

A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial up modem, but it sends and receives through radio waves. In this work we are using SIEMENS MC55 tri-band GSM/GPRS engine that works on the three frequencies GSM 900MHz, GSM 1800MHz, GSM 1900MHz. This modem requires SIM card for a wireless carrier in order to operate and to control modem like sending and receiving messages/emails using AT commands. This GSM modem connected to base station through RS-232 for sending SMS using AT commands and receiving the messages.

Computers use AT commands to control modems. Both GSM modems and dial-up modems support a common set of standard AT commands. In addition to the standard AT commands, GSM modems support an extended set of AT commands. These extended AT commands are defined in the GSM standards. With the extended AT commands, the following operations can be performed:

- Reading, writing and deleting SMS messages.
- Sending SMS messages.
- Monitoring the signal strength.
- Monitoring the charging status and charge level of the battery.
- Reading, writing and searching phone book entries.

The number of SMS messages that can be processed by a GSM modem per minute is very low i.e., about 6 to 10 SMS messages per minute.

7. System Flow

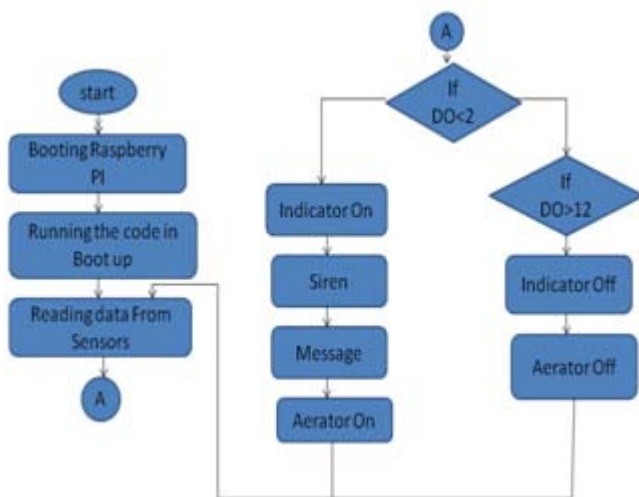


Figure 4: System Flow

Flow chart of the Project is shown in the Figure 2

The Flow Chart shows that

STEP 1: Start

STEP 2: Booting the raspberry pi

STEP 3: Running the code in Boot up

STEP 4: Reading the data from the sensors

STEP 5: If the dissolved oxygen sensor value is below the threshold value 2 then the indicator turns on and gives a siren and aerator turns on and the message is sent to the authorized person.

STEP 6: If the dissolved oxygen sensor value is above the threshold value 12 then the indicator, aerator will be automatically turnoff.

8. Hardware Implementation



Figure 5: Raspberry Pi Board

The **Raspberry Pi** is a credit-card-sized single-board computer developed in the UK by the Raspberry Pi Foundation with the intention of promoting the teaching of basic computer science in schools. The Raspberry Pi is manufactured in two board configurations through licensed manufacturing deals with Newark element14 (Premier Farnell), RS Components and Egomania. These companies sell the Raspberry Pi online. Egomania produces a version for distribution solely in China and Taiwan, which can be distinguished from other Pis by their red colouring and lack of FCC/CE, marks. The hardware is the same across all manufacturers. The Raspberry Pi has a Broadcom BCM2835 system on a chip (SoC), which includes an ARM1176JZF-S 700 MHz processor, Video Core IV GPU, and was originally shipped with 256 megabytes of RAM, later upgraded to 512 MB. It does not include a built-in hard disk or solid-state drive, but uses an SD card for booting and persistent storage.

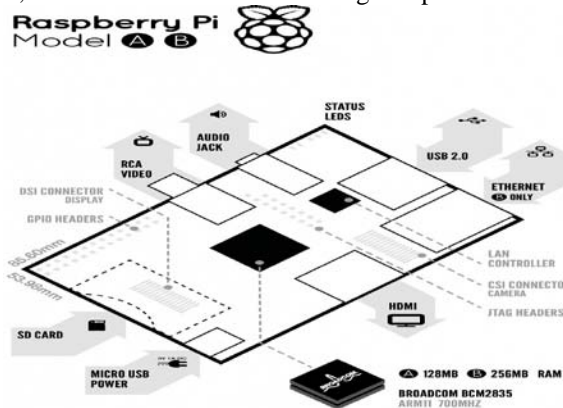


Figure 6: Board Overview

The Foundation provides Debian and Arch Linux ARM distributions for download. Tools are available for Python as the main programming language, with support for BBC BASIC (via the RISC OS image or the Brandy Basic clone for Linux), C, Java and Perl [8]. No matter what operating system we are going to use for the installation process, we have to download the Debian image from the official download site. We can download it using HTTP or via Torrent. After the download has finished, we should have a file named 2014-07-15-wheezy-raspbian.zip on your local hard drive then we need to extract the file. First insert the SD card and plug in the power supply. When you boot Raspbian for the first time, it starts a configuration program named

Raspi-config. When you boot Raspbian for the first time, it starts a configuration program named Raspi-config. It helps you configure the most important aspects of the Linux system. We're probably used to control user interfaces with mouse, but we have to control Raspi-config with our keyboard.

9. Experimental Results

Design and implementation of water quality measurements using hybrid sensors was implemented successfully. The dissolved oxygen sensor, GSM, Speakers are interfaced to raspberry pi and keyboard devices are interfaced with raspberry pi board through USB ports. Figure 7 shows the hardware setup of the Raspberry pi board with connections and µSD card.



Figure 7: Dissolved oxygen sensor, GSM, Speakers are interfaced to raspberry pi

Led will glow when the threshold level of dissolved oxygen in water is less than the value 2, which is shown as in the below Figure 8

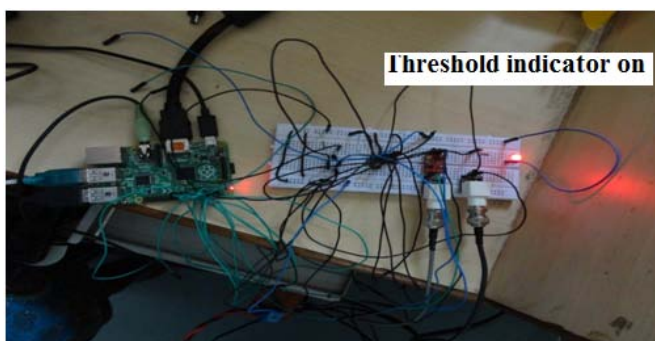


Figure 8: Threshold Indicator

Alert Sound Produced at the time of Threshold value is below 2 which is shown in the Figure 9 as “PLAYING WAVE, 8000Hz STEREO”

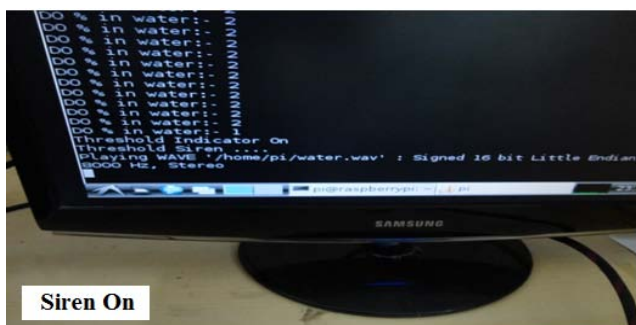


Figure 9: Alert sound

The aerator in the Test Aquarium Setup will be on when threshold level is below the value 2 which is shown in the Figure 10

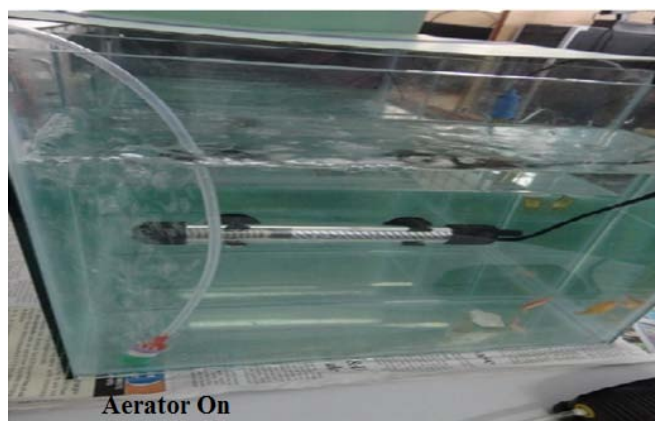


Figure 10: Aquarium Setup

Message Alert to the authorized person when the dissolved oxygen is below the value 2 which is shown in the Figure 11

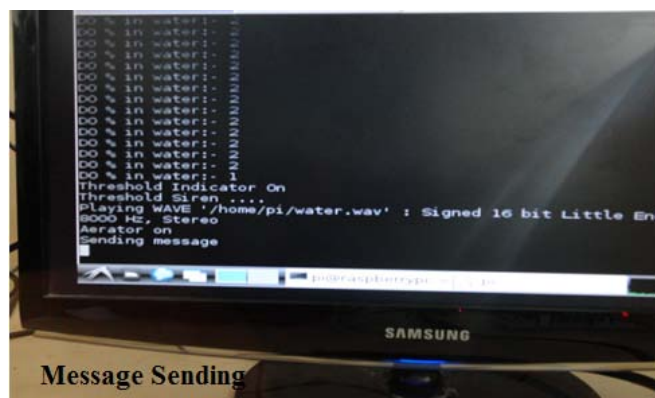


Figure 11: Message Alert

GSM module sending message to authorized person which is shown in the Figure 12

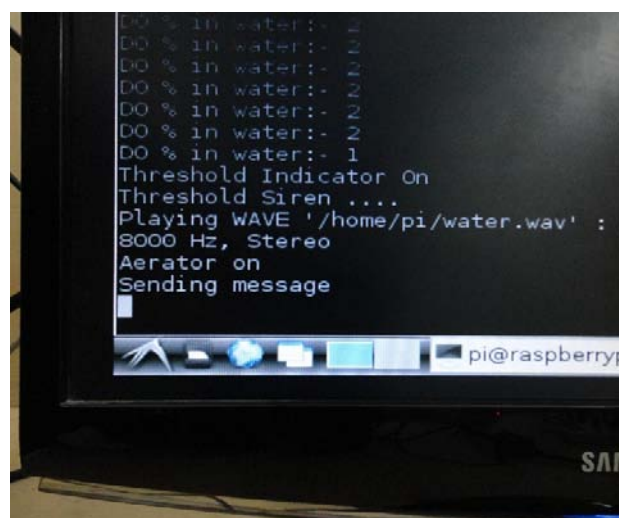


Figure 12: GSM Module sending message

Authorized person getting “DO Alert” message to the Mobile which is shown in the Figure 13



Figure 13: Authorized Person Mobile

10. Conclusion

The project based on water quality measurement using hybrid sensors has been successfully designed and implemented. It is useful in conservation of water quality which is the most essential need for living beings. Raspberry Pi board is used which is an ARM based personal computer for implementation. The system designed provides an efficient way of improving Dissolved oxygen levels in the water which will be very useful for the aquariums and can be applied in variety of industries and applications where accurate measurement and control is required to improve and optimize processes. For example cell culture in biotechnology, sewage treatment etc.

References

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