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Mental Stress State Detection Using IOT

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ABSTRACT :

Stress produces serious physical and mental injury that is challenging to identify. To identify irregularities that could result in chronic illnesses, it is crucial to constantly evaluate stress levels. IoT-based wireless networks provide the ability to use sensors to measure stress levels and broadcast the data for quick action.The effects of stress can be profound and seriously detrimental to an individual's physical and mental health. Even though it can be difficult to tell whether someone is stressed, it is important to do so as soon as you can. Even though a person seems to be in good physical health, stress can still exist in the body and lead to a number of chronic diseases. Stress can also affect mental stability, which can cause additional problems. As a result, regular stress monitoring is crucial for diagnosing.

Keywords: Iot , monitoring system , sensors , stress

Introduction :

Stress is a major issue in contemporary life today. Nearly everyone is working extremely hard to reach their deadlines and goals, including students and employers, which causes intense work pressure and significant levels of mental stress. Despite the fact that people are frequently aware of their stressful circumstances, they frequently neglect their

health and fail to take their medications when they should, which can occasionally have fatal consequences or even result in death. If left unchecked, certain sensors, such as heart rate and blood pressure, can be frightening. However, if the proper medication is administered at the appropriate time, it can prevent heart attacks and lower the likelihood of fatalities. Designing stress detection and health monitoring technology that could aid people in understanding their current condition of mental health.

Due to its growing importance in contemporary society, mental stress has frequently come up in study articles, and numerous strategies have been suggested to deal with it. The effort [Error! Unable to locate the referenced source. offers suggestions for reducing workplace stress that can be advantageous to both people and the organisation. It provides methods for dealing with dysfunctional stress for both employees and organisations, and it is divided into three parts.

Review of wearable sensor-based systems for health monitoring and prognosis; several systems are examined to address issues with the current biosensor networks and provide guidance and references for upcoming inconspicuous solutions. They examine the HRV rhythms of healthy, average individuals when they sleep in this investigation. This is carried out to identify stress. HRV is recognised as an indicator of the autonomic nervous system activity.

Hardware :

Node Mcu –

IOT platform NodeMCUESP8266 is free and open source. It originally came with hardware based on the ESP-12 module and firmware that runs on Espressif Systems' ESP8266 WI-FI SOC. Support for the ESP32-bit MCU was subsequently added.

Shortly after the release of the ESP8266, Node MCU was developed. The ESP8266 started being produced by Express if Systems on December 30, 2013.

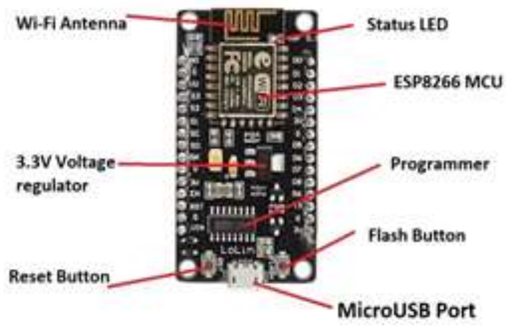

Fig 1: Node Mcu

The Lua programming language is employed by the firmware. The firmware was created using the Espress if Non-Oss dk for ESP8266 and is based on the elua project. Many open source initiatives, including lua-cjson, are utilised.

DHT-11 (Digital humidity and temperature sensor) –

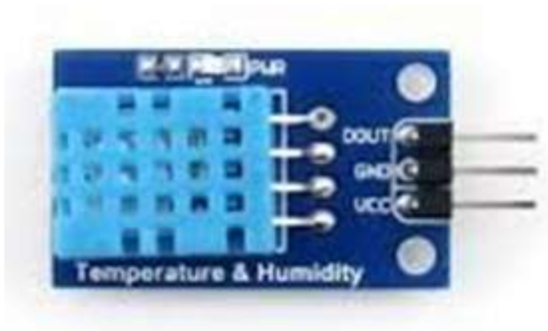

Fig 2: DHT-11 sensor

Digital humidity and temperature sensor. It measures the humidity in the air using a thermistor and a capacitive humidity sensor, and it outputs a digital signal on the data pin. The sensor can measure temperatures between 0 and 50 degrees Celsius and humidity levels between 20% and 90% with an accuracy of 1 degrees and +1%. Therefore, if you want to measure in this range, this sensor might be the best option.

Pulse sensor –This sensor is also known as a heartbeat sensor or a heart rate sensor. Connecting this sensor from the human ear or fingertip to an Arduino board will enable it to function. such that it is simple to compute heart rate. A 24 inch colour coding wire, an ear clip, Velcro Dots 2, transparent stickers 3, etc. are all included with the pulse sensor.This sensor is connected to an Arduino without soldering using a coloured cable. The ear clip can be easily applied with hot glue and is made to resemble a heart rate sensor in size. To create a strap to wrap the sensor around a fingertip, use two Velcro dots. The sensor includes three holes and transparent strikers to prevent moisture from damaging it.

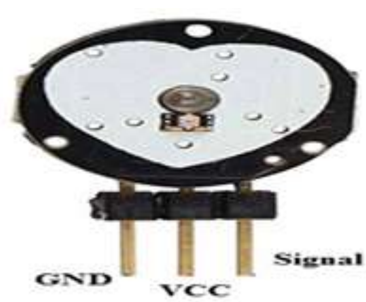

Fig 3: Pulse sensor

Three pins are part of the heartbeat sensor.Black (GND), Red (VCC), and Purple (Signal) wire colours are used to connect to systems.

IR Sensor –

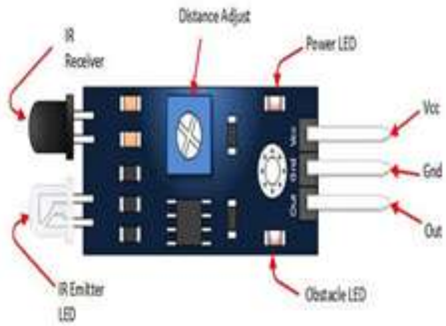

Fig 4: IR Sensor

An electrical device that produces light to identify objects in the immediate vicinity is known as an infrared (IR) sensor. The IR sensor has the ability to measure the heat of an item and recognise motion. All things normally emit thermal radiation in the infrared band, which can be picked up by an IR sensor but is invisible to the unaided eye.There are active and passive IR sensors. While passive sensors just use infrared detectors, active sensors also include an infrared source. Thermal or quantum passive sensors are both capable of detecting things, but quantum sensors are better at it. The photo/optocoupler, which consists of an IR LED and an IR photodiode, is how IR sensors function. The IR LED produces radiation, which is detected when it reflects off an object.

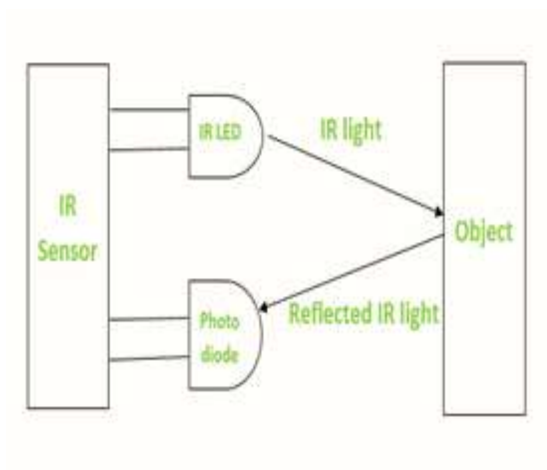

Fig 5: Block Diagram of IR sensor

Oximeter -

Fig 6: Oximeter Sensor

Pulse oximeters gauge the blood's oxygen saturation. It makes use of the differing absorption properties of oxygenated and deoxygenated haemoglobin. The difference in the intensity of transmitted light at each wavelength is used to determine the blood oxygen concentration in a pulse oximeter sensor probe that has two LEDs and a photo-detector. A suitable area of the body is chosen to place the probe.

LCD Display-

Fig 7: LCD Display

Liquid crystal displays, or LCDs, combine the solid and liquid states. It is frequently used in computers, TVs, mobile phones, and portable video games and creates an image using a liquid crystal. Compared to CRT screens, LCD screens are significantly thinner and use less power. LCD technology requires a backlight because it does not emit light but rather filters it. Due to their reduced power requirements, smaller sizes, and lighter weights, LCD-screen devices are replacing those with CRT screens in technology.

Block Diagram :

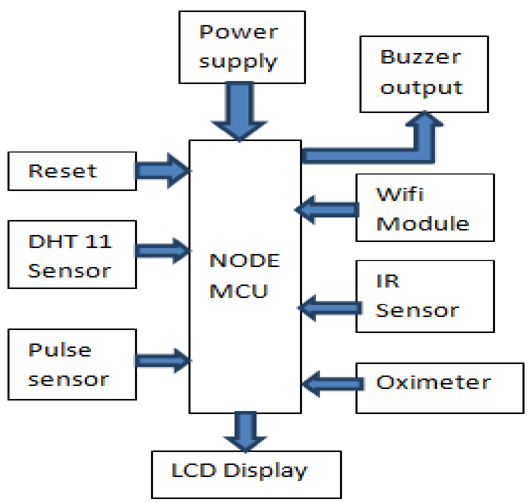

Fig 8: block diagram of the stress detection system

Software requirements :

The preferred tool for programmers wishing to programme and offer significant aid in software development is the software known as Arduino Integrated Development Environment (IDE). Since C is frequently the language of choice for building programmes for Arduino, programming is accomplished by uploading to the real hardware. This approach is easy and seamless, giving programmers a way to fix bugs and polish their software.

Methodology :

Temperature, humidity, heart rate, and oxygen level are just a few of the vital indications that are detected by the system's sensors. The microcontroller receives these sensor readings and processes them for further analysis and storage. The sensor outputs are compared to specified values, establishing a standard by which anomalous sensor results can be identified. A message alerting the user to the problem will be delivered to their mobile device via the Wi-Fi module if the microcontroller detects any parameters outside of the typical range. The Thingspeak server also continuously monitors the sensor values, giving continuous vitals monitoring. This makes it possible to identify any health problems early and take appropriate action to provide the best possible health and wellness.

Advantages :

The technology is incredibly adaptable and requires little money. Additionally, it supports Human Stress Detection. Finally, it alerts us to a person's stress level.

Results :

The model under consideration has been tested on a broad spectrum of consumers spanning a variety of ages. The collected findings were then recorded and sent to the Thingspeak server over wifi, while a notification was sent to the recipient over GSM. The model's accuracy was found to be 96.10% when compared to the readings recorded by the doctor. The stress detection system's hardware configuration is shown in Figure below.

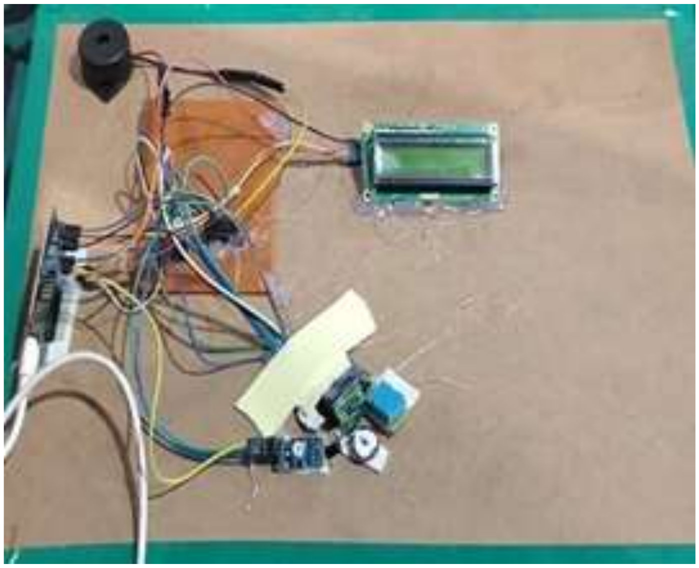

Fig 9: Hardware setup of the model

Fig 10: Displaying Readings of person 1on LCD display

Fig 11: Displaying Readings of person 1on mobile screen

Fig 12: Displaying Readings of person 2on LCD display

Fig 13: Displaying Readings of person 2on mobile screen

Conclusion:

Even with today's technology breakthroughs, there is currently no viable low-cost method of stress detection. Although there are numerous mobile applications for e-Health, there isn't one that can detect stress precisely. In our work, we use low-cost technology and somewhat higher precision to estimate the stress level using previously discovered stress signals. By writing efficient programmes to analyse the stress level and striking a trade-off with improved accuracy at the expense of sophisticated devices, we have decreased the number of hardware modules needed.

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