

IOT Based Pregnancy Women Health Monitoring System for Prenatal Care

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ABSTRACT— In the developing countries most of the peoples are lived in the rural areas and medical systems are not amalgamated for sharing information. mostly, the pregnant women are unable to do their normal checkups at the starting time of pregnancy time and this cause higher death count in case of newborn and parental in the rural areas as well as in urban also. Due to this situation, the women are facing an immense medical issue. Accelerometer sensor is designed to measure the Abnormal Positions of the women and it is transfer into the Raspberry Pi. Some important parameters such as Heartbeat rate, and temperature for the women are measured using various types of sensors. The measured parameters are transmitted by way of IOT and it is displayed in the mobile phone. This system is highly sensitive and light weight even for small motion, so it is preferred as a home monitoring device. Finally, we used GSM module to send SMS for abnormal rate.

Keywords: Raspberry pi, Health parameters, Temperature sensor, IOT, Mems sensor, ADC, GSM.

I. INTRODUCTION

Pregnancy is an important phase for a woman's health as well her child. All the precautions and steps taken in order to ensure better health and seamless delivery of the baby after 9 months is crucial. During such advancements in technology and increased use of devices for daily chores, we have introduced an android mobile application which could accompany the ladies during their pregnancy phase thoroughly. This application majorly would take primary vitals of the user, especially heart rate and body temperature. These values will be transferred via Raspberry Pi to cloud server in real-time. Internet connectivity is the important factor for this application to run successfully.

Embedded System Implementation

Introduction:

An embedded system is one kind of a computer system mainly designed to perform several tasks like to access, process, and store and also control the data in various electronics-based systems. Embedded systems are a combination of hardware and software where software is usually known as firmware that is embedded into the hardware. One of its most important characteristics of these systems is, it gives the o/p within the time limits. Embedded systems support to make the work more perfect and convenient. So, we frequently use embedded systems in simple and complex devices too. The applications of embedded systems mainly involve in our real life for several devices like microwave, calculators, TV remote control, home security and neighborhood traffic control systems, etc.

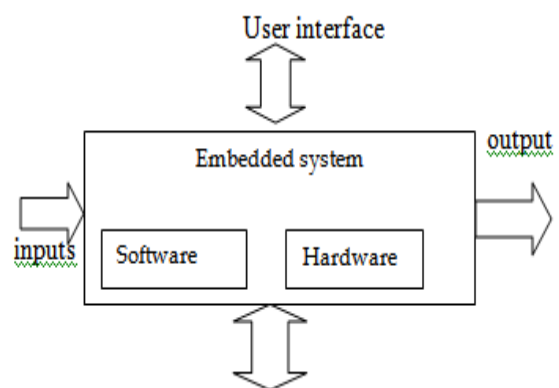


Fig: Overview of embedded system

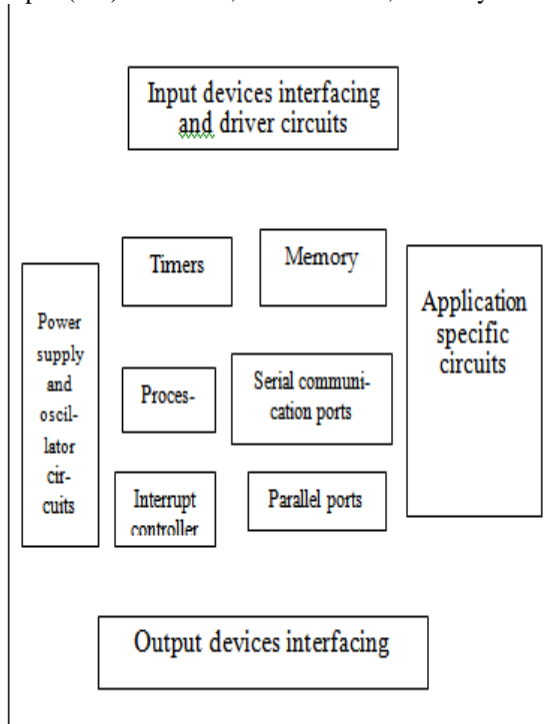
Embedded system:

Embedded system includes mainly two sections, they are

1. Hardware
2. Software

Embedded System Hardware:

As with any electronic system, an embedded system requires a hardware platform on which it performs the operation. Embedded system hardware is built with a microprocessor or microcontroller. The embedded system hardware has elements like input output (I/O) interfaces, user interface, memory and the



Block Diagram of embedded system

- Power Supply
- Processor
- Memory
- Timers
- Serial communication ports
- Output/Output circuits
- System application specific circuits

Embedded systems use different processors for its desired operation. Some of the processors used are

1. Microprocessor
2. Microcontroller
3. Digital signal processor

Microprocessor vs. Microcontroller

Microprocessor

- CPU on a chip.
- We can attach required amount of ROM, RAM and I/O ports.
- Expensive due to external peripherals.
- Large in size
- general-purpose

Microcontroller

- **Computer** on a chip
- fixed amount of on-chip ROM, RAM, I/O ports
- Low cost.
- Compact in size.
- Specific –purpose

Embedded System Software:

The embedded system software is written to perform a specific function. It is typically written in a high level format and then compiled down to provide code that can be lodged within a non-volatile memory within the hardware. An embedded system software is designed to keep in view of the three limits:

- Availability of system memory
- Availability of processor's speed
- When the system runs continuously, there is a need to limit power dissipation for events like stop, run and wake up.

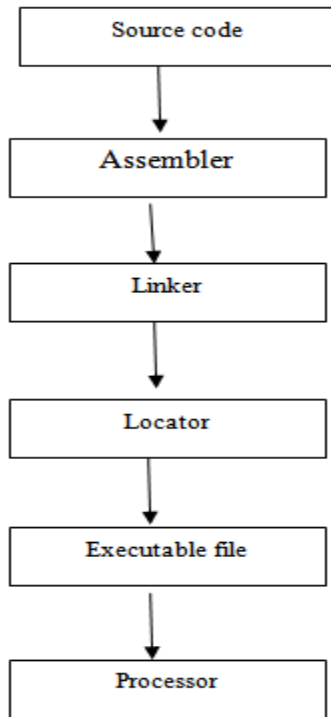
Bringing software and hardware together for embedded system:

To make software to work with embedded systems we need to bring software and hardware together .for this purpose we need to burn our source code into microprocessor or microcontroller which is a hardware component and which takes care of all operations to be done by embedded system according to our code.

Generally we write source codes for embedded systems in assembly language, but the processors run only executable files. The process of converting the source code representation of your embedded software into an executable binary image involves three distinct steps:

1. Each of the source files must be compiled or assembled into an object file.
2. All of the object files that result from the first step must be linked together to produce a single object file, called the re-locatable program.
3. Physical memory addresses must be assigned to the relative offsets within the re-locatable program in a process called relocation.

The result of the final step is a file containing an executable binary image that is ready to run on the embedded system.



Flow of burning source code to processor

Implementation flow:

Stage 1:

Considering the problems of existing methods and giving solution to that problem by considering the basic requirements for our proposed system

Stage 2:

Considering the hardware requirement for the proposed system

For this we need to select the below components:

1. Microcontroller
2. Inputs for the proposed system (ex: sensors, drivers etc...)
3. Outputs (ex: relays, loads)

Stage 3:

After considering hardware requirements, now we need to check out the software requirements. Based on the microcontroller we select there exists different software for coding, compiling, debugging. we need to write source code for that proposed system based on our requirements and compile, debug the code in that software .

After completing all the requirements of software and hardware we need to bring both together to work our system. For this we need to burn our source code into microcontroller, after burning our source code to microcontroller then connect all input and output modules as per our requirement.

II. EXISTING SYSTEM

In a hospital, either the nurse or the doctor

has to move physically from one person to another for health check, which may not be possible to monitor their conditions continuously. Thus, any critical situations cannot be found easily unless the nurse or doctor checks the person's health at that moment. This may be a strain for the doctors who have to take care of a lot number of people in the hospital. Also, when medical emergencies happen to the patient, they are often unconscious and unable to press an Emergency Alert Button. One of the application protocols that are being used.

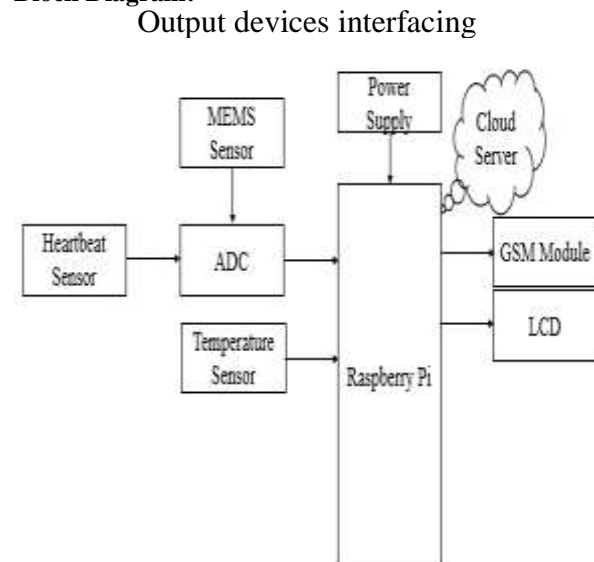
Drawbacks:

- Any critical situations cannot be found easily unless the nurse or doctor checks the person's health at that moment.

III. PROPOSED SYSTEM

In proposed system we are providing health monitoring of a pregnant women using Arduino interfacing them with health monitoring sensors like Heartbeat and temperature. By Using MEMS Sensor, we will check the count that how many times that baby kicks. So as this is for pregnant women it is required to monitor them all the time. If any abnormality happens message will be sent.

Block Diagram:

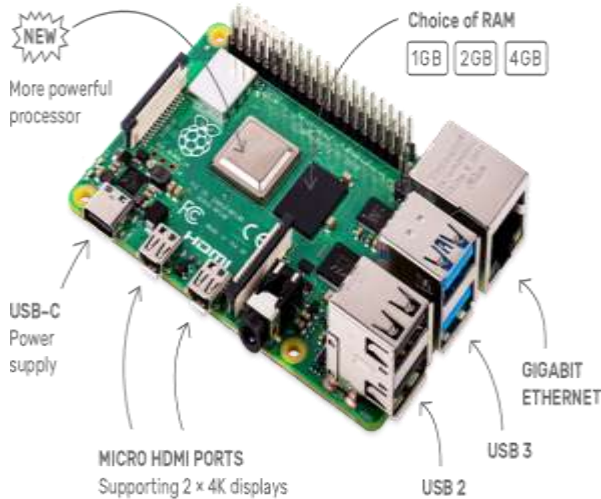


IV. HARDWARE REQUIREMENTS

Raspberry Pi 4:

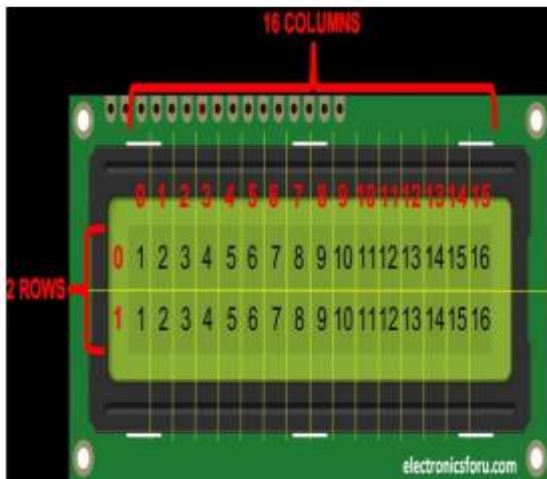
Raspberry Pi is a small-sized computer used Linux operating system. It is mini size computer used mostly to run larger and smart programs to achieve output quickly. Raspberry Pi 4 B+ (RP4) is the lasted model developed by the company, which has all the required latest wired and wireless communications systems

used in most of the smart projects. A single Raspberry Pi 4 comes to a Quad-Core processor but it has three different versions which give three different sizes of RAM. Pi 4 uses mini HDMI and it also has two ports for two 4K displays.



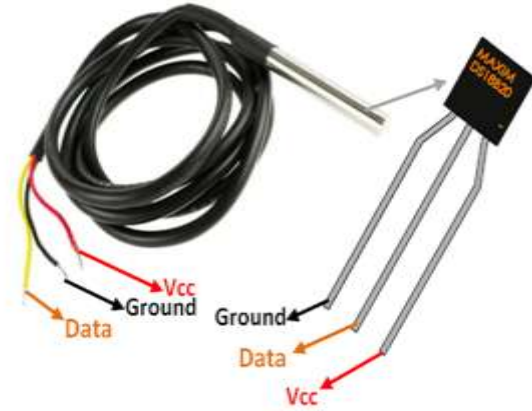
LCD

- An LCD is an electronic display module that uses liquid crystal to produce a visible image. The 16x2 translates o a display 16 characters per line in 2 such lines. In this LCD each character is displayed in a 5x7 pixel matrix.



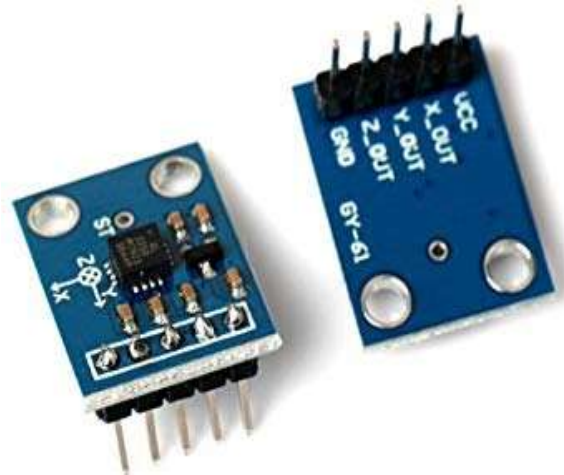
DS18B20 Temp Sensor

The DS18B20 is one type of temperature sensor and it supplies 9-bit to 12-bit readings of temperature. These values show the temperature of a particular device. The communication of this sensor can be done through a one-wire bus protocol which uses one data line to communicate with an inner microprocessor. Additionally, this sensor gets the power supply directly from the data line so that the need for an external power supply can be eliminated.



MEMS Sensor

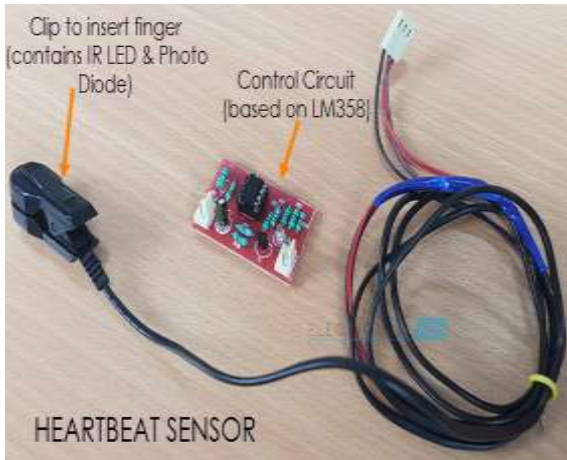
MEMS are low-cost, and high accuracy inertial sensors and these are used to serve an extensive range of industrial applications. This sensor uses a chip-based technology namely micro-electro-mechanical-system. These sensors are used to detect as well as measure the external stimulus like pressure, after that it responds to the pressure which is measured pressure with the help of some mechanical actions.



Heartbeat Sensor

- Monitoring heart rate is very important for athletes, patients as it determines the condition of the heart (just heart rate). There are many ways to measure heart rate and the most precise one is using an Electrocardiography

- But the more easy way to monitor the heart rate is to use a Heartbeat Sensor. It comes in different shapes and sizes and allows an instant way to measure the heartbeat.



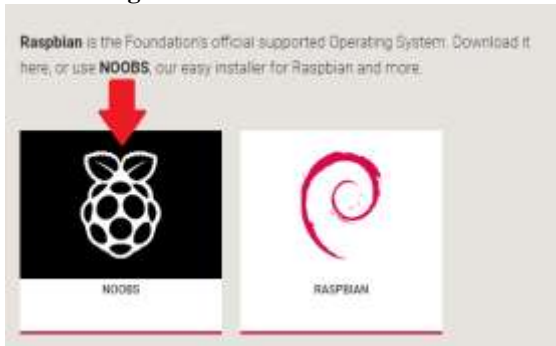
GSM Module

A GSM modem is a device which can be either a mobile phone or a modem device which can be used to make a computer or any other processor communicate over a network. A GSM modem requires a SIM card to be operated and operates over a network range subscribed by the network operator. It can be connected to a computer through serial, USB or Bluetooth connection.



Software Requirements

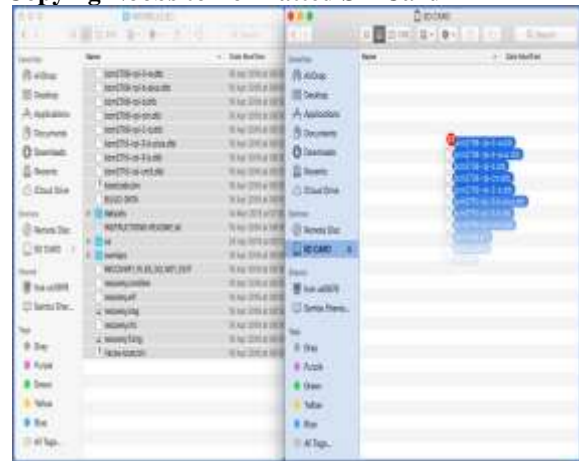
Downloading noobs:



Set up your SD card

- Format the SD card using SD Formatter 4.0
- Download NOOBS
- Extract NOOBS from the zip archive
- Copy all the files to SD card

Copying Noobs to Formatted SD Card



Noobs installation After Inserting SD card in Raspberry Pi



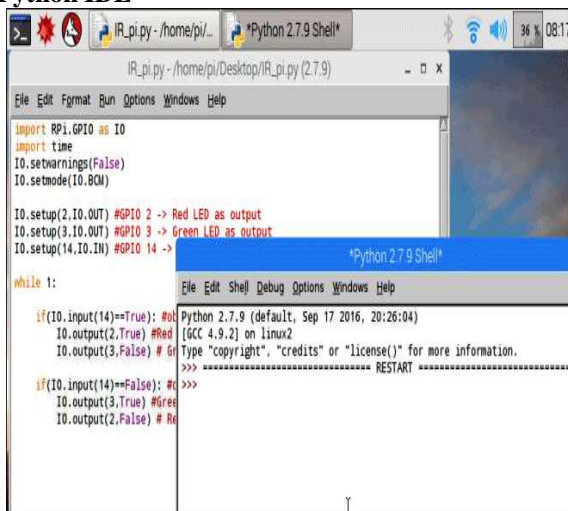
Raspberry pi setup



Raspberry Pi Desktop



Python IDE



ADVANTAGES

- Monitoring the Patient Continuously.
- They can easily communicate with us.

APPLICATIONS

- Used in the hospitals
- Patients at home

V. CONCLUSION

IT IS DESIGNED TO GIVE DIGITAL OUTPUT OF HEAT BEAT OF THE MATERNAL WHEN A FINGER IS PLACED ON IT. THE TEMPERATURE OF THE MATERNAL CAN ALSO BE MEASURED BY PLACING A FINGER ON IT. THE THREE AXIS X, Y, Z IN THE ACCELEROMETER SENSOR SHOWS THE TILT OF THE FETUS WHEN THE SENSOR IS PLACED IN THE MOTHER ABDOMINAL WALL. BY USING THIS APPROACH THE PREGNANT WOMEN AND DISABLE PREGNANT WOMEN IN RURAL AREAS WILL ABLE TO DO THEIR REGULAR CHECKS UPS ON THE DAILY BASIS.

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