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HEALTH MONITORING SYSTEM

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Abstract: **With the outbreak of the COVID-19 pandemic social isolation and quarantine have becomecommonplace around the world. Regular doctor visits and exchanges between patients and medical workers are no longer necessary with IoT health monitoring solutions. Many people, on the other hand, require medical experts to check and observe their health on a frequent basis. We have used technology to make patients' lives easier in order to diagnose and treat them early in our suggested study. The Internet of Things (IoT) is being used to construct a smart health monitoring system that can track a person's blood pressure, heart rate, oxygen level, and temperature. This system is beneficial in rural areas or villages where neighbourhood clinics can communicate with city hospitals regarding the health of their patients. If any changes in a patient's health are detected based on standard readings, the IoT system will notify the physician or doctor. The greatest relative error (percent r) in heart rate, patient body temperature, and SPO2 measurements was determined to be 2.89 percent, 3.03 percent, and 1.05 percent, respectively, which was equivalent to commercial health monitoring systems. 2 This IoT-based health monitoring device enables our doctors to acquire real-time data with ease. The system can monitor the parameters at regular intervals thanks to the availability of high-speed internet. Furthermore, the cloud platform enables for data storage, allowing for the retrieval of prior measurements in the near future. In the field of health, the rising usage of mobile technology and smart gadgets has had a significant impact on the world. Health professionals are increasingly taking advantage of the advantages that these technologies provide, resulting in major improvements in health care in both clinical and non-clinical settings. The Internet of Things is growing, enabling for the integration of devices that can connect to the Internet and transmit information on the state of patients' health in real time to clinicians who can help. The goal of this essay is to create a health-monitoring architecture based on an ontology. Many individuals can examine details of the patient's health in an IOT-based system. The reason for this is that the data must be monitored by going to a certain website or URL.**

1. Introduction

According to studies, almost 2000 people die each month as a result of their own health irresponsibility. This is due to a lack of personal time and a severe job, which causes people to overlook their health management. The motivation for creating this project is from the ever-increasing world of technology, which causes people to overlook regular health checks, which should be done on a monthly or quarterly basis. We're using the internet of things to track the patient's numerous parameters in this research. The real-time parameters of a patient's health are communicated to the cloud via Internet connectivity in the patient monitoring system based on Internet of things project. These parameters are transferred to a distant Internet location where the user can view them from any location on the planet. Another advantage of employing IOT is that this data may be seen on a desktop computer, laptop, Android smartphone, tab, or tablet. To view this data, all that is required is a working Internet connection. To view this data over the Internet, there

are a number of cloud service providers to choose from. We are using the internet of things to monitor several parameters of the patient in this project. The real-time parameters of a patient's health are communicated to the cloud utilising Internet connectivity in a patient monitoring system based on the Internet of things project. These parameters are transferred to a distant Internet location where the user can view them from any location on the planet. Every time the human race advances in terms of technology, health is always a huge worry. The recent Corona virus onslaught, which has harmed China's economy to some extent, is an illustration of how health care has grown increasingly important. It is always a better option to monitor these individuals utilising remote health monitoring technologies in places where the virus has spread. As a result, the current answer is an Internet of Things (IoT)-based health monitoring system. Patients can be observed outside of traditional clinical settings thanks to a remote patient monitoring system (e.g. at home), which improves access to human services offices while lowering costs The main goal of this project is to design and implement a smart patient health tracking system that uses sensors to monitor patient health and the internet to notify loved ones if there are any problems. Different clientele can see subtle aspects of the patient's blossoming in an IOT-based framework. In most rural locations, the nearest medical institution is not within walking distance of the locals. As a result, most people have doctor's appointments, hospitalizations, and diagnostic testing procedures. Temperature and pulse recognition are used by each of our bodies to assess our overall health. The sensors are connected to a microcontroller that tracks the status and is thus interfaced to an LCD screen, as well as a remote connection that can exchange alarms. If the framework detects any unexpected changes in heart rate or body temperature, it notifies the client about the patient's state via IoT and also displays subtle features of the patient's pulse and temperature in real time on the web. In this way, an IOT-based tolerant wellbeing tracking framework effectively utilises the web to monitor silent wellbeing measurements and save time. There is a significant ability to ignore any type of minor health issue, which is manifested in the early stages by changes in vital elements such as body temperature, heartbeat rate, and so on. When a person's health problem has progressed to the point where his or her life is in jeopardy, they seek medical help, which can result in an unnecessary waste of money. This is important to consider, especially when an epidemic spreads in a region where doctors are unable to reach. To prevent the spread of disease, giving patients a smart sensor that can be monitored from afar would be a practical solution that could save many lives.

2. Overview

Every life is important and more important is to make our health fit regularly. This has been our motivation for taking up this project, which may help many people in serious or Life-threatening conditions. This project analyse patient's health parameter like heartbeat rate, temperature and oxygen level in oxygen (SpO2) so that we can conclude health status of patient. There are so many diseases and health issues are which can be identified by just testing temperature, heart beat rate and oxygen level so that's why we select these parameters for our project.

The average body temperature is 98.6 F (37 C). But normal body temperature can range between 97 F (36.1 C) and 99 F (37.2 C). A normal resting heart rate for adults ranges from 60 to 100 beats per minute. Generally, a lower heart rate at rest implies more efficient heart function and better cardiovascular fitness A normal level of oxygen is usually 95% or higher. Some people with chronic lung disease or sleep apnea can have normal levels around 90%. The “SpO2” reading on a pulse oximeter shows the percentage of oxygen in someone's blood. In this project firstly patient puts his/her index finger on max30100 sensor and hold DS18B20 module for few seconds so that sensor can take input properly then all inputs are analysed by the sensors and send it to the iot server (here we used thingspeak iot server)

For transferring the data to iot server we used NodeMcu wifi module so that we can make a wireless contact with device (like laptop or smartphone). After sending the data to iot server any one can access health report from that server. It helps people to check their loved ones health status regularly on daily basis and it can be used by doctors too for providing a cure for disease by analysing data from server on their unavailability.

3. Block Diagram

The terminal system is primarily responsible for gathering and monitoring typical human health data in a human health monitoring system based on the Internet of Things. When anomalous data happens, it will be shown on the LCD as well as on the IOT Server. It is vital to undertake research and analysis on aberrant data at this time, as wellas rapid

data processing. For example, the precise situation of the monitor is first established, and then emergency rescue steps are taken.

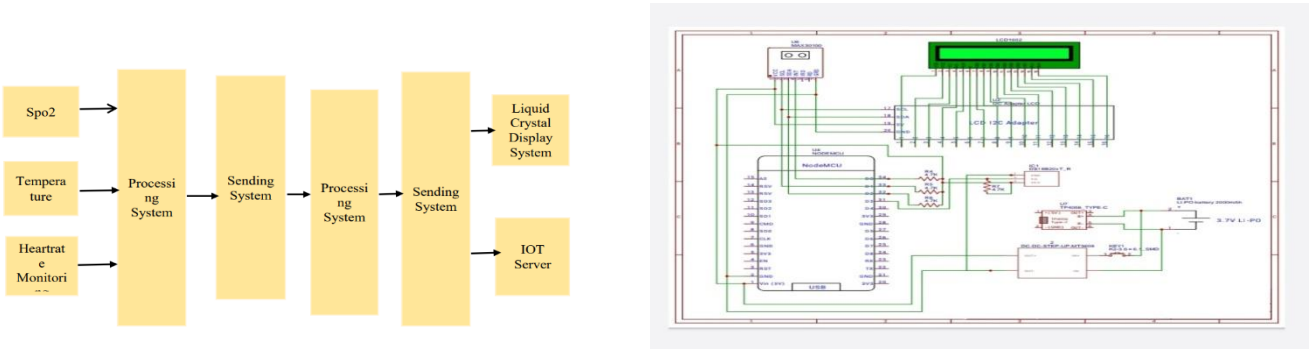


Fig. 1 Block Diagram & Circuit Diagram

3.1 Temperature sensor

The DS18B20 digital temperature sensor uses a single wire protocol to measure temperature in the range of -67oF to +257oF (-55oC to +125oC) with +-5 percent accuracy. The data received from the 1-wire can be in the 9-bit to 12-bit range.

Because this sensor adheres to the single wire protocol, it may be controlled by a single pin on the microcontroller. This is an advanced level protocol in which each sensor may be programmed with a 64-bit serial code, allowing multiple sensors to be controlled from a single microcontroller pin. An overview of a DS18B20 temperature sensor is presented in this article.

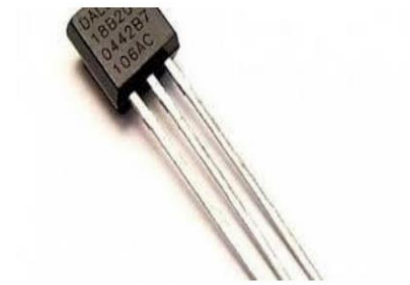


Fig. 2 Temperature sensor

Pin 1 (Ground): This pin is connected to the circuit's GND line.

Pin2 (Vcc): This pin is used to supply the sensor with power, which might be 3.3V or 5V.

Pin3 (Data): This pin provides the temperature value, which can be sent using the 1-wire technique.

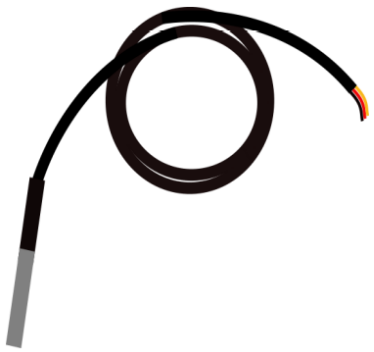


Fig. 3 Temperature sensor module

3.2 MAX30100

The device is equipped with two LEDs, one of which generates red light and the other infrared light. Pulse rate can be determined using only infrared light. Both red and infrared light are used to monitor oxygen levels in the blood.

As a result of having more blood, the amount of oxygenated blood in the blood increases when the heart pumps blood. When the heart relaxes, the volume of oxygenated blood decreases. Finally, the device measures the time between the rise and fall of oxygen-rich blood to determine the pulse rate.

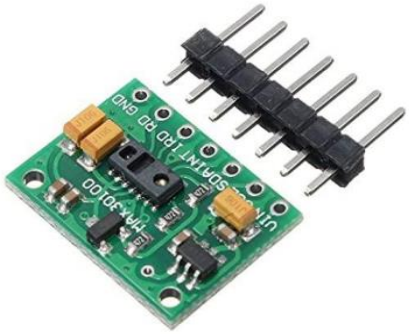


Fig. 4 MAX30100

Deoxygenated blood absorbs red light and passes more infrared light, whereas oxygenated blood absorbs red light and passes more infrared light. The MAX30100's principal function is to read both light sources' absorption levels and store them in a buffer that can be read through I2C.

3.3 MT3608

The MT3608 is an integrated circuit, and the module is a circuit that surrounds the IC and allows it to function as an adjustable converter.

The MT3608 module's PINOUT is:VCC or VIN is the red wire from the battery (or power source) that we attach here (2V - 24V)

IN- This is where we attach the black wire from the battery (or power source), which is ground, GND, or V— The positive voltage of the power distribution circuit or a component powered is connected here.

OUT- This is where we connect the power distribution circuit's ground or a component that is energised.

Fig. 5 MT3608

3.4 TP4056

The TP4056 is a LiPo charging IC. A basic battery charger chip that can charge at 130mA to 1A. Learn how to make the most of it. Learn how to correctly set it up for Safe In-Circuit Charging. The TP4056 is a single-cell lithium-ion battery charger that protects against overcharging and undercharging. It has two status outputs, one for charging that is in progress and the other for charging that is finished. It also comes with a programmable 1A charging current.

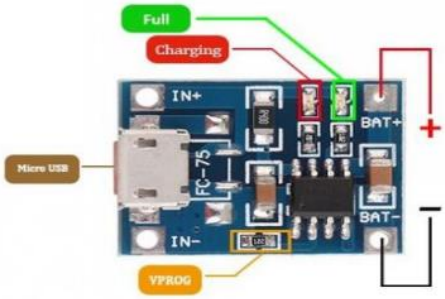
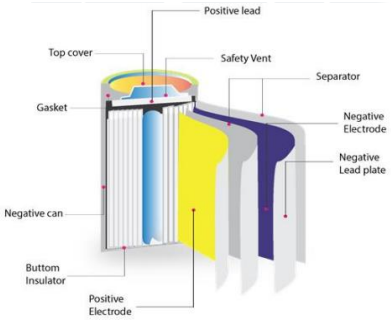


Fig. 6 TP4056

3.5 Lithium Polymer Battery (LiPo Battery)

A lithium-ion polymer (LiPo) battery (also known as Li-poly, lithiumpoly, PLiON, and other names) is a rechargeable Li-ion battery with a lithium-ion polymer (LiPo) chemistry.

In the liquid electrolyte used in traditional Liion batteries, there is a polymer electrolyte. LiPo chemistries come in a variety of forms. Almost everyone makes use of The electrolyte in all of them is a high conductivity gel polymer. LiPo



batteries have higher specific energies than ordinary lithium batteries and are frequently employed in systems where weight is an issue, such as mobile devices, drones, and some electric vehicles.

Fig. 7 LiPo Battery

3.6 Adapter

An I2C LCD adaptor is a device that contains a PCF8574 microcontroller. chip. This microcontroller is an I/O expander that connects with other microcontrollers. with another microcontroller chip that communicates through two wiresprotocol. Anyone can control a 16x2 LCD with this adapter.There are simply two wires (SDA, SCL). It saves a lot of arduino or other pins.micro-controller. It comes with a built-in potentiometer for controlling the LCD.contrast. 0x27 is the default I2C address. This is something you can fix. A0, A1, and A2 are connected to form an address.

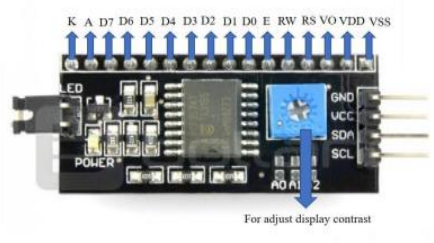


Fig. 8 Adapter

3.7 LCD 16x2 Display

An LCD (Liquid Crystal Display) screen is a type of electronic display that can be used in a variety of ways. A 16x2 LCD display is a relatively basic module that can be found in a variety of devices and circuits. A 16x2 LCD can display 16 characters per line, and there are two of them. Each character is presented in a 5x7 pixel matrix on this LCD. The 224 distinct characters and symbols can be displayed on the 16 x 2 intelligent alphanumeric dot matrix display.

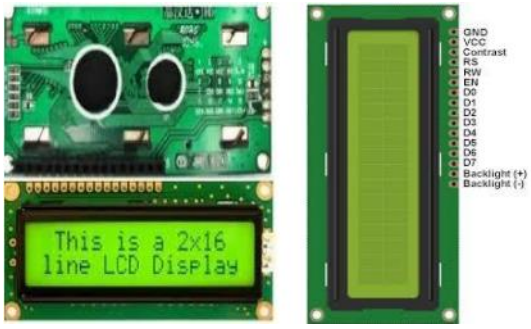


Fig 9 LCD 16x2 Display

4. Advantages

i. ***Continuous Monitoring:*** Many healthcare circumstances, like as chronic diseases, cardiac 94 disorders, and others, necessitate long-term patient monitoring during therapy. In such cases, the IoT device must be capable of doing effective real-time monitoring.

ii. ***Scalability****:* Scalability refers to a healthcare device's ability to respond to changes in the environment. A system with greater scalability runs smoothly and efficiently, taking advantage of all available resources. As a result, designing a device with more scalability is critical. This improves the efficiency of a system for both current and future uses. An Internet of Things (IoT) system is the integration of various medical devices, sensors, and actuators that share data via the Internet. The absence of homogeneity among connected devices in an HIoT system reduces the system's scalability, hence it must be managed well.

5. Disadvantages

i. ***Power Consumption:*** The majority of IoT devices are powered by batteries. It is difficult to change a sensor's battery once it has been installed. As a result, a high-capacity battery was employed to power the system. Currently, researchers around the world are attempting to build healthcare gadgets that can generate their own power. Integration of the IoT system with renewable energy systems is one such potential solution. These solutions may be able to assist alleviate the global energy issue to some extent.

ii. ***Data Privacy and Security:*** The use of cloud computing has revolutionised the concept of real-time monitoring. However, this has increased the vulnerability of healthcare networks to attackers. This could result in the mismanagement of sensitive patient data and have an impact on the treatment process. Several precautionary precautions must be considered while developing an HIoT system to protect it from this harmful attack. Identity authentication, secure booting, fault tolerance, authorization management, whitelisting, password encryption, and secure pairing protocols must all be evaluated and used by medical and sensor devices in an HIoT network to avoid an attack. Wi-Fi, Bluetooth, Zigbee, and other network protocols, for example, must be integrated with secure routing algorithms and message integrity verification techniques. Because the Internet of Things is a connected network in which each user is connected to a server, any flaw in the IoT security services could jeopardise the patient's privacy. This could be remedied by incorporating advanced and safe algorithms and cryptographies into a more secure environment.

Conclusion:

It concludes that a human health monitoring system based on the Internet of Things can provide people with daily health management, which is important for improving the quality and level of health services.

Implementaion of final project

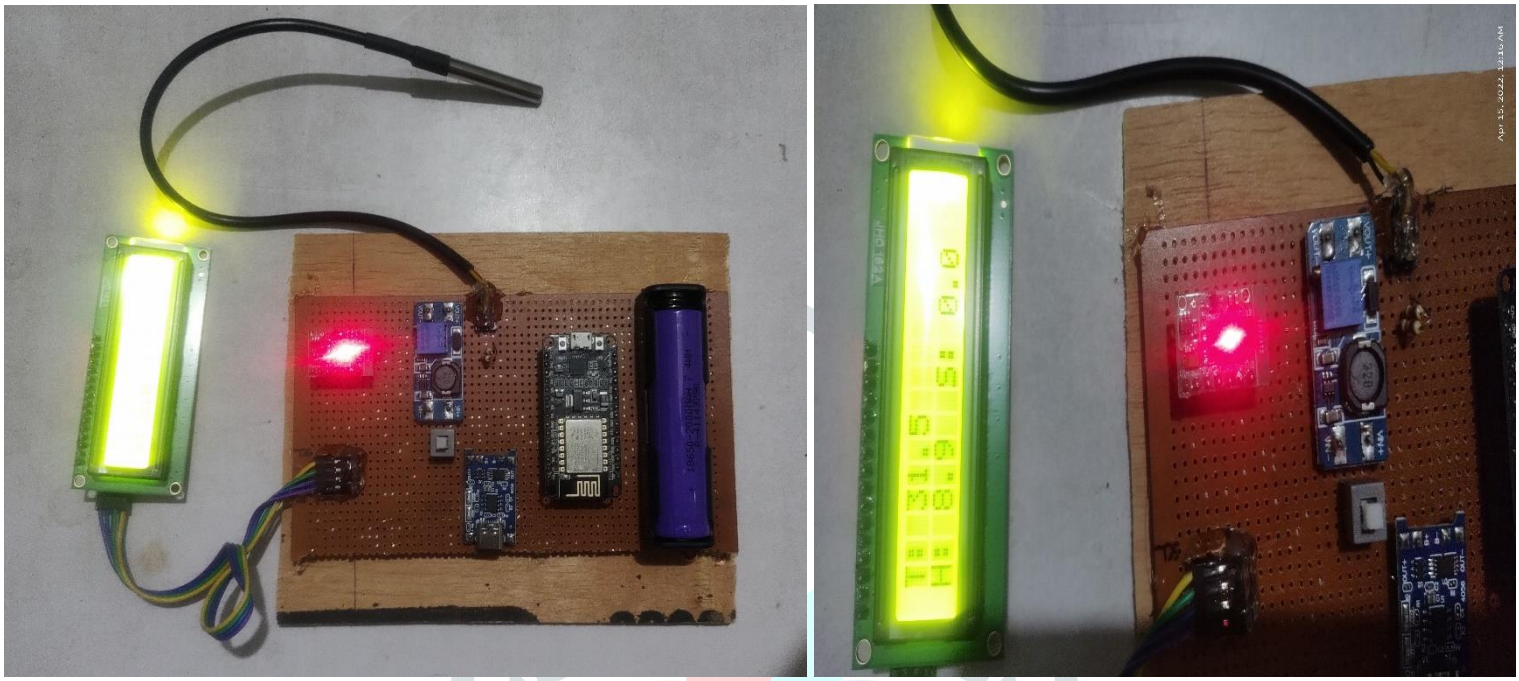


Fig. 10 This is how our project looks

Output

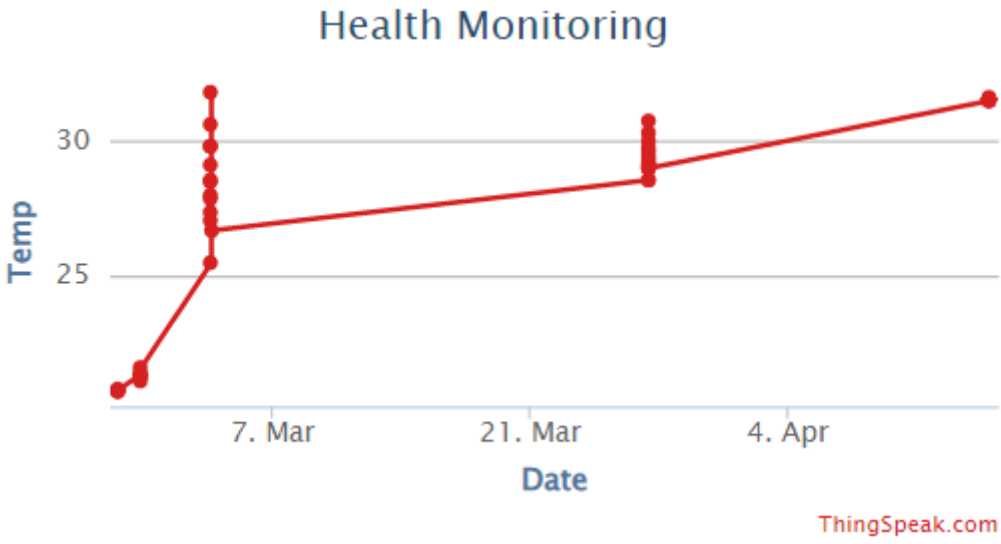


Fig. 11 Temp

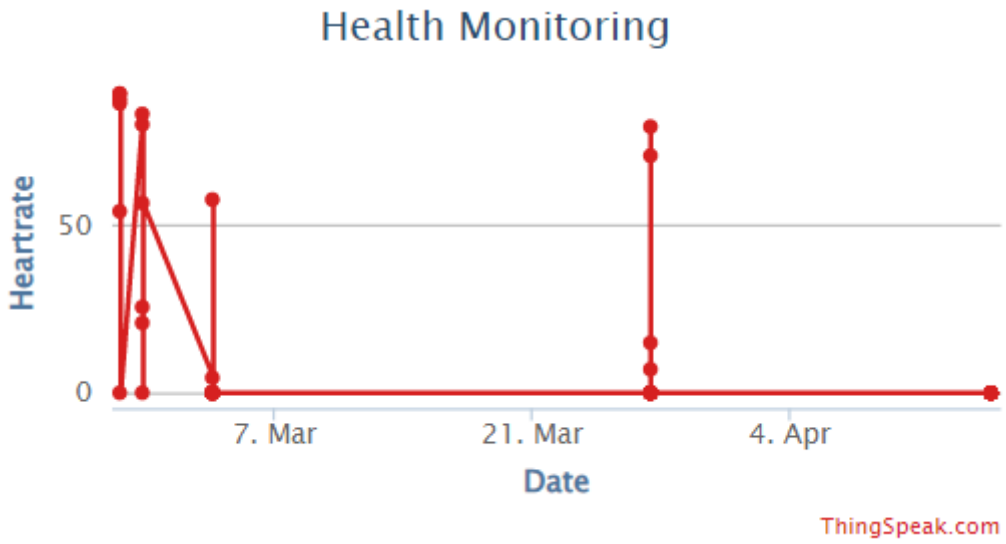


Fig. 12 Heartrate

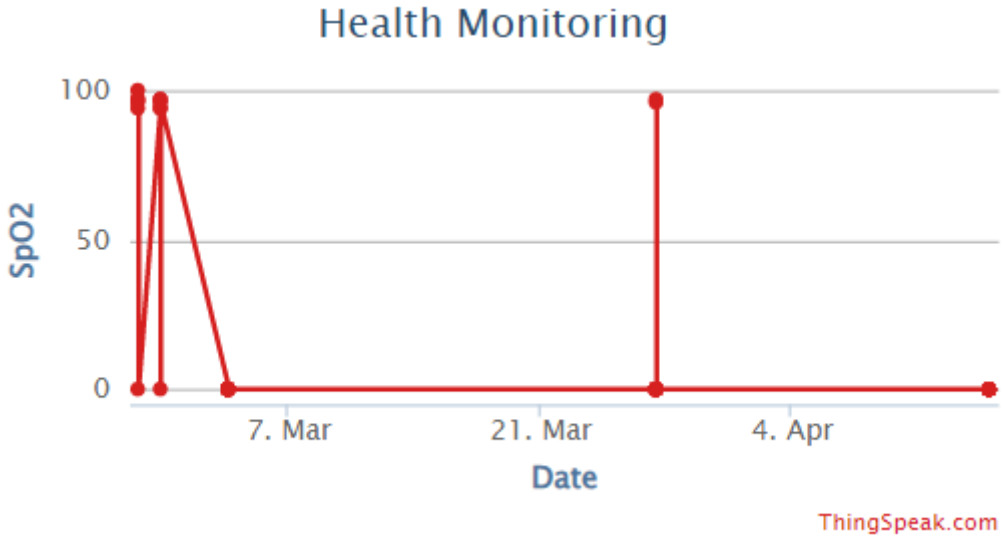


Fig. 13 SpO2

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2. K.Navya et al.Int,Journal of Engineering Research and Applications Vol.3,Issue 5,Sep-Oct 2013,pp.483-486 "A Z Based Patient Health Monitoring System" K.Navya et al.Int,Journal of Engineering Research and Applications Vol.3,Issue 5,Sep-Oct 2013,pp.483-486 "A Z Based Patient Health Monitoring System" K Navya is a M-tech student at CMR College of Engineering and Technology in Hyderabad, Andhra Pradesh, India.