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LUNG CAPACITY AND HEALTH ANALYSER USING IOT

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ABSTRACT: *Health is wealth. In the recent times, healthcare has become expensive and remote services are not effective. In order to solve this problem The LUNG CAPACITY AND HEALTH ANALYSER USING IOT helps people to monitor their health in more effective and efficient ways. The project aims to provide various healthcare measurements. This model comprises of three sectors to monitor the health of a patient. The first sector contains the LM35 sensor to detect the body temperature, MAX30100 sensor to detect the pulse rate and SPO2 levels of the patient. The second sector is used for diagnosing and checking of maximum lung capacity by using a spirometer and IR sensor setup. The last sector in this model is used to display the obtained data on the LCD screen and transmitted to ThingSpeak web server for remote monitoring and analysis. These components collectively form an integrated model for comprehensive analysis and monitoring health of the patients.*

I. INTRODUCTION

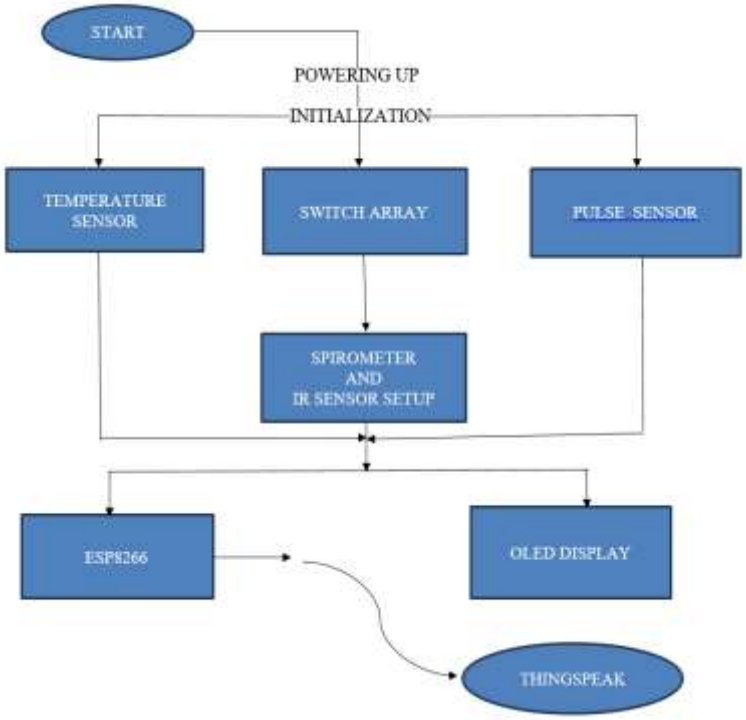
Variations in body temperature, pulse rate, and breathing or respiratory rate have a significant impact on how diseases are treated. For this assessment, the paper proposes an ultimate model for testing the pulmonary volumes at home and attempt to obtain a high health score. An incentive spirometer with three vertical columns, a ball in each, and infrared sensors installed on it is one of the key components of this system. Healthcare professionals may easily obtain the test findings, and the model is compatible to use. The spirometers are cost effective and reusable multiple times after washing. Measurements of various vital physiological factors such as body temperature, pulse rate, and breathing or respiratory rate, are taken into consideration by choosing appropriate and accurate sensors.[2][3]

II. EXPLANATION AND BLOCK DIAGRAM

Health equals riches. Healthcare has recently become more expensive, and remote services have proven ineffective. To solve this problem, the Lung capacity and health analyser using IOT that enables people to monitor their health more effectively and efficiently, remotely. The project intends to give a variety of healthcare metrics. This model consists of three sectors used to monitor a patient's health. The first sector has the MLX90614 sensor, to detect body temperature, MAX30100 sensor to detect the patient's pulse rate and SPO2. The second sector diagnoses and assesses maximum lung capacity utilizing a spirometer and an IR sensor system. The third sector is about displaying the physiological data on the LCD and THINGSPEAK Webserver.

The three primary vital signs on a regular basis by medical practitioners are body temperature, pulse rate, and breathing rate. These indicators influence one another and aid in the detection and monitoring of health issues. For instance, the respiratory rate rises in tandem with an increase in body temperature. As a result, this project covers the construction of a straightforward, inexpensive IOT-based patient health monitoring system and uses three distinct sets of sensors to detect all three symptoms. The Arduino Nano is the project's central component in this setup.

Patient’s health data is transmitted to doctors who are stationed remotely in cities and health centers using ESP8266, a Wi-Fi module. THINGSPEAK is used to analyze the data in real-time before judgments are made.[4]



Spirometer:

Hospitals frequently utilize incentive respirometers, sometimes known as spirometers, for patients with lung and/or chest conditions. In an attempt to achieve a high score on the spirometer, patients inflate the tube connected to it. The three glass columns require flow rates of 600 cc, 900 cc, and 1200 cc, in that order. The number of balls that reach the tops of the columns indicate the amount of airflow the patient is producing. For instance, maximum airflow (1200cc) is produced if all three balls reach the top of their respective columns. Similarly, airflow of 900cc and 600cc is produced if two balls and a single ball reach the top of their respective columns respectively.[7]

Courtesy: Projects Factory

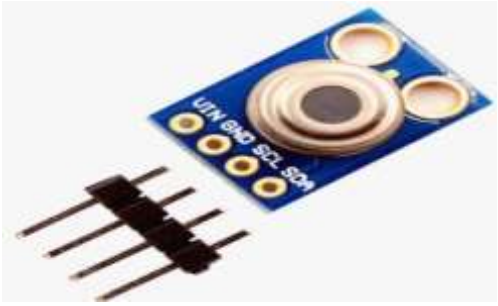
IR sensor:

An infrared sensor is an electronic gadget that produces light in order to detect something in its surroundings. An infrared sensor can measure an object's heat while also detecting motion. There are three infrared sensors fixed opposite to the spirometer tubes at a particular height. If, only the first IR sensor returns a high signal, it indicates patient's lung capacity is low, at 600cc. If the first and second IR sensors read high values, the patient has average lung health, which is equivalent to 900cc capacity. If all three infrared sensors read a high value, the person has great lung health of 1200cc.

Courtesy: Androiderode

MLX90614 sensor:

It is crucial to measure a patient's body temperature because it might reveal a lot about their health. The model uses LMX90614 to measure the body temperature.



Courtesy: Amazon.in

MAX30100 sensor:

It is a modern integrated pulse oximeter and heart rate sensor from analog device. It combines two LED's, a photodetector, optimized optics, and low noise analog signal processing to detect pulse oximetry(SpO2) and heart rate signals. By measuring the ratio of IR and RED light received by the photodetector, the oxygen level (SpO2) in the blood is calculated. The MAX30100 works by shining both lights onto the finger or earlobe and measuring the amount of reflected light using a photodetector. Pulse oximetry is based on the principle that the amount of RED and IR light absorbed varies depending on the amount of oxygen in your blood. The MAX30100 has an on-chip temperature sensor that can be used to compensate for the changes in the environment and to calibrate the measurements. [5]

Courtesy: Amazon.in

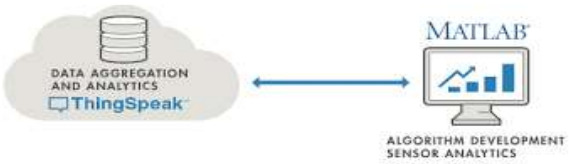
ESP8266 module:

The Wi-Fi chip used is ESP8266. It is equipped with a TCP/IP protocol stack, which enables it to establish a network connection with Wi-Fi. Because every chip has a command set encoded into it, connecting it to an Arduino device is simpler for users. Its affordability, portability, and low weight account for its popularity in Internet of Things applications. All the sensors values are sent to the ESP8266 module. The data from ESP8266 is then sent to the THINGSPEAK web server for further processing.[6]

Courtesy: IndiaMART

THINGSPEAK:

THINGSPEAK is an analytical approach to IOT platform. It helps to provide cloud services to small-scale IOT applications. It helps to visualize and act on the data collected by the devices connected to THINGSPEAK through the Internet.[1]



Courtesy: THINGSPEAK

III. PROCEDUDE TO USE:

Spirometer and IR sensor setup: The spirometer requires the user to inhale air through a mouthpiece and a tube. Wash the tube with warm or lukewarm water before each use. Maintain a straight posture and regular breathing; do not strain your lungs. Avoid having a large dinner. The balls now move in the column in response to air pressure when the user inhales through the tube, showing their lung capacity. The sensors pick this up, show it on the LCD, and send it to the web platform.

MAX30100 sensor: The purpose of the pulse sensor in this instance is to gauge the patient's heart rate or pulse beat.. The patient has to touch the sensor with their finger, not press it. Verify that the finger is clean and free of any wounds or cuts. The readings will appear on the LCD in BPM.

MLX90614 Sensor: The patient's body temperature is determined via the temperature sensor. To ensure that you receive reliable test results, avoid eating anything right before the exam. The LCD will show the temperature reading sensed by the sensor in degrees Celsius.

IV. FUTURE SCOPE:

The suggested idea has a modest scope and has the potential to become a product in the future. It can be utilized by doctors when they are unable to visit remote places with all the necessary equipment, such as remote locations, villages, and primary healthcare centers.

V. CONCLUSION:

Hospital incentive respirometers can be exceedingly costly, often surpassing the financial resources of certain nations, such as India. This study proposes a low-cost, user-friendly project. The product can be used anywhere and at any time, and it provides quick and precise test results.

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