Experiment No: 01

Title: Study of Raspberry-Pi, Beagle board, Arduino and other micro controller (History & Elevation)

What is the difference between the Raspberry-Pi, Beagle board, Arduino?

A Raspberry Pi is a general-purpose computer, usually with a Linux operating system, and the ability to run multiple programs. It is more complicated to use than an Arduino.

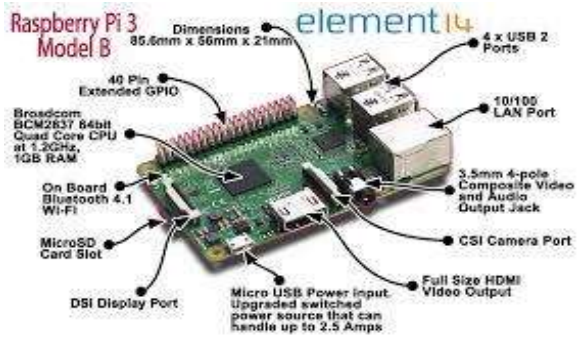
The BeagleBoard is a low-power open-source single-board computer produced by Texas Instruments in association with Digi-Key and Newark element14. The BeagleBoard was also designed with open source software development in mind, and as a way of demonstrating the Texas Instrument's OMAP3530 system-on-a-chip.

An Arduino is a microcontroller motherboard. A microcontroller is a simple computer that can run one program at a time, over and over again. It is very easy to use.

Theory:

Raspberry pi

Though the Raspberry Pi doesn't offer internal storage, we can use SD cards as the flash memory in the total system, allowing you to quickly swap out different versions of the operating system or software updates to debug. Because of this device is independent network connectivity, you can also set it up to access via SSH, or transfer files to it using FTP. It is having 512 MB RAM, 700 MHz microprocessor and hardware support for SPI, I2C and Serial.



Advantages (Pros)

Following are some of the main advantages of Raspberry Pi

- It is very easy to connect to the internet
- Entire Linux software stack is available
- Can be programmed using a variety of programming languages

Disadvantages (Cons)

Following are some of the main limitations of Raspberry Pi

- Accessing hardware is not a real-time. If the CPU is busy, then interfacing with the hardware can be delayed
- Does not have enough power to drive inductive loads
- There is no inbuilt Analog to Digital converter available
- The hardware design is not open source. Even though it is not a big deal, for some people it might a deal breaker

BeagleBoard

What is BeagleBone Black?

BeagleBone Black is a low-cost, community-supported development platform for developers and hobbyists. Boot Linux in under 10 seconds and get started on development in less than 5 minutes with just a single USB cable.

Processor: AM335x 1GHz ARM® Cortex-A8

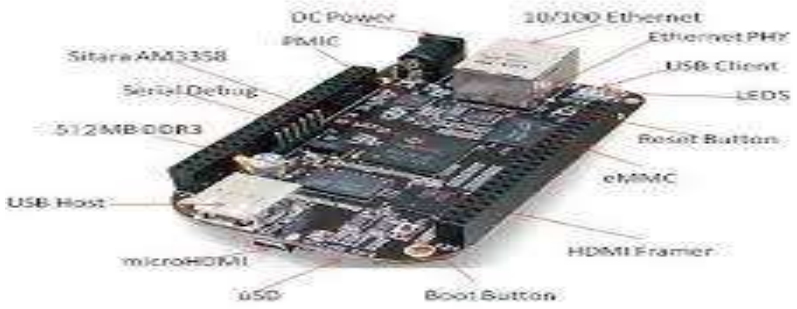
- 512MB DDR3 RAM
- 4GB 8-bit eMMC on-board flash storage
- 3D graphics accelerator
- NEON floating-point accelerator
- 2x PRU 32-bit microcontrollers

Connectivity:

- USB client for power & communications
- USB host
- Ethernet
- HDMI
- 2x 46 pin headers

Software Compatibility:

- Debian
- Android
- Ubuntu
- Cloud9 IDE on Node.js w/ BoneScript library
- plus much more

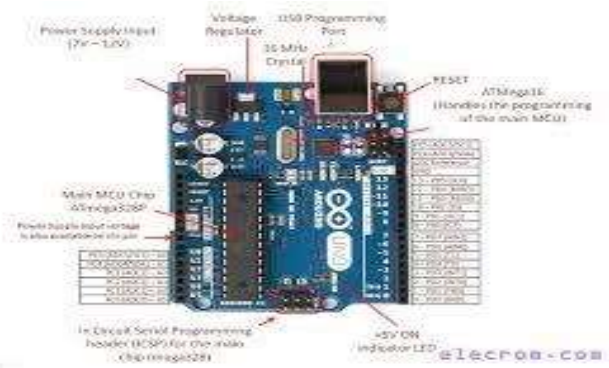


The board was designed using Cadence OrCAD for schematics and Cadence Allegro for PCB manufacturing; no simulation software was used.The BeagleBoard measures approximately 75 by 75 mm and has all the functionality of a basic computer.[9] The OMAP3530 includes an ARM Cortex-A8 CPU (which can run Linux, Minix,[10] FreeBSD,[11] OpenBSD,[12] RISC OS,[13] or Symbian; a number of unofficial Android ports exist[14][15]), a TMS320C64x+ DSP for accelerated video and audio decoding, and an Imagination Technologies PowerVR SGX530 GPU to provide accelerated 2D and 3D rendering that supports OpenGL ES 2.0. Video out is provided through separate S-Video and HDMI connections. A single SD/MMC card slot supporting SDIO, a USB On-The-Go port, an RS-232 serial connection, a JTAG connection, and two stereo 3.5 mm jacks for audio in/out are provided. Built-in storage and memory are provided through a PoP chip that includes 256 MB of NAND flash memory and 256 MB of RAM(128 MB on earlier models). The board uses up to 2 W of power and can be powered from the USB connector, or a separate 5 V power supply. Because of the low power consumption, no additional cooling or heat sinks are required.

Using Arduino

An Arduino board is best used for simple repetitive tasks: opening and closing a garage door, reading the outside temperature and reporting it to Twitter, driving a simple robot.

Raspberry Pi is best used when you need a full-fledged computer: driving a more complicated robot, performing multiple tasks, doing intense calculations (as for Bitcoin or encryption)



Arduino uno

Advantages (Pros)

Following are some of the main advantages of Arduino.

- Very easy to get started.
- Can be used for real-time applications for both hardware, software and IDE is open source.
- Not much programming knowledge needed to do basic stuff.
- It is very easy to extend and has tons of user contributed shields and libraries. Shields are available to do attractive much anything.

Disadvantages (Cons)

Following are some of the main limitations of Arduino.

- It is not very powerful when compared with Raspberry Pi
- You need to program using either Arduino or C/C++
- Connecting to the internet is slightly difficult, but not impossible. Parsing of Arduino with YQL and JSON is possible.

Difference between **Microcontroller and Microprocessor**

Microcontroller

It's like a small computer on a single IC. It contains a processor core, ROM, RAM and I/O pins dedicated to perform various tasks. Microcontrollers are generally used in projects and applications that require direct control of user. As it has all the components needed in its single chip, it does not need any external circuits to do its task so microcontrollers are heavily used in embedded systems and major microcontroller manufacturing companies are making them to be used in embedded market. A microcontroller can be called the heart of embedded system. Some examples of popular microcontrollers are 8051, AVR, PIC series of microcontrollers,.

Microprocessor

Microprocessor has only a CPU inside them in one or few Integrated Circuits. Like microcontrollers it does not have RAM, ROM and other peripherals. They are dependent on external circuits of peripherals to work. But microprocessors are not made for specific task but they are required where

tasks are complex and tricky like development of software's, games and other applications that require high memory and where input and output are not defined. It may be called heart of a computer system. Some examples of microprocessor are Pentium, I3, and I5 etc.

Question :

1) Explain the Difference between Raspberry-Pi, Beagle board, Arduino.

2) Give the advantages and disadvantages of Raspberry-Pi, Beagle board, Arduino.

3) Write short note on Raspberry-Pi, Beagle board, Arduino.