# Smart Raspberry Pi Puppy

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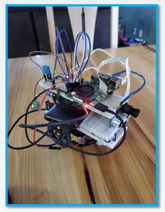
## *Parts:*

**This Smart Raspberry Pi Puppy project includes a lot of different small parts:**

- **Raspberry Pi 4 Model B – 4G RAM**
- **Temperature & Humidity, A Raspberry Pi Camera, GPS, Ultra Sonic Sensor**
- **Mini 3-Layer Round Robot Chassis Kit**
- **Dual H-BRIDGE Motor Drive for DC or Steppers**
- **ELEGOO UNO R3 Board (Support Arduino)**
- **Breadboard, Raspberry Pi Fan, Jumper wires, and resistor kit.**

## *Assembly:*

**This Raspberry Pi Puppy is using the 3-Layer Round Robot Chassis kit as a base for most of its components. The first layer only includes the wheel and the motors to move the wheels**
**The second layer will have one breadboard that includes a UNO R3 Board, 3 Ultra Sonic sensors.**
**The third layer will have one breadboard on top that attached with the Raspberry Pi, a Dual H-RIDGE Motor Driver to control the two wheels, and a camera module sensor.**



## *Architecture:*

**The Raspberry Pi 4 will be acted as the brain for this whole project. Amazon Web Services Greengrass will also be installed on the Raspberry Pi 4 to enable all IoT features.**
**In the second layer of the robot, the ELEOO UNO R3 boar will connect and handle all of the sensors that related to the movement part of the robot such as Ultra Sonic Sensor, and avoidance sensor.**
**In the third layer of the robot, the Raspberry Pi board will connect and handle all the logic part of the robot such as handling OpenCV library for the camera sensor, the temperate and humidity in the Raspberry Pi environment, and trigger where the robot needs to move to avoid object as well as following object.**

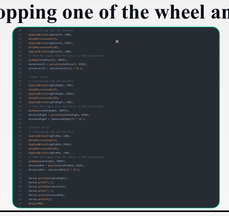
## *Robot Sensors:*

**Most of the sensors are using to handle the robot movement such as Camera Module, Ultra Sonic Sensor, Avoidance Sensor, and Dual H-Bridge. Those sensors will be used asynchronous together to handle all the movement smoothly.**

**Besides all the sensors that related to robot movements, the project also supports some sensors that we usually see in a smart home such as temperature & humidity sensor. All of the data will be updated constantly every 1 minute or manually when the developer decides to trigger any lambda function on AWS.**

## *Robot Movements:*

**The movement of the robot is controlled by a lot of different sensors. The Ultra Sonic Sensors will continuously track the distance of all the objects in the front, back, right, and left of the robot. The avoidance sensor will also alert the robot if it too close to the object when the Ultra Sonic sensors do not catch it. The Camera Module will try to track the object/person that it was told to follow and move close to it. It will use the Ultra Sonic sensors as well as the avoidance to avoid hitting a wall while it comes close to the target.**
**The robot will move forward and backward by using both of the wheels. The robot will turn left and right by stopping one of the wheel and move the other wheel.**



## *Machine Leaning – AI:*

**This project will use a library called OpenCV, which is a software library for dataflow programming. This library will allow me to train my own deep learning module to recognize a target face or a target object quickly.**
**This library is wildly supported by the Raspberry Pi community, and there are a lot of tutorials that you can find to help you with any topic,**

## *Amazon Web Services - IoT:*

**Raspberry Pi will be acted as a Greengrass Core that enables this device to connect to AWS IoT Services.**
**All the message (payload) will be uploaded to AWS IoT core by using the MQTT protocol and save all the surrounding data on the Dynamo DB table on AWS.**
**In this project, the temperate, humidity, altitude, latitude, and longitude will be published up the AWS IoT core every 1 minutes**

## *Conclusion:*

**Raspberry Pi 4 and sensors are some affordable options that allow anyone to create their own smart IoT devices. The IoT platform and cloud computing services like AWS is a great invention because it helps to speed up the development process of training a machine learning model and developing smart devices. With the help of could computing services, it opens a new area where a single developer could design such a large-scale smart devices project in just a few months.**

## *FAQ:*

**Q: What is AWS Greengrass?**

**A: AWS IoT Greengrass is a software that lets you use your device to connect to AWS IoT Services to run AWS Lambda functions or Machine Learning on the cloud**

**Q: What are the all possible way to control the robot?**

**A: The robot can be controlled by using command lines, voice.**

## *GitHub link and other information:*

https://github.com/daoquangvy/RaspberryPiPuppy

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