Help Session: Raspberry Pi

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Today

- Introduction to Raspberry Pi
- Setting up your Raspberry Pi
- Term project (Raspberry Pi) requirements
- Term project (Raspberry Pi) expectations
- Helpful links
Introduction to Raspberry Pi
What is Raspberry Pi?

- Computer (Single Board Computer)
- Learn coding & Build electronics projects
You can do really cool things!

- Raspberry Pi Hexapod Robot
- Raspberry Pi plotter
- PETOI Robot cat
- Raspberry Pi based humanoid robot
OpenCat Framework

Open choice of components

Customizable parts

Muscle
Actuator (Servo)

Low level instructions

Brain
AI chip (Raspberry Pi)
Perception
Personality
Random mood
Decision

String token set

Cerebellum and Spinal Cord
Microcontroller (Arduino)
Power management
Instinctive movements
Instructed movements
Balancing
Pre-crash and recovery

Human Interface
Touch/button
Remotes
Sound
Vision
Bluetooth/WiFi
Apps, etc.

Environment
Ultrasound
Infrared
Lidar
Pressure
GPS, etc.

PETOI Robotic Kitten

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Raspberry Pi advantages

- Small & Portable
- Cheap (price per performance)
- Availability
  - Also in terms of add-ons (HATs)
- Well documented
- Versatile
- Support for a vast array of peripherals (thanks to the Linux Kernel)
- Compact (especially Zero)

Raspberry Pi is the third best-selling computer brand in the world.
Raspberry Pi models

Raspberry Pi 3 Model B+
- 1.4GHz 64-bit quad-core processor
- dual-band wireless LAN
- Bluetooth 4.2/BLE
- faster Ethernet
- Power-over-Ethernet support (with separate PoE HAT)

Raspberry Pi 3 Model A+
- Our third-generation single-board computer, now in the A+ format

Raspberry Pi 3 Model B
- The latest revision of our third-generation single-board computer

Raspberry Pi 2 Model B
- The Raspberry Pi 2 Model B is the second-generation Raspberry Pi

Raspberry Pi 1 Model B+
- The Model B+ is the final revision of the original Raspberry Pi

Raspberry Pi 1 Model A+
- The Model A+ is the low-cost variant of the Raspberry Pi

Raspberry Pi Zero W
- Single-board computer with wireless and Bluetooth connectivity

Raspberry Pi Zero
- Our lowest-cost single-board computer
Setting Up Your Raspberry Pi
What you will need

- Raspberry Pi 3 B+
- SD card
- Power supply adapter
- HDMI cable
- USB mouse
- USB keyboard
- TV or monitor
- USB mouse
- USB keyboard
OS options

- Ubuntu MATE
- Snappy Ubuntu Core
- LibreELEC
- PiNet
- Windows 10 IoT Core
- OSMC
- RISC OS
- Weather Station
- IchigoJam RPi
- NOOBS
- Raspbian

The official supported Raspberry Pi Operating System - based on Debian
OS options

**New Out Of the Box Software**

- NOOBS
- Raspbian

The official supported Raspberry Pi Operating System - based on Debian
Setting up your Raspberry Pi
SSH
(Secure Shell)
**GPIO**

General Purpose Input/Output

Raspberry Pi A+ / B+ and Raspberry Pi 2 GPIO pins

- **GPIO**
- **Ground**
- **3.3v**
- **5v**
- **ID EEPROM**
  - Advanced use only!
Programming language options

Almost everything

- C, C++, Python2/3, Javascript (node), Ruby, Lisp, Rust...

Most projects are either C or Python
GPIO Libraries

Python/C

- RPi.GPIO
  - RPi GPIO Code Samples
- RPIO.GPIO
- wiringPi (Python/C)
- pigpio (Python/C/Javascript)
- gpiozero
- bcm2835
Tips

• For (prototype) web servers: **Python Flask**

• For GUls: **Tkinter** (Python) or **Qt** (C++) or Node.js+Express.js

• If you need e.g. read analog voltages and control motors
  - consider combining an Arduino with a Raspberry Pi
  (Raspberry Pi commands Arduino board via serial (USB))
Term Project (Raspberry Pi) Requirements
Requirements

Project must involve:

1. A single board computer (eg. Raspberry Pi)
   a. with Wifi capability
   b. with an operating system installed on it
2. Communication with at least one other computer
   a. eg. another board, laptop or networked computer
3. At least one sensing device
   a. eg. sensor, camera, a computation device supplying data
To do:

D1. Team composition and idea proposal (done)

D2. Progress report

D3. Final report and demo
   - Report: 1500-2500 words
   - Code
   - Demo: 10-15 minutes to a TA

D4. Presentation (slides)

D5. Peer review
D2. Progress report

Evaluate for at least 2 attribute:

- Limitations like resolution, accuracy or response time
- Potential security holes and how they can be mitigated
- Power consumption estimates of the device
- Cost and marketability of a device based on your project
Term Project (Raspberry Pi) Expectations
Expectations

- Originality
- Innovation
Helpful Links
Helpful links

● **Help Guides**
  ○ [Setting up SSH](#)
  ○ [Help videos (getting started)](#)
  ○ [FAQs](#)
  ○ [Embedded Linux Wiki](#)

● **Forums & Tutorials**
  ○ [Raspberry Pi Forums Raspberry Pi Projects](#)
  ○ [Hackaday.io Raspberry Pi projects](#)
  ○ [Adafruit learning guides](#)
  ○ [Raspberry Pi subreddit](#)
  ○ [Instructables](#)