



Automated Environmental Data Acquisition System using Raspberry Pi

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Abstract: In this paper, we are exhibiting an automated monitoring system using DHT-11, MQ-7, MQ-2, LDR sensor and this sensor data is represented graphically using ThingSpeak. For obtaining the stable data using all these sensors is a challenging task which is done by using shell programming language and interfaces the obtained data on Internet of Things (IoT). By successfully performing this system, it can be used in many applications such as Home automation weather station, Laboratory temperature logger. This system is implemented using Raspberry Pi B+ and Controller based ADC sensor module. The system provides a break through utilizing the sensor data on any applications as it is represented using ThingSpeak which is an emerging area of research. The system is pre-programmed as such it will work as standalone system mode.

Index terms: Raspberry Pi, Raspbian OS, Arduino DHT-11, MQ-7, MQ-2, LDR sensors, Shell, ThingSpeak.

INTRODUCTION

ARM board provide high speed, better accuracy, good flexibility and low cost solution for development of embedded system. Using ARM board as development platform speed up the process of development. Raspberry pi Model B (as shown in figure.1) is currently most popular ARM board. It has a Broadcom BCM2835 system on a chip SoC, which includes an ARM1176JZF-S 700 MHz processor, VideoCore IV GPU, and is shipped with 512MB of RAM. It does not include a built-in hard disk instead it uses an SD card for booting and long-term storage. It comes with two USB ports, RJ45 Ethernet port, HDMI port and RCA output on board.



Figure 1 Porting OS on pi

Linux provide open source distributions for young developers to download, customize, compile and burn OS to their core for free. There are many linux distribution

which can be ported on Raspberry pi like Debian, RiscOS, Fedora, Moebius, Raspbian, Android etc. we selected Debian of its Simplicity of implementation, code-elegance, and minimalism and GUI support which makes it better than other. It is low cost, highly customizable, light weight. We downloaded Debian image from raspberrypi.org the official website of raspberry pi and prepared a bootable SD Card for our Raspberry pi.

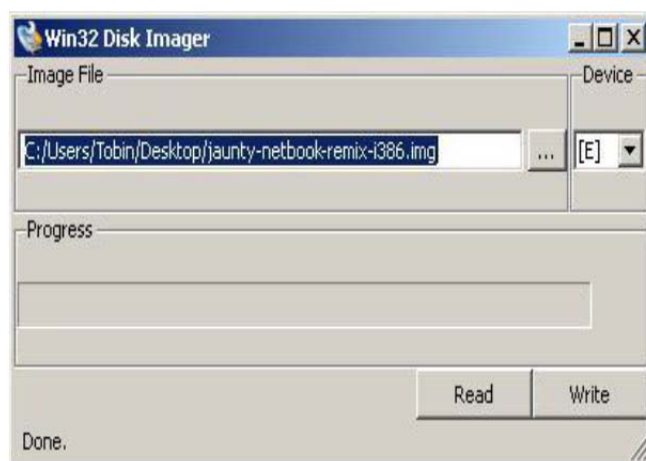


Figure 2

After Downloading Debian image and Disk Imager follow below step to prepare bootable SD Card.

Steps :

1. Note the drive letter assigned to your flash media
2. Start Disk Imager
3. Select the downloaded file and target device, and click "Write"
4. Remove your flash media when the operation is complete.

WORKING SCHEMES

Initially, Raspberry Pi is installed with the Raspbian operating system

- MQ-7, MQ-2, LDR and DHT-11 Temperature sensors sends their value to Arduino microcontroller which is connected to Raspberry Pi
- In the Arduino microcontroller the Arduino program is burnt such that each sensor has its own cut off values
- If the sensor sends a value outside the cut off value required action takes place
- A transmitter pin in the analog pi board sends the sensor data to the Raspberry Pi

- In the Raspberry Pi a Shell program is programmed such that it gets all the sensor values
- At pi we are generating a log file and plotting & displaying this data on thingspeak.com site as shown in figure 3.

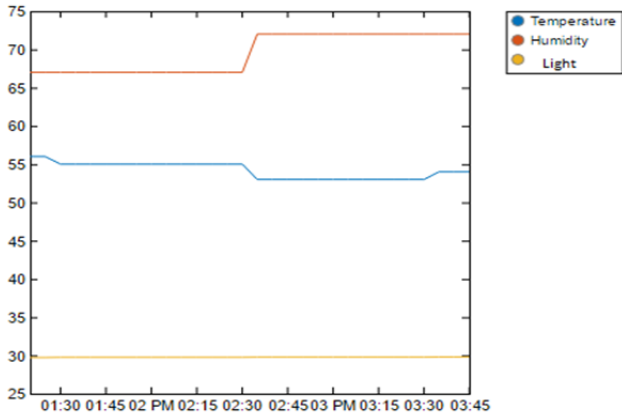


Figure 3

RESULTS

After the execution of the code the results can be seen through the web service ThingSpeak as shown below Figure.



Figure 4

CONCLUSION

This paper explains the design and development of the Data acquisition application using debian operating system. Here we have ported the debian OS to Raspberry pi Board model B and then we have made Arduino UNO board and Raspberry pi board talk serially and exchange data. We have connected sensors with Arduino which reads the temperature from environment and serially provide it to Raspberry pi. At pi we are generating a log file and plotting the graph using a shell program and displaying this data on thingspeak.com site. The combination of Raspberry Pi and Arduino has made the connections easy and has simplified the entire task with high speed, better accuracy and good flexibility.

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