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SURVEY ON RASPBERRY PI FOR INDUSTRIAL SENSOR

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Abstract: This paper shows Raspberry Pi feature, advantages, and comparison with single board computer. Raspberry pi cheap, flexible, fully customizable and programmable small computer board. Raspberry Pi board consist of ARM11 programmable processor, Real time operating system and on – chip memory. Raspberry Pi Most effective factor is Reduce Complexity of devices, Reduce over all cost of system.

Keywords: Raspberry Pi, GPIO, Operating System

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INTRODUCTION

Fast growing industrial age every industrial unit needs speed in manufacturing. Automation provides far better service to customers eliminating the monotonous work by human, achieving accuracy and speed in work. They are high in demand and are used to carry out most of the work which saves time and is more efficient. The use of Open-Source environment makes it effective cost , Linux based Operating system used in Raspberry Pi (Raspbian OS),and Python are freely available for user to use and also to develop [1].

II. What is Raspberry Pi ?

Raspberry Pi is a small, powerful, cheap, hackable and education-oriented computer board introduced in 2012(Fig.1). This credit card-sized computer with many performances and affordable for 25-35\$ is perfect platform for interfacing with many devices. The Raspberry Pi board contains a processor and graphics chip, program memory (RAM) and various interfaces and connectors for external devices. Some of these devices are essential, others are optional but all Raspberry Pi models have the same CPU named BCM2835 which is cheap, powerful, and it does not consume a lot of power [2]. Raspberry Pi operates in the same way as a standard PC. SD card use for installing operating system, Flash memory card normally used in digital cameras is configured in such a way to 'look like' a hard drive to Raspberry Pi's processor. The unit is powered via the micro USB connector. Internet connectivity via an Ethernet/LAN cable or via an USB dongle (WiFi connectivity) [3, 4].

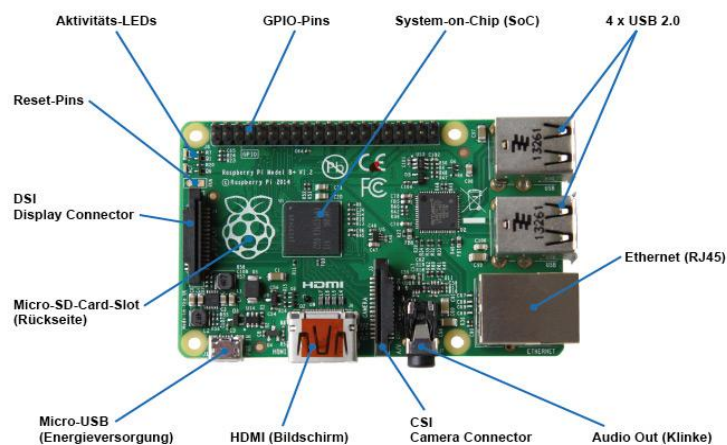


Fig 1. Raspberry Pi Board [5]

Like any other computer, the Raspberry Pi also uses an operating system. OS is a flavor of Linux called Raspbian. Linux, as a free and open source program, is a great match for Raspberry Pi. On one hand, it keeps the price of the platform low.

III. Flexibility

One of the great things about the Raspberry Pi is that it is very flexible and there's no single way to use it. For example, it can be used for: general purpose computing, learning to program or integrate it with electronics projects [3]. The following core components enable the wide range of its usage.

- Four USB 4.0 ports allows connecting peripherals and storage devices while one micro USB serve for powering device.
- The 3.5mm analog audio jack allows connecting headphones and speakers to the Raspberry Pi what is especially useful for audio and media player based projects.
- Composite RCA port for attaching the yellow video cable from TV allows using TV a monitor.
- The High Definition Multi-media Interface (HDMI) port allows the Raspberry Pi to be hooked up to high definition televisions and monitors that support the technology. It is also used for streaming video and audio from the web to TV.
- Support for DSI (Display Serial Interface) – Raspberry Pi can be expanded with display.
- Support for CSI (Camera Serial Interface) – Raspberry Pi can be expanded using camera.
- The GPIO (general purpose input and output) pins on the Raspberry Pi are the main way of connecting with other electronic boards. It consists of 40 pins arranged in two rows containing 20 pins each. The left row contains the even-numbered pins, and the right row contains the odd-numbered pins (Fig 2)

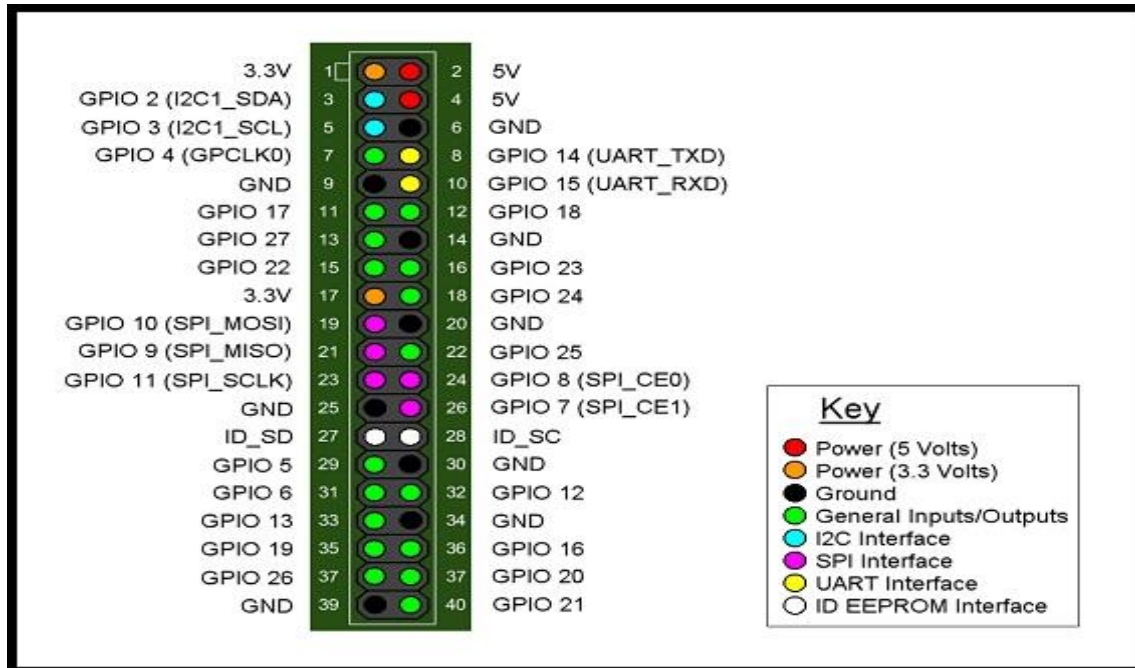


Fig: 2 Pin Diagram of GPIO [6]

The GPIO pins on the Raspberry Pi are the main way of connecting with other electronic boards. In other words, the GPIO pins can accept input and output commands and thus can be programmed on the Raspberry Pi. It is important to note that there is a certain difference between GPIO pins schedule among model a model B and model B+ of the Raspberry Pi.

IV. Power and Memory

The CPU is the main component of the Raspberry Pi, Responsible for carrying out the instructions of a computer program via mathematical and logical operations. The processor of Raspberry Pi is a 32 bit, 700 MHz System on a Chip (SoC), which is built on the ARM11 architecture and can be overclocked for more power. ARM chips come in a variety of architectures with different cores configured to provide different capabilities at different price points. This means that the vast majority of the system's components its central and graphics processing units, audio and communications hardware along with 256 – 512 MB memory chip, are built onto single component. The ARM-based BCM2835 is the reason why the Raspberry Pi is able to operate on just the 5V 1A power supply provided by the onboard micro USB port. The Raspberry Pi for operating requires up to 700mA. The unit of Raspberry Pi can be powered using a range of power sources (assuming they are able to provide enough current ~700mA).

It is important to note there's no hard drive on the Raspberry Pi; everything is stored on a Secure Digital (SD) Card. Although large SD cards holding 16 GB, 32 GB or more are available, they are often prohibitively expensive, but the minimum required size of SD card is 2 GB depending on the distribution demands of the operating system. If possible, it is necessary to use the SD card class 10. This storage can be expanded by using devices that provide an additional hard drive upon using the USB ports. Raspberry Pi Model A has 256MB of RAM while the Model B has 512MB. Compared to other considered systems Raspberry Pi has the largest amount of memory.

IV. Operating System

Like every computer, the Raspberry Pi needs an operating system, and the preferred one for the Raspberry Pi is Linux distribution. That's partly because it's free, but mainly it's because it runs on the Raspberry Pi's ARM processor [2]. There are several distribution of Linux ported to the Raspberry Pi's BCM2835 chip, including Debian, Fedora Remix and Arch Linux [7]. The Raspberry Pi uses an operating system called Raspbian.

This Table shows comparison between single board computer.

Table 1. Comparison between single board computer

Features	Aadino Uno	Raspberry Pi (Model B+)	BeagleBone Black
Processor	ATmega328	ARM11	AM335X
RAM	2Kbyte	512MB	512MB
Speed	16MHz	700MHz	700Mz
Operating system	N/A	Linux	Android, linux, Windows etc
Size	2.95in x 2.125in	3.37in x 2.125in	3.4in x 2.1in
Cost	\$29.95	\$35	\$45

V. Advantages

After analysis above performed, general conclusions about the Raspberry Pi advantages can be stated.

- It is important to mention that Raspberry Pi is a small independent computer that runs on the Linux operating system and can be programmed as needed.
- It has a very large working memory (many other sensor nodes do not have).
- It has expandable memory for store the data.
- It works on processor which supports a large set of instructions.
- It operates at speed 700 MHz.
- It has support for USB 4.0 which allows its expansion with a large number of peripherals.
- Communication and expansion with network devices over a LAN adapter are possible.
- Possible Form an expandable system with various electronic components (sensors and electronic circuits) using digital inputs and outputs, I2C or SPI protocols (most of today's devices use one of these methods of communication).

VI. CONCLUSION

Raspberry Pi is ultra-cheap Serviceable computer board. With support for a large number of input and output peripherals, and network communication it makes the perfect platform for interfacing with many different devices and using in wide range of applications. By coupling it with RF Module it can communicate remotely. Installing the webserver on the Raspberry Pi board it providing access to the internet, Raspberry pi becomes complete and ideal system to connecting Industrial Sensor.

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