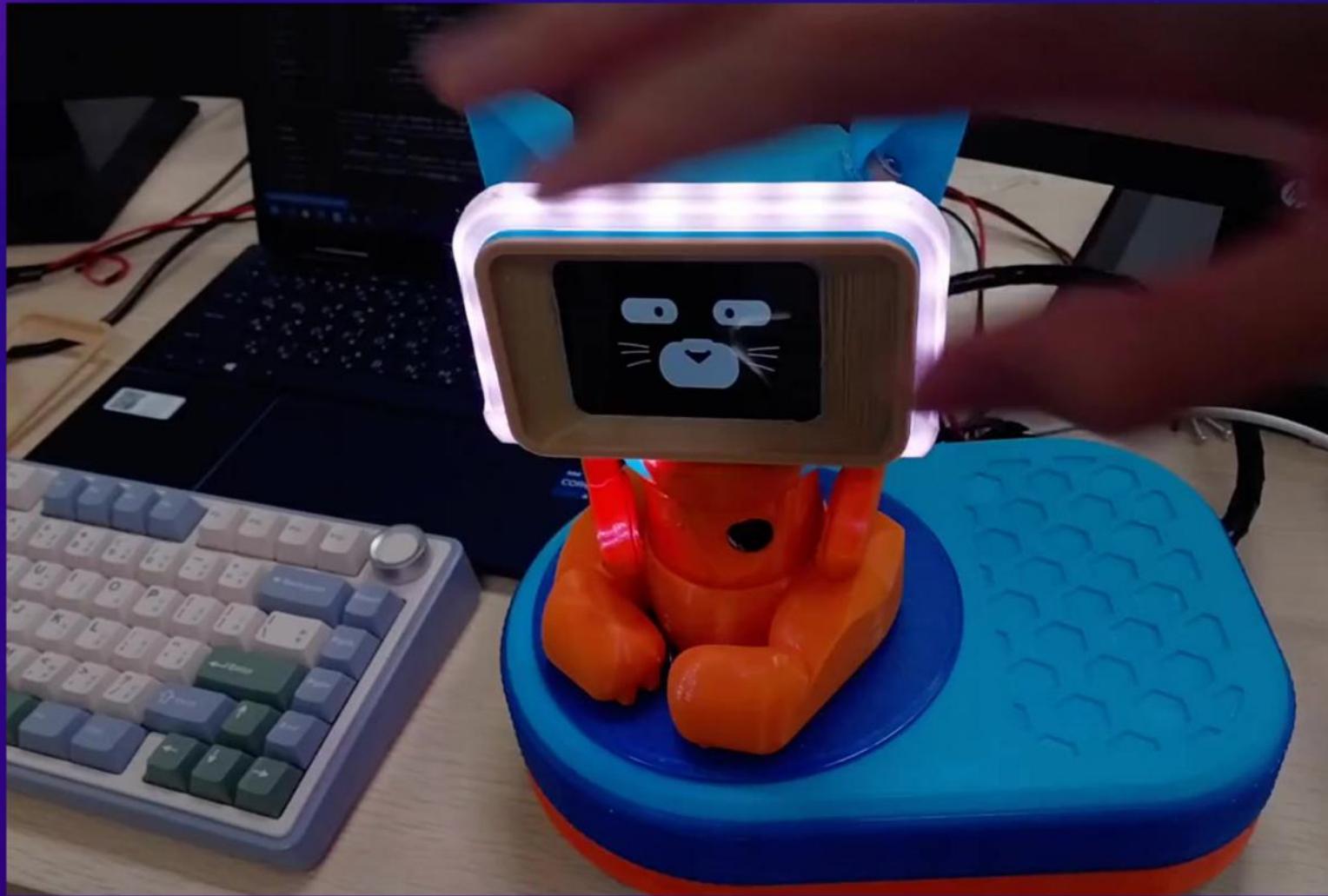


(Waking Up)



Algorithm

Expression



Experiment

Display: Idle, Dizzy, Happy

Sound: Meow

Light: Expression Light



Experiment

Function: Tracking, Expression and Online Controlling,

Including: Display, Sound, Light (Head and Ambient),

Motion Tracking, Servo, Haptic, Radar



Future Development

AI & Software

- **Voice assistant**

Hardware Expansion

- Wireless charging, Mobility

User Experience

- **App companion**
- Cloudlink



Timeline



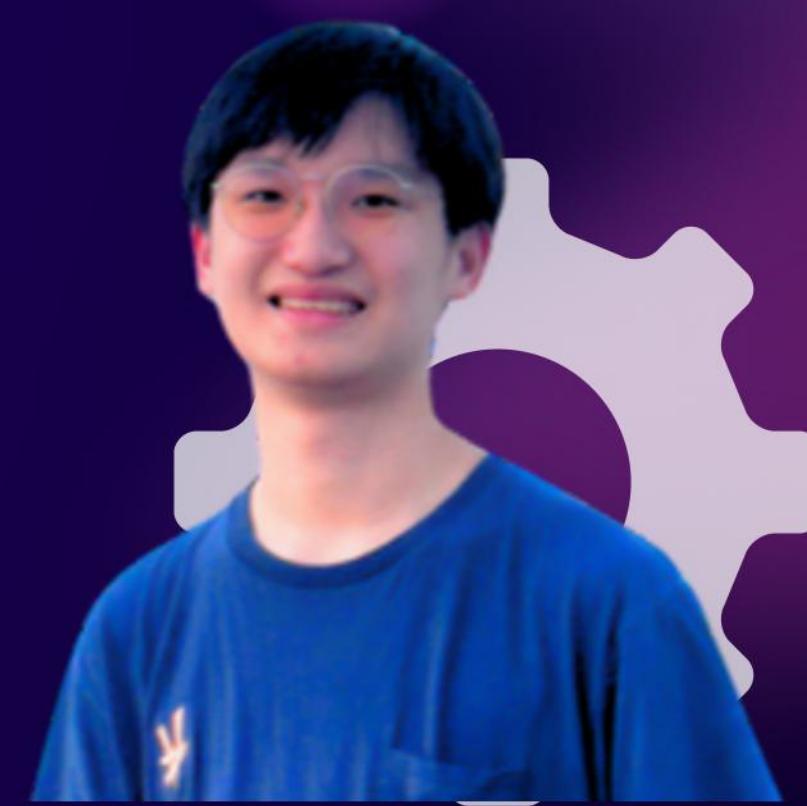
MEMBER



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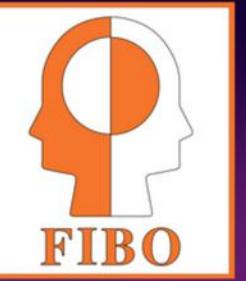
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Q & A





THANK YOU

