ASSIGNMENT

TOPIC: ARDUINO AND RASPBERRY PI

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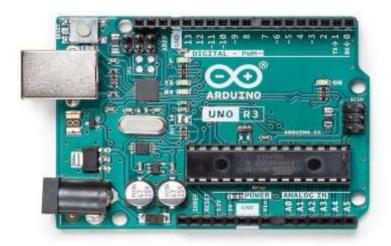
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Arduino

What is Arduino?

Arduino is an open-source electronic device that can read inputs (such as light on a sensor, finger on a button, or a Twitter message), and based on these inputs produces output (such as turning on an LED or activating a motor). Arduino was designed at Ivrea Interaction Design Institute as an easy tool aimed at students without a background in electronics and programming. After gaining popularity, it started changing to adapt to new needs and challenges. Owing to its simple and easily accessible user interface, it has empowered many projects, from everyday objects to complex scientific instruments.

Arduino boards are microcontrollers, not full computers with their own operating system like Raspberry Pi. They simply execute code written in C/C++, stored in their firmware. Arduino Integrated Development Environment (IDE) is an open-source software used to write codes and upload them to an Arduino board.

An important upside of Arduino is that it is open-source, which means that many design files and source code are already available. You can pick any one among them or improve them to make your own Arduino board.

Features

- Most of the Arduino boards come with an 8-bit Microcontroller.

- 32k bytes of flash memory and 2k bytes of SRAM (Static Random Access Memory).

- Input voltage required- 7 V – 12V

- Arduino uses C/C++ as a programming language.

- Digital I/O pins- 14

- Analog Input pins- 6

- Clock frequency-

- Processor speed ranges from 8 MHz to 400 MHz. The average speed of most of the Arduinos is 16 MHz.

- Flash Memory- 32KB

- It is limited to IDE (Integrated Development Environment)

Advantages of Arduino

- Arduino's hardware and software are open-source, allowing customization of code and board.

- It presents a cost advantage compared to Raspberry pi, offering budget-friendly choice.

- It user-friendly nature enhances appeal, with easy learning and usage.

- Programming Arduino through its integrated Development (IDE) is straightforward.

- Arduino benefits from versatile applications.

Dis-Avantages of Arduino

- It possesses significantly lower processing capability in comparison to Raspberry pi.

- Arduino boards lacks support for internet and wireless connectivity.

- Utilizes an 8-bit cpu architecture.

- Arduino is limited in its ability to execute intricate tasks.

Raspberry Pi

What is Raspberry Pi?

A small, fully functional computer that can be plugged into a computer monitor, keyboard, and mouse. It has all qualities of a PC- a dedicated processor, memory, and a graphics driver. It even has its own operating system called Raspberry Pi OS which is an optimized version of Linux.

Raspberry Pi does not offer storage, but you can use microSD cards to store whatever OS (Raspberry Pi, Ubuntu Mate, etc) you like. Raspberry Pi also contains Bluetooth, ethernet, and WiFi-based connectivity, so it can also be used to transfer files over the internet. Raspberry Pi project design and the software are not open-source.

Since a Raspberry Pi board is no less than an entire computer inside a Printed Circuit Board, it is often called Single Board Computer or SBC. Raspberry Pi foundation is continuously updating and making it better. Since its release, it has been a popular choice for application in Robotics, Weather monitoring, IoT, and many other electronic systems.

Features

- Superior software implementation
- 64-bit Quad-core processor
- Large RAM (latest Raspberry Pi 4 Model B Board has up to 8G of RAM)
- Processor speed- 700MHz- 1.5GHz

- Raspberry Pi has 40 input/output pins.

- It can be connected to the Internet.

- It can run all kinds of applications (including MS Office and Email).

- It contains everything- CPU (Central Processing Unit), GPU (Graphics Processing Unit), Ethernet port, GPIO (General-purpose Input/Output) pins, and power source connector.

Advantages of Raspberry pi

- Since it supports an operating system, It can perform complex operations like Weather monitoring, Controlling robots, etc.

- You can use it as a portable computer because it has everything- from CPU (Central Processing Unit) to ethernet port and WiFi support.

- It has a large number of GPIO (General-Purpose Input/Output) pins (the famous model of Raspberry Pi has 40 GPIO pins). Therefore, it can support a large number of sensors.

- It has superior processing power. The 4 B variant of Raspberry Pi comes with a 1.6 GHz processor.

- It can run all kinds of applications (including MS Office and Email).

Dis-Advantages of Raspberry pi

- Raspberry Pi"s hardware and software are closed-source. It means that you cannot customize your own Raspberry Pi single-board computer (SBC).

- Raspberry Pi does not have any internal storage, it requires a micro SD card to work as internal storage.

- It sometimes overheats during heavy operations.

Difference Between Arduino and Raspberry Pi

Parameters	Arduino	Raspberry Pie
Control Unit	The Control Unit of the Arduino is from the ATmega family.	The Control Unit of the Raspberry Pi is from the ARM family.
Basis	Arduino works on the basis of a microcontroller.	Raspberry Pi, on the other hand, works on the basis of a microprocessor.
Use	The Arduino basically helps in controlling all the electrical components that connect to a system's circuit board.	The Raspberry Pi primarily computes data and info for producing valuable outputs. It also controls the various components in any given system on the basis of the outcome (of the computation).
Structure of Hardware and Software	The Arduino boards have a very simple structure of software and hardware.	The Raspberry Pi boards consist of comparatively complex software and hardware architecture.
Type of CPU Architecture	Arduino has an 8-bit architecture.	Raspberry Pi has a 64-bit architecture.

RAM Usage	Arduino makes use of very little RAM of about 2 kB (Kilobytes).	Raspberry Pi always requires more RAM than Arduino of about 1 GB (Gigabytes).
Processing Speed	Arduino clocks 16 MHz (Megahertz) of processing speed in a system.	The Raspberry Pi clocks 1.4 GHz (Gigahertz) of processing speed in a system.
Cost Efficiency	It has a higher cost-efficiency because it is comparatively cheaper.	It has a lower cost-efficiency because it is comparatively more expensive.
I/O Drive Strength	The I/O current drive strength in the case of Arduino is higher.	The I/O current drive strength in the case of Raspberry Pi is lower.
Power Consumption	Arduino consumes power of about 200 MW (Megawatts).	Raspberry Pi consumes about 700 MW.

Raspberry Pi Or Arduino – Which is better?

It is actually Raspberry Pi which has an upper hand in a fight between itself and Arduino.

With its greater processing speed, internet connectivity, support for a large number of different sensors, and its ability to perform complicated tasks, it is a better choice.

But this does not mean that Arduino is completely out of the contention. It has its own advantages. It is cheaper, open-source, and good for beginners.

CONCLUSION

Both Arduino and Raspberry Pi have their advantages and disadvantages. The choice between them depends on the type of your project and your budget.

Arduino is suitable for repetitive tasks like- opening and closing doors, turning on/off lights, etc. So if your project contains any repetitive element and simply requires providing output based on sensory inputs, Arduino should be your choice.

Raspberry Pi is best suited to perform complicated tasks like- driving complicated robots, weather monitoring, posting to the internet, etc. So your project requires complex functionalities and internet connectivity, Raspberry Pi is your solution.

I hope this might have helped you to know Arduino and Raspberry Pi and take an informed decision.