STRESS DETECTOR AND REDUCER WEARABLE DEVICE USING IOT

A PROJECT REPORT

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ABSTRACT

Wearable devices have recently received considerable interest due to their great promise for a plethora of applications. Increased research efforts are oriented towards a non-invasive monitoring of human health as well as activity parameters. A wide range of wearable sensors are being developed for real-time non-invasive monitoring. Stress detection and reduction is the proceeding analysis subject among researchers. Diversity automation evolves on person stress detection and reduction using wearable sensors. This project provides a comprehensive review of sensors used in wrist-wearable devices, methods used for the visualization of parameters measured as well as methods used for intelligent analysis of data obtained from wrist-wearable devices. Aim of our proposed system is to build a device used to identify human stress level and to reduce it. Here we are using the galvanic sensor, heart rate sensors and ECG sensors are used to identify human stress level by monitoring the heart rate, skin resistance level and pulse rate. Using IR LED (9000nm – 12000nm) light allows light energy to penetrate one to three inches into your muscle tissue. Your muscles use the energy to create their own heat, which causes them to relax naturally. There’s no better way to achieve that kind of relaxation. The collected sensors data will be displayed within the online page, LED screen using IoT (Internet of Things).Suggestions to be placid are going to be displayed and recently collected sensors data are displayed in android applications.

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INTRODUCTION

1.1. OVERVIEW

The main objective of stress detector and reducer wearable device using IoT is to significantly find the stress in human being and reduce it. Our system predicts the human stress level using heartbeat, skin respiration rate and pulse rate, once stress is detected then immediately it will switch on the IR LED which is will reduce the stress through light waves penetration.

1.2 PROBLEM DEFINITION

Stress has become ingrained part of our life, being stressed by our tension and worries, etc. Stress causes physical illnesses, such as heart attacks, arthritis, and chronic headaches or psychological diseases like mental illness, anger, anxiety, and depression. There are several research works coming up to resolve the limitations on measuring, analyzing and identifying the human stress levels Amongst the many stress monitoring methods the more reliable method to determine the human stress level is to use physiological signals. The stress can be mainly classified into two categories: Acute stress and Chronic stress. Acute stress is the response of the body to a stressor for very shorter period and after that the body will attain the equilibrium. Chronic stress is the one which pertains for a longer period and can produce harmful effects on our body. Stress has a vital role in almost all diseases which includes diabetes, hypertension, migraine headaches, cardiovascular diseases, mental health problems, liver cirrhosis, cancer etc. Understanding the stress levels of the patients such as cancer patients and cardio patients can play a vital role in their recovery.It is very important to understand the stress status of a person much before the stress starts to cause some adverse effects on our body. The main purpose of this work is to develop a continuous stress monitoring system and thereby reduce the effects of stress on mental health as well as physical health of a person. Our Proposed system detects the stress occurring by using the physiological parameters such as the heartbeat rate, pulse rate and skin resistance and it reduces the stress using IR LED light penetration.

CHAPTER 2

CHAPTER 2
LITERATURE SURVEY

1.Automatic Stress Detection Using Wearable Sensors and Machine Learning: A Review

Year: 2020

Author: Nurdina Widanti; Budi Sumanto; Poppy Rosa; M. Fathur Miftahudin [1].

Concept: Stress is a feeling of being under abnormal pressure which comes fromdifferent aspects of our day to day life. Stress management is important during this modern era to keep up one's stress level low and reduce health risks as stress is one of the primary cause leading to major chronic health disorders. In this paper, we examine and review various stress detection approaches who uses low-cost wearable sensors for data collection andmachine learning algorithms for predicting stress level of anindividual. Researchers have found that stress level can bedetected through some physiological measures like heart rate,heart rate variability and skin conductance. This paper aims toprovide a comprehensive review on various stress detectiontechniques and gives a reliable guideline towards more efficient detection of stress**.**

Merits: Detecting Stress of an individual with the help of wearable sensors and machine learning algorithms are effective and affordable.

Demerits: Used multiple features correlated with each other increases computation time and used some costly commercial devices for physiological signal collection.

2.Challenges and Opportunities in Utilizing IoT-Based Stress Maps as a Community Mood Detector

Year:2019

Author:MuratYuksel;Wei Wang;Shafaq Chaudhry;Damla Turgut;Naim Kapucu[2].

Concept: Stress has been known to cause physical and mental issues like depression, anxiety, insomnia, lower immunity, stroke, as well as leading to suicidal thoughts or violence towards others. Stress is not just a state of mind, but it is measurable. With the ubiquity of Internet of Things (IoT), and the integration with highly sensitive biosensors, it may be feasible to use these devices for detecting stress in public places. Moreover, correlating such stress data with social media streams can lead to insights into the psychological well-being of the community as a whole. We present a framework of such a community stress map based on social media and explore techniques for gathering data for measuring stress levels as well as detecting abnormal levels. This stress map can then be leveraged by emergency and crisis response teams for public safety and help them be proactive in allocating resources to the stressed areas indicated in the map.

Merits: a time series of national maps of happiness and negative emotions.

Demerits: Need to aggregate data and transfer it with a high enough frequency to adhere to the real-time nature of collecting and monitoring stress data.

3. **Acute Mental Stress Measurement using Brain-IoT System**

Year:2019

Author: Bhagyashree Shirke; Jonathan Wong; Kiran George [3].

Concept: Every individual experience stress of varied intensity while performing daily tasks. Excessive stress can be harmful to human health. Hence, stress assessment is essential in preventing detrimental long-term effects. In this study, weinvestigate the feasibility of EEG for the measurement of acute mental stress. Also, the post-stress analysis with four distinct cases on stress-induced subjects is carried out. The experiments accomplished were conducted using an EEG headset, ThingSpeak database, and a mobile application. The subject is required to play a mobile game, which induces stress as the game level progresses. This raw EEG data is pre-processed and analyzed in MATLAB and sent over to the ThingSpeak database. When the acute level of stress is detected, the individual gets notified by the mobile application to prompt soothing music and closing eyes. Overall, the experiment concluded with reduced stress levels of the subject after closing eyes with and without music.

Merits: Non-invasive method for individuals to diagnose and cope with their stress levels.

Demerits: Reading may be slightly inaccurate by EEG headset due to the inference of the hair and high sensitivity to muscle movement.

4.**Development and Analysis of Analog-Digital Neural Net for Speech Stress Detection**

Year:2018

Author: Vasilii G. Arkhangelsk Sergey A. Alyushin Alexander V. Alyushin[4].

Concept: Autonomous SSDs (Speech Stress Detector) are widely used at present. Known electronic realizations suffer from low noise immunity, their methods of stress detection require further development and verification. State-of-the-art integrated technologies permit to superpose digital reprogrammable systems with analog neuron like elements and receive new quality of data processing in SSD. Proposed real-time neural network is characterized by rational representation and distribution of main SSD functions in neural net in analog and digital forms. Single layer structure of ADNN (Anolog-Digital Neural Net) supports self-organization process in SSD during speech analysis, new features extraction and classification. Developed by the authors ADNN SSD prototype has shown higher noise immunity level in comparison with conventional realizations, can be treated as promising model for instrumental base development on the one hand and hardware real time realization in the future embeddable systems on the other.

Merits: supports self-organization process in speech stress detection during speech analysis.

Demerits: Cannot able to detect stress by body condition.

5. A Smart Sensor in the IoMT for Stress Level Detection.

Year:2018

Author: LaavanyaRachakonda;PrabhaSundaravadivel; Saraju P.Mohanty; Elias Kougianos; Madhavi Ganapathiraju[5].

Concept: Psychological stress is a sense of pressure whichaffects the physiological parameters in a person. In this paper anovel stress detection system, iStress is proposed which monitors stress levels through body temperature, rate of motion and sweatduring physical activity. The implementation of the Stress system uses a neural network approach utilizing a Mamdani-type fuzzylogic controller with more than 150 instances as the model. The collected data are sent and stored in the cloud, which can help in real time monitoring of the person's stress level thereby reducing risks to health. This system consumes low energy although operating in real time. The proposed system has an ability to produce results with 97% accuracy, low system complexity and moderate cost.

Merits: Monitors stress levels through body temperature, rate of motion and sweat during physical activity.

Demerits: Detects stress only through physical activities.

CHAPTER 3

CHAPTER 3

SYSTEM ANALYSIS

3.1 EXISTING SYSTEM

The early stress detection research was performed in the laboratory environments, while the current research continues on real-life environments. current EEG (Electroencephalogram) measuring devices are obtrusive for individuals and they are not applicable to daily life routines. So we don't have an efficient device for reducing the stress level. Testing and debugging of electrostatic discharge (ESD) or electrical fast transient issues in modern electronic systems can be challenging.

3.2 PROPOSED SYSTEM

The negative effects of mental stress on human health have been known for decades. High-level stress must be detected at early stages to prevent these negative effects. In our proposed system we are going to develop an automatic stress detection system using smart wearable devices which can be carried during the daily life routines of individuals. Here we are using galvanic sensor and heart rate sensor to detect the heart beat count and blood pressure level and ECG Senor. And we are using IR sensor to reduce the stress level. All the data from the sensors are sent to the smart phone application using IoT Server. This is cost efficient compare to all the other existing systems.

3.3TECHNOLOGY STACK

- Arduino PROMINI
- Arduino IDE
- Internet of Things [IoT]
- Wampserver
- PHP
- MySql

ARDUINO PROMINI

The Arduino Pro Mini is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, an on-board resonator, a reset button, and holes for mounting pin headers. A six pin header can be connected to an FTDI cable or Sparkfun breakout board to provide USB power and communication to the board.

The Arduino Pro Mini is intended for semi-permanent installation in objects or exhibitions. The board comes without pre-mounted headers, allowing the use of various types of connectors or direct soldering of wires. The pin layout is compatible with the Arduino Mini.

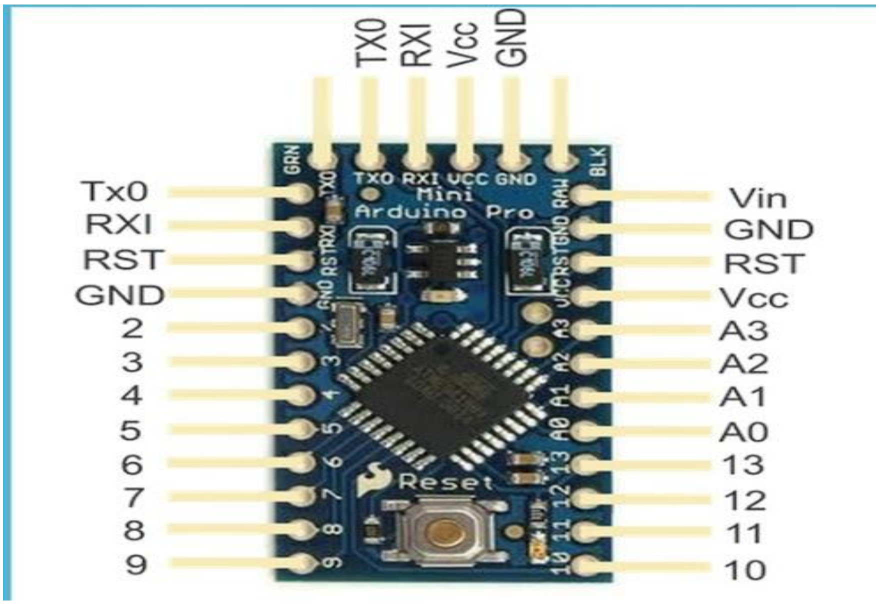


Figure 3.1 ARDUINO PROMINI

Power: The Arduino Pro Mini can be powered with an FTDI cable or breakout board connected to its six pin header, or with a regulated 3.3V or 5V supply (depending on the model) on the Vcc pin. There is a voltage regulator on board so it can accept voltage up to 12VDC. If you're supplying unregulated power to the board, be sure to connect to the "RAW" pin on not VCC.

The power pins are as follows:

RAW For supplying a raw voltage to the board.

VCC The regulated 3.3 or 5 volt supply.

GND Ground pins.

Memory: The ATmega328 has 32 kB of flash memory for storing code. It has 2 kB of SRAM and 1kBs of EEPROM.

Input and Output: Each of the 14 digital pins on the Pro Mini can be used as an input or output, using pinMode,digitalWrite, and digitalRead functions. They operate at 3.3 or 5 volts (depending on the model). Each pin can provide or receive a maximum of 40 mA and has an internal pull-up resistor (disconnected by default) of 20-50 kOhms. In addition, some pins have specialized functions:

Serial: 0 (RX) and 1 (TX) Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the TX-0 and RX-1 pins of the six pin header.

External Interrupts: 2 and 3. These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value. See the attachInterrupt function for details.

PWM: 3, 5, 6, 9, 10, and 11. Provide 8-bit PWM output with the analogWrite function.

SPI: 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). These pins support SPI communication, which, although provided by the underlying hardware, is not currently included in the Arduino language.

LED: 13. There is a built-in LED connected to digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off.

The Pro Mini has 8 analog inputs, each of which provide 10 bits of resolution (i.e. 1024 different values). Four of them are on the headers on the edge of the board; two (inputs 4 and 5) on holes in the interior of the board. The analog inputs measure from ground to VCC. Additionally, some pins have specialized functionality:

I2C: A4 (SDA) and A5 (SCL). Support I2C (TWI) communication using the Wire library.

There is another pin on the board:

Reset: Bring this line LOW to reset the microcontroller. Typically used to add a reset button to shields which block the one on the board.

Communication: The Arduino Pro Mini has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega328 provides UART TTL serial communication, which is available on digital pins 0 (RX) and 1 (TX). The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board via a USB connection.

A SoftwareSerial library allows for serial communication on any of the Pro Mini's digital pins.

The ATmega328 also supports I2C (TWI) and SPI communication. The Arduino software includes a Wire library to simplify use of the I2C bus; see the reference for details. To use the SPI communication, please see the ATmega328 datasheet.

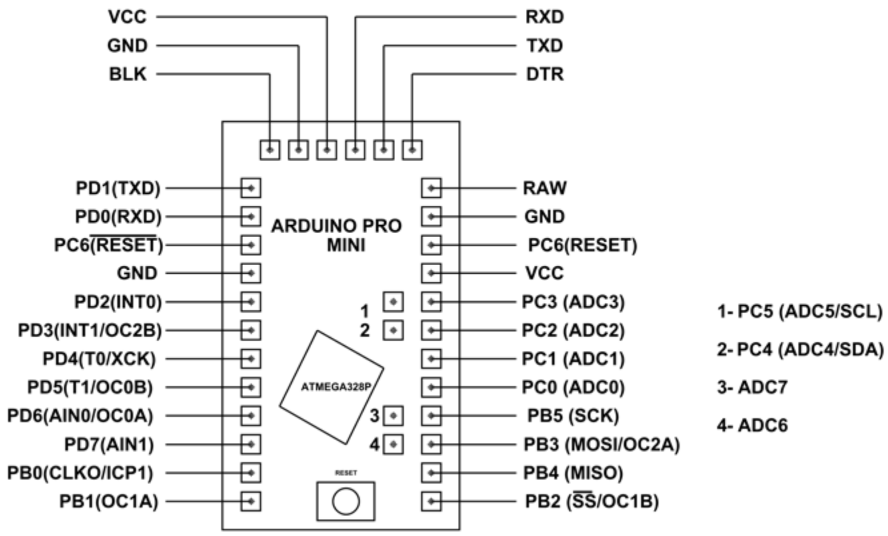


Figure: 3.2 ARDUINO PROMINI PIN DIAGRAM

ARDUINO IDE

The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. It runs on Windows, Mac OS X, and Linux. The environment is written in Java and based on Processing and other open-source software. The Arduino

Integrated Development Environment (IDE) is a cross-platform application (for Windows, macOS, Linux) that is written in functions from C and C++. It is used to write and upload programs to Arduino compatible boards, but also, with the help of 3rd party cores, other vendor development boards.

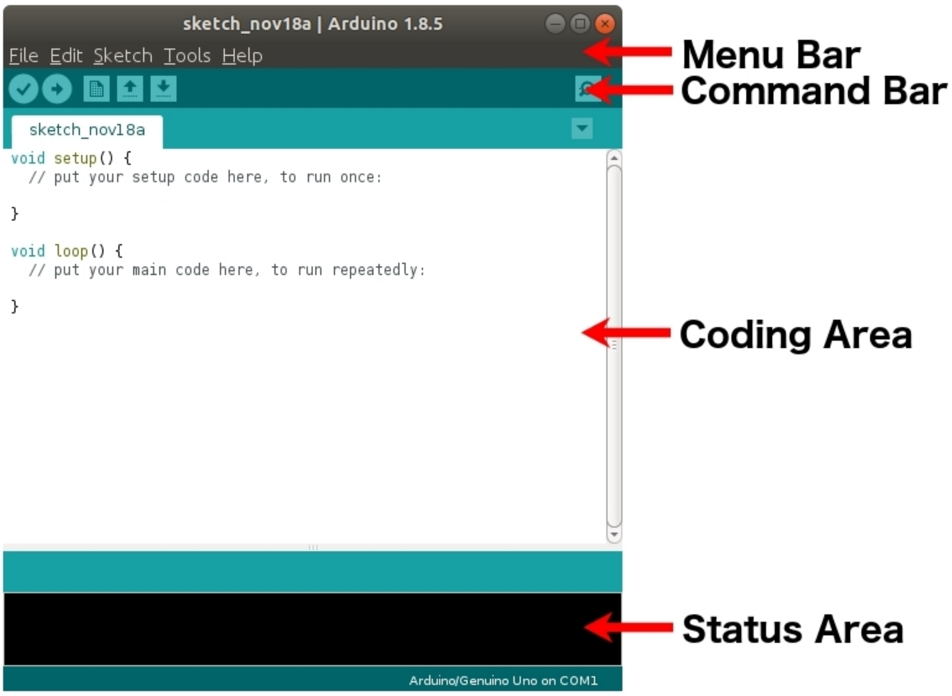


Figure: 3.3 ARDUINO IDE

The source code for the IDE is released under the GNU General Public License, version 2.The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub main() into an executable cyclic executive program with the GNU toolchain, also included with the IDE distribution. The Arduino IDE employs the program avrdude to convert the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware.This software can be used with any Arduino board.

INTERNET OF THINGS

Internet of Things [IoT] is a system of interconnected objects, usually called smart devices, through the Internet. The object can be a heart monitor, a remote or an automobile with built-in sensors. That is objects that have been assigned an IP address and have the capability to collect and transfer data over a network. The objects interact with the external environment with the help of embedded technology, which helps them in taking decisions. Since these devices can now represent themselves digitally.The globally ruling technology acting as a single key to shrinking this whole universe to a tiny globally connected village, whereas IoT comprises of just two words which precisely depicts its definition.

Internet: Inter connectivity-For global connection

+

Things: Embedded system devices-sensors, actuators, RFID tags, QR code and so many.

For sensing the data

Collecting the data

Sending the data

Thus, on the whole, the Internet of Things is the technology which enables everything to communicate by themselves over the internet through the devices without the use of computers. Here comes the most essential and prevalent term in IoT called ‘Smart’ which means Automation – the process of decreasing human intervention or involvement thereby increasing the machine intelligence to perform every tasks by itself, which could be done by IoT.

IoT makes an intertwined network of artificial things like physical devices, vehicles, home appliances and even to connect with natural living beings like plants, animals and so on.

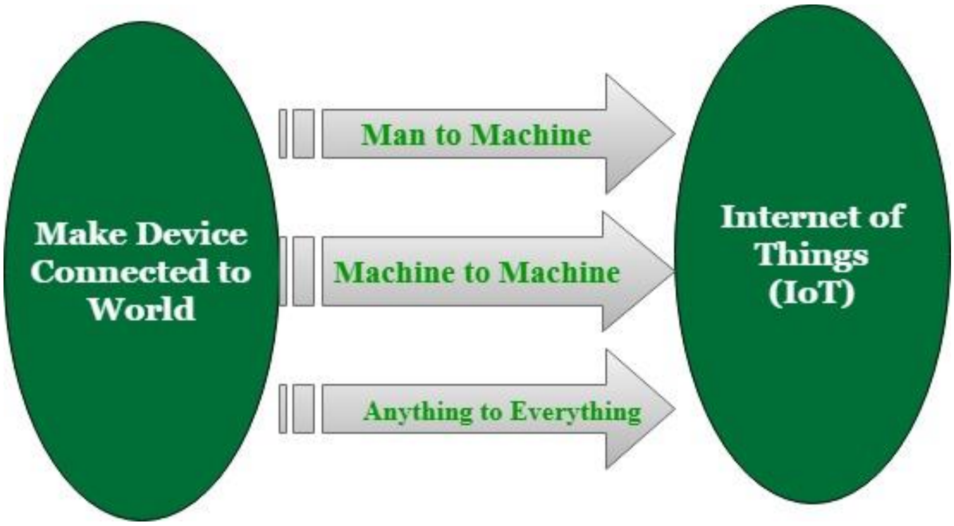


Figure :3.4.IOT APPLICATION

Some communication devices in IoT:

Sensors: Devices which converts physical parameters like temperature, motion etc. into the electrical signals .Smart sensors are the indispensable enablers of IoT.

Actuators: Devices which is a contrast to sensors. It transforms electrical signals into physical movements. Both sensors and actuators are transducers which converts one form of energy to other. Exchange of datais the most important key factor in IoT. Hence sensors and actuators play a vital role here.

RFID Tags: Wireless microchips used for automatic unique identification of anything by tagging it over them. You have been seen it in credit cards, automobile ignition keys and so on.

Since interconnection of things is the main goal of IoT, the RFID tags get hand shaken with IoT technology and is used to provide the unique id for the connected "things" in IoT. These are many communication devices and protocols in IoT.

IoT Hardware Processor:

Arduino

1. Open-source electronics prototyping platform

2. The simplest and the beginner’s choice.
3. To create interactive (IoT) electronic applications
4. It is the first micro controller based development board
5. Easy to program for beginners by Arduino IDE

Set up procedure:

1. It itself has **0.5KB of boot loader** that makes the program to be burned into the circuit.
2. All we have to play with Arduino is to download the Arduino software and to start the code.
3. The Arduino programs are called as sketches
4. Basic Arduino language : C/C++

Advantages:

1. Inexpensive
2. Cross-platform/Multi platform
3. Flexible and easy prototyping
4. Provides pre-wiring and free code libraries
5. More reliable for hardware applications

ADVANTAGES OF IOT

- Communication
- Automation
- Remote control
- More information
- Better decision
- Continuous monitoring
- Time saving
- Money saving

- Efficient handling

WAMPSERVER

Stands for "Windows, Apache, MySQL and PHP." WAMP is a variation of LAMP for Windows systems and is installed as a software bundle (Apache, MySQL, and PHP). It is used for web development and internal testing, but may also be used to serve live websites.

WampServer is a Web development platform on Windows that allows you to create dynamic Web applications with Apache2, PHP, MySQL and MariaDB. WampServer automatically installs everything you need to intuitively develop Web applications. You will be able to tune your server without even touching its setting files. Best of all, WampServer is available for free in both 32 and 64 bit versions. Wampserver is not compatible with Windows XP, SP3, or Windows Server 2003.

The most important part of the WAMP package is Apache (or "Apache HTTP Server") which is used run the web server within Windows. By running a local Apache web server on a Windows machine, a web developer can test web pages in a web browser without publishing them live on the Internet.

WAMP also includes MySQL and PHP, which are two of the most common technologies used for creating dynamic websites. MySQL is a high-speed database, while PHP is a scripting language that can be used to access data from the database. By installing these two components locally, a developer can build and test a dynamic website before publishing it to a public web server.

While Apache, MySQL, and PHP are open source components that can be installed individually, they are usually installed together.

Features

- Manage your Apache, MySQL and MariaDB services
- Install and switch Apache, MySQL, MariaDB and PHP releases

- Manage your servers settings
- Access your logs
- Access your settings files
- Create alias
- Use VirtualHost as hosters

PHP

PHP stands for **PHP: Hypertext Preprocessor**. PHP is a server-side scripting language designed specifically for web development. PHP can be easily embedded in HTML files and HTML codes can also be written in a PHP file. The thing that differentiates PHP with client-side language like HTML is, PHP codes are executed on the server whereas HTML codes are directly rendered on the browser.

PHP File

- PHP files can contain text, HTML, CSS, JavaScript, and PHP code
- PHP code is executed on the server, and the result is returned to the browser as plain HTML
- PHP files have extension ".php"

Working

- can generate dynamic page content
- create, open, read, write, delete, and close files on the server
- can collect form data
- can send and receive cookies
- can add, delete, modify data in your database
- can be used to control user-access
- can encrypt data

With PHP you are not limited to output HTML. You can output images, PDF files, and even flash movies. You can also output any text, such as XHTML and XML.

MYSQL

MySQL, the most popular Open Source SQL database management system, is developed, distributed, and supported by Oracle Corporation.

MySQL is a database management system.

A database is a structured collection of data. It may be anything from a simple shopping list to a picture gallery or the vast amounts of information in a corporate network. To add, access, and process data stored in a computer database, you need a database management system such as MySQL Server. Since computers are very good at handling large amounts of data, database management systems play a central role in computing, as standalone utilities, or as parts of other applications.

MySQL databases are relational.

A relational database stores data in separate tables rather than putting all the data in one big storeroom. The database structures are organized into physical files optimized for speed. The logical model, with objects such as databases, tables, views, rows, and columns, offers a flexible programming environment. You set up rules governing the relationships between different data fields, such as one-to-one, one-to-many, unique, required or optional, and “pointers” between different tables. The database enforces these rules, so that with a well-designed database, your application never sees inconsistent, duplicate, orphan, out-of-date, or missing data.

The SQL part of “MySQL” stands for “Structured Query Language”. SQL is the most common standardized language used to access databases. Depending on your programming environment, you might enter SQL directly (for example, to generate reports), embed SQL statements into code written in another language, or use a language-specific API that hides the SQL syntax.

MySQL software is Open Source.

Open Source means that it is possible for anyone to use and modify the software. Anybody can download the MySQL software from the Internet and use it without paying anything. If you wish, you may study the source code and change it to suit your needs. The MySQL software uses the GPL (GNU General Public License) to define what you may and may not do with the software in different situations. If you feel uncomfortable with the GPL or need to embed MySQL code into a commercial application, you can buy a commercially licensed version from us.

The MySQL Database Server is very fast, reliable, scalable, and easy to use.

If that is what you are looking for, you should give it a try. MySQL Server can run comfortably on a desktop or laptop, alongside your other applications, web servers, and so on, requiring little or no attention. If you dedicate an entire machine to MySQL, you can adjust the settings to take advantage of all the memory, CPU power, and I/O capacity available. MySQL can also scale up to clusters of machines, networked together.

MySQL Server was originally developed to handle large databases much faster than existing solutions and has been successfully used in highly demanding production environments for several years. Although under constant development, MySQL Server today offers a rich and useful set of functions. Its connectivity, speed, and security make MySQL Server highly suited for accessing databases on the Internet.

MySQL Server works in client/server or embedded systems.

The MySQL Database Software is a client/server system that consists of a multithreaded SQL server that supports different back ends, several different client programs and libraries, administrative tools, and a wide range of application programming interfaces (APIs).

CHAPTER 4

CHAPTER 4

SYSTEM DESIGN

4.1 ER DIAGRAM

An Entity–relationship model (ER model) describes the structure of a database. Here sensors act as a composite attribute which subdivided into three attributes heart rate sensor value, Galvanic skin response value and Electrocardiogram sensor value. Values received from sensors are send to entity called microcontroller1 which has relationship with RF Transmitter. If the destress values are detected will be send to another entity called IOT.IOT has attributes called android application and LED display. Another function of microcontroller1 if the person is found to be in stress. The Microcontroller1 which also has the relationship with RF Receiver. The RF Receiver acts as the entity here will send the signal to another entity called Microcontroller2. Microcontroller 2 has attribute called IR LED, send the reduced value through the signal to microcontroller 1 which has the relationship with RF Transmitter and from the RF Transmitter the reduced values are send to the IOT entity. Values and suggestions will be displayed in android application and LED display.

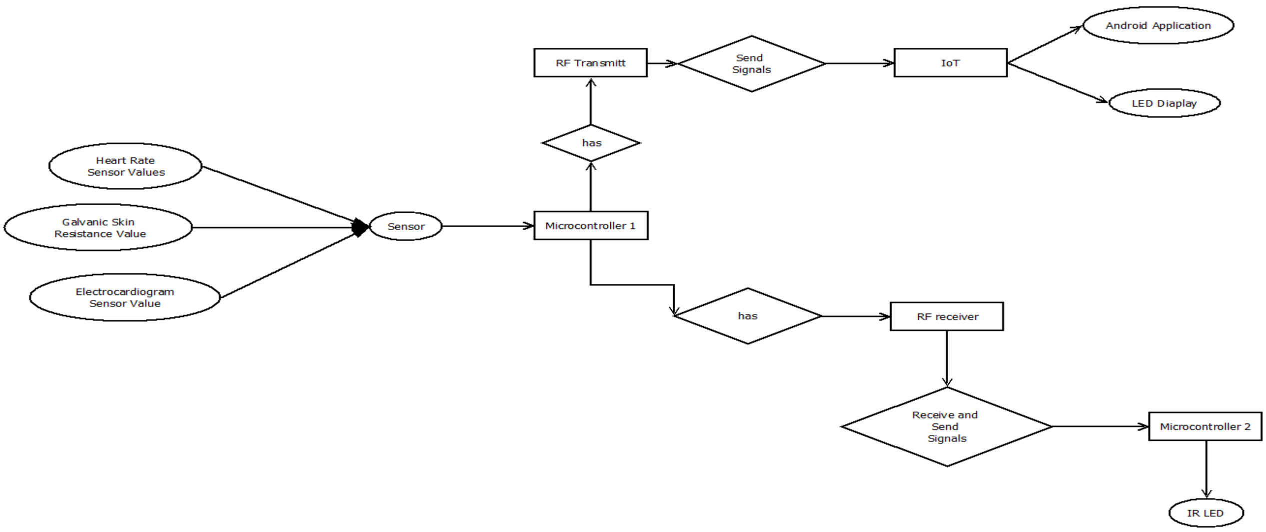


Figure: 4.1 ER DIAGRAM OF STRESS DETECTOR AND REDUCER WEARABLE DEVICE USING IOT

4.2 DATA DICTIONARY

Data dictionary is a centralized repository of metadata. Metadata is data about data. Such as

- What table(s) each field exists in
- What database(s) each field exists in
- The data types, e.g., integer, real, character, and image of all fields in the organization’s databases
- The sizes, e.g., LONG INT, DOUBLE, and CHAR(64), of all fields in the organization’s databases

Table 4.1:DATA DICTIONARY

NAME	FIELD TYPE	SIZE	CONSTRAINT
SNO	INT	10	PRIMARY KEY
LAST UPDATE	INT	10	NOT NULL
HEART RATE	INT	10	NOT NULL
GSR RATE	INT	10	NOT NULL
ECG RATE	INT	10	NOT NULL

Last Update	sno	Heart Beat (BPM)	Galvanic Skin Resistance	ECG
2021-03-23 13:00:09	2	3	2	31
2021-03-23 12:55:11	1	1	2	3

Figure: 4.2 .DATA DICTIONARY OF STRESS DETECTOR AND REDUCER WEARABLE DEVICE USING IOT

4.3 UML DIAGRAMS

USECASE DIAGRAM

A use case diagram at its simplest is a representation of a user's interaction with the system and depicting the specifications of a use case. The user acts as an actor where interacts with server with the following system. Heart rate sensor value, galvanic skin response value, electrocardiogram sensor value are collected from user and send to another actor called server and additional use case system called RF Transmitter helps to carried out signals to send to RF Receiver which acts as another additional use case system and send the carried signals to another use case IR LED and the detected values and reduced values will be displayed in the use case called android application and LED display from the actor called server to the actor called user

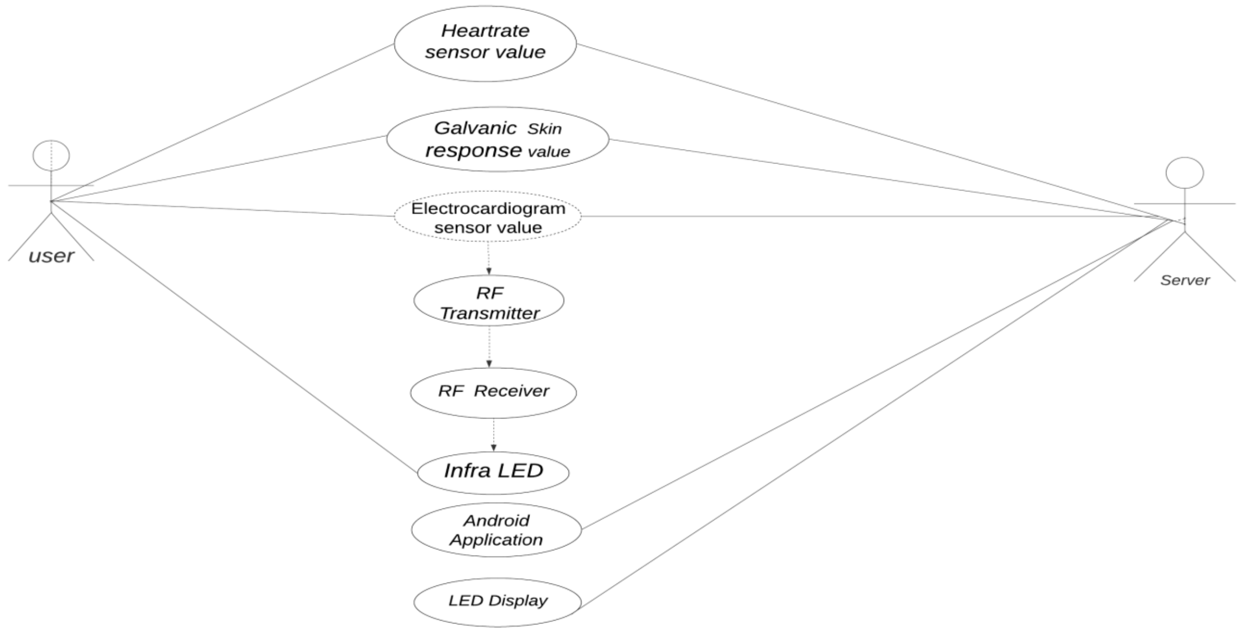


Figure :4.3 USE CASE DIAGRAM OF STRESS DETECTOR AND REDUCER WEARABLE DEVICE USING IOT

CLASS DIAGRAM

Class diagram in the Unified Modeling Language (UML) is a type of static structure diagram that describes the structure of a system by showing the system's classes, their attributes, operations (or methods), and the relationships among objects. In class diagram the three sensors function is used to calculate heart rate, Galvanic skin resistance and pulse rate. The sensor values given as an attribute to the Microcontroller 1. The Microcontroller 1 function is to compare the sensor values with the threshold value that is set by the user. Microcontroller 1 identified that the person is in stress or not. Once the detection gets completed. The collected data will be stored in the IOT. The stress level will be in the form of graph which is used to identify the level of stress also it shows the time i.e how many times the stress has been detected to the IOT. The same graph and the values will be shown in the Android Application in the form of time stress level and after these activity the microcontroller 2 starts working based on the threshold value .The IR LED gets on and reduce the stress.

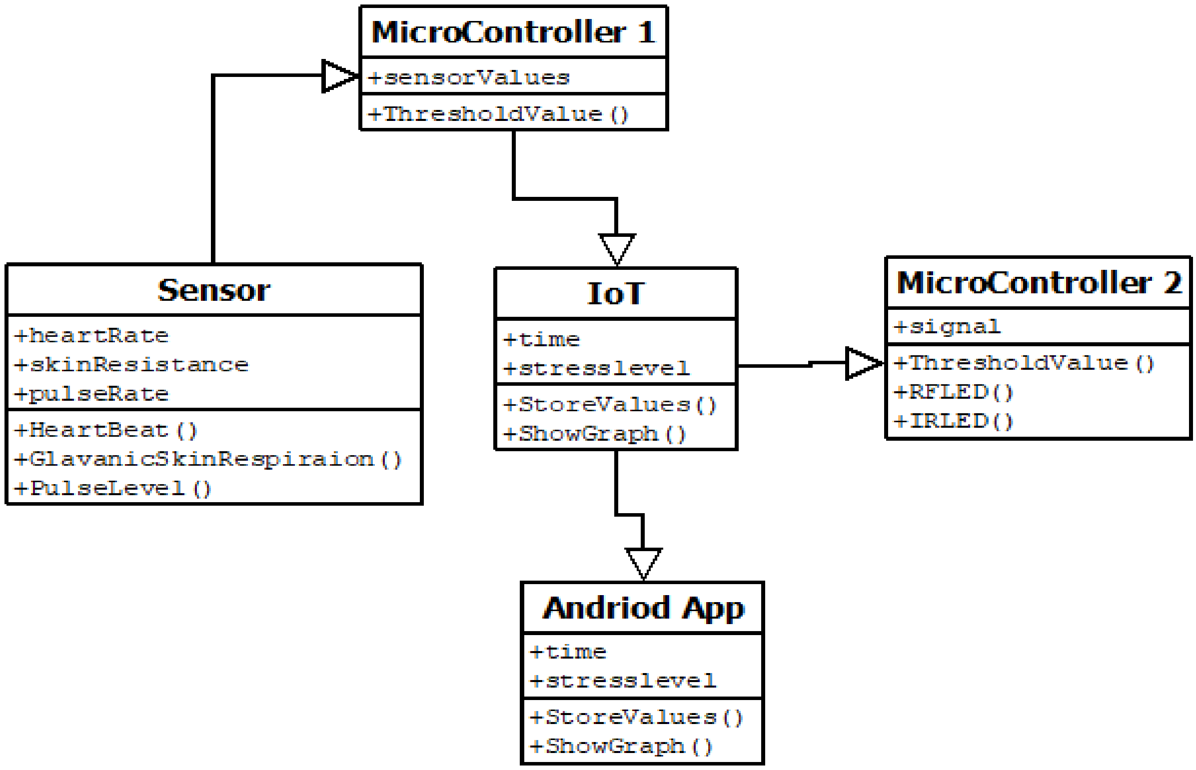


Figure :4.4 :CLASS DIAGRAM OF STRESS DETECTOR AND REDUCER WEARABLE DEVICE USING IOT

SEQUENCE DIAGRAM

Sequence diagrams describe how and in what order the objects in a system function. Here user acts an object where it uses message caller activation bar to get the values of Heart Rate Skin Resistance, ECG Value. Another object called Microcontroller 1 has the message receiver activation bar to receive the values from user. The received values are carried out to the server which act as an another object. If the user found to be in stress with stress indication message bar the Microcontroller 1exchange the information with server. The server will send the signal as a message to Microcontroller2.The Microcontroller2 will send the message to switch on the IR LED. The Microcontroller 2 also exchange the information i.e stress is reduced to the object called user.

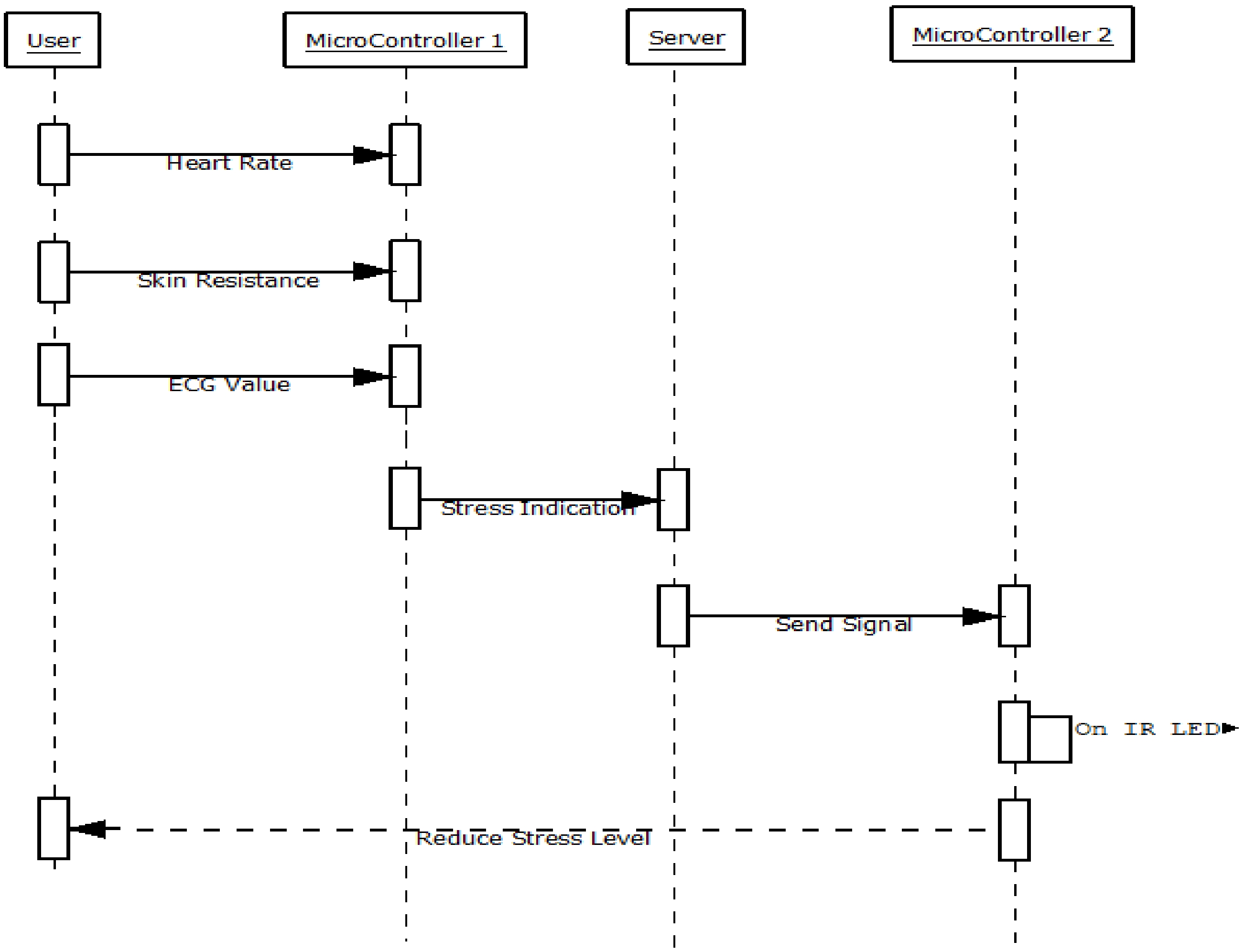


Figure :4.5 SEQUENCE DIAGRAM OF STRESS DETECTOR AND REDUCER WEARABLE DEVICE USING IOT

ACTIVITY DIAGRAM

Activity diagram are typically used for business process modeling for modeling the logic captured by a single use case or usage scenario, or for modeling the detailed logic of a business rule. The initial state is to get the sensor values from user and send the values to Microcontroller 1. The action of Microcontroller 1 is subdivided into two activities .The First activity is when the person is found to be in destress the values are detected and given to IOT Server. The IOT Server will display the values in android application and LED Display .The Second activity is when the person is found to be in stress .The Microcontroller 2 will send the signal to reduce the stress. The final state is to send the reduced stress value to IOT Server.

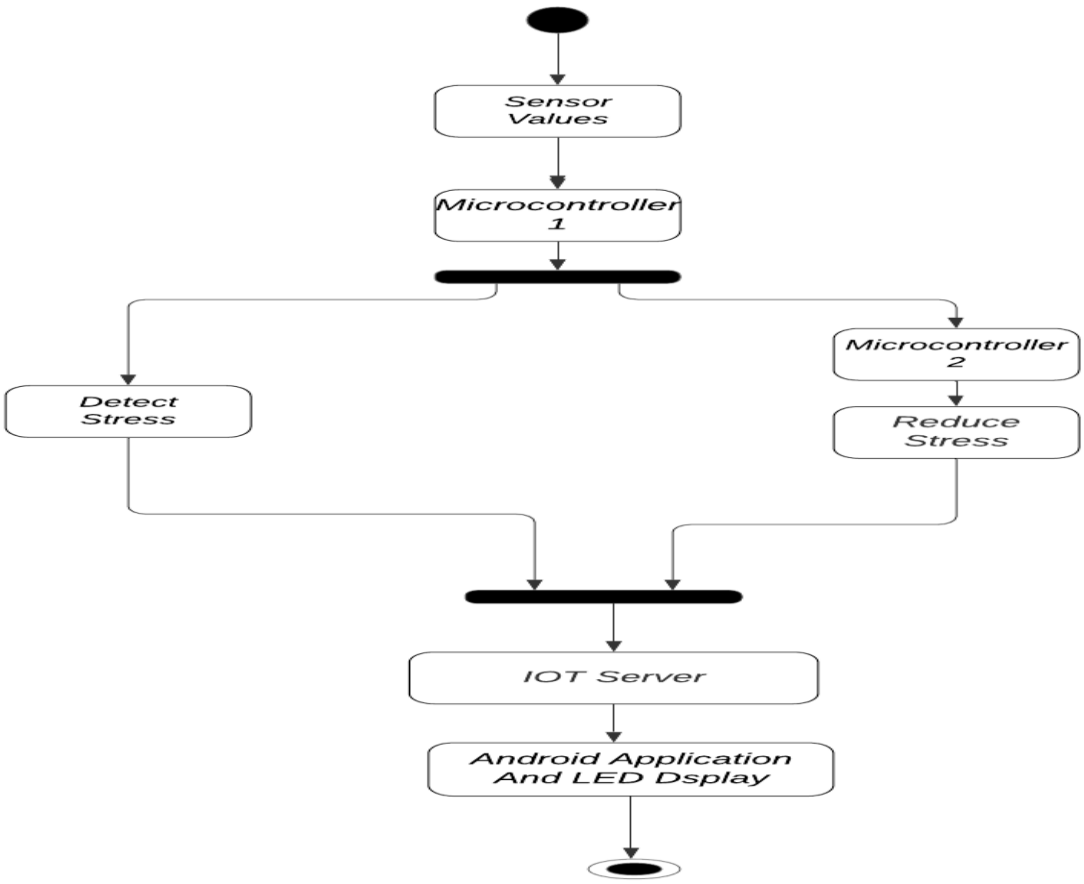


Figure: 4.6 ACTIVITY DIAGRAM OF STRESS DETECTOR AND REDUCER WEARABLE DEVICE USING IOT

CHAPTER 5

CHAPTER 5

SYSTEM ARCHITECTURE

5.1 ARCHITECTURE OVERVIEW

The sensors block collects the sensors value from the user, sends it to microcontroller1. The microcontroller1 checks the threshold value and if it exceeds the threshold value it identifies that the person is in stress .The values detected by the sensors are sent to IoT server in the form of waves which is achieved by using PHP. The microcontroller1 also sends signal to RF Transmitter indicating stress which in turn sends signal to RF receiver which is in microcontroller2. Once microcontroller2 receives the signal, it switches ON the IR LED which reduces the stress in a person.

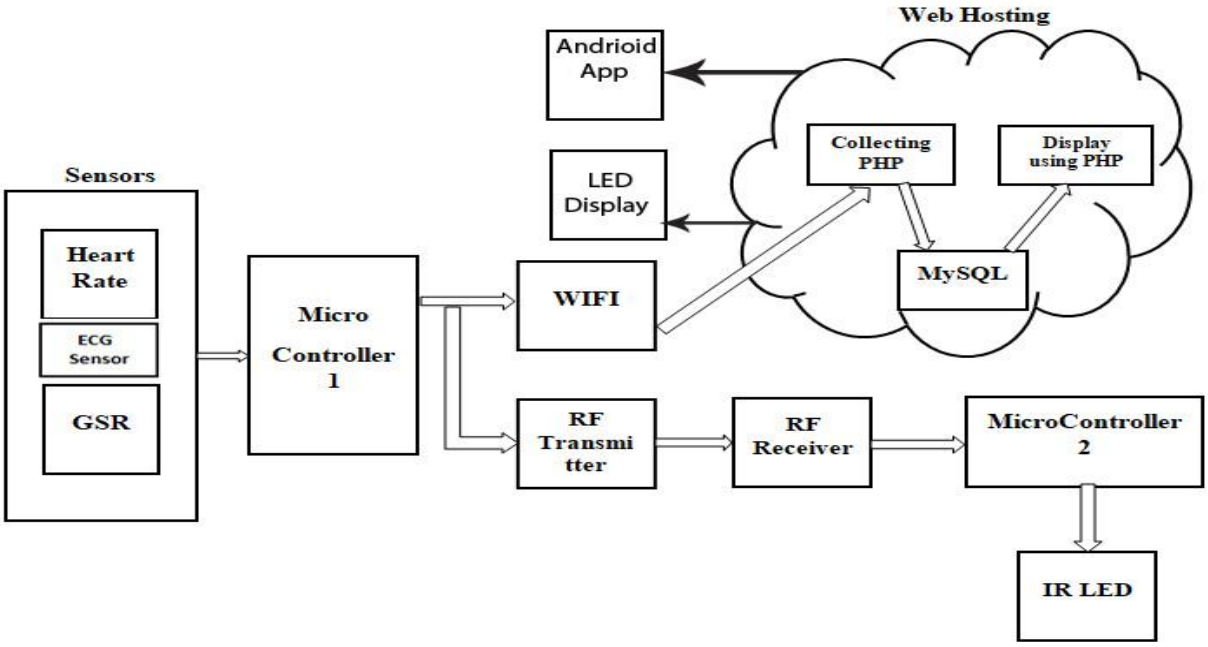


Figure :5.1 SYSTEM ARCHITECTURE OF STRESS DETECTOR AND REDUCER WEARABLE DEVICE USING IOT

Microcontroller [Atmega 328p]:

The Arduino Uno board is a microcontroller based on the ATmega328. It has 14 digital input/output pins in which 6 can be used as PWM outputs, a 16 MHz ceramic resonator, an ICSP header, a USB connection, 6 analog inputs, a power jack and a reset button. This contains all the required support needed for microcontroller.

A microcontroller is a compact integrated circuit designed to govern a specific operation in an embedded system. A typical microcontroller includes a processor, memory and input/output peripherals on a single chip and it is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. First Microcontroller collects the information from heart beat sensor, GSR sensor, ECG sensor . Then it sends that information to be stored in database in cloud sever via WIFI Module. If any stress is detected by the microcontroller it will send the signal to the RF Receiver via RF Transmitter. Second Microcontroller will turn ON the IR LED as soon as it receives the data from the RF Receiver.

HEART RATE SENSOR

Heart beat sensor is meant to administer digital output of warmth beat once a finger is placed on that. When the center beat detector is functioning, the beat LED flashes in unison with every heart beat. This digital output are often connected to microcontroller on to measure the Beats Per Minute (BPM) rate. It works on the principle of light-weight modulation by blood flow through finger at every pulse.

Benefits and Features

Complete Heart-Rate Sensor Solution Simplifies Design

• Integrated LEDs, Photo Sensor, and High-Performance Analog Front -End

• Tiny 5.6mm x 2.8mm x 1.2mm 14-Pin Optically Enhanced System-in-Package

Ultra-Low-Power Operation Increases Battery Life for Wearable Devices

• Programmable Sample Rate and LED Current for Power Savings

• Ultra-Low Shutdown Current (0.7µA, type)

Advanced Functionality Improves Measurement Performance

• High SNR Provides Robust Motion Artefact Resilience

• Integrated Ambient Light Cancellation

• High Sample Rate Capability

• Fast Data Output Capability

APPLICATIONS

● Wearable Devices

● Fitness Assistant Devices

● Medical Monitoring Devices

GSR:

When the Stress gets increased the resistance of the skin will also get increases and that is detected by the Galvanic skin response and send to the First Microcontroller

ECG Sensor:

ECG records the electrical activity generated by heart muscle depolarizations, which propagate in pulsating electrical waves towards the skin. ECG electrodes are typically wet sensors, requiring the use of a conductive gel to increase conductivity between skin and electrodes.

Wi-Fi Module:

For Wi-Fi connectivity here we are using ESP 12E module. This will act as a Wi-Fi module for data transmission from the microcontroller to the server.

RF TRANSMITTER

RF Transmitter is used to transmit the data from the First Microcontroller. Here we are using RF433MHz Transmitter for transmitting purpose**.**

Specifications RF 433MHz Transmitter

- Frequency Range: 433.92MHz
- Input Voltage: 3-12V

RF RECEIVER

RF Receiver is used to receive the data from the transmitter and sent to the second microcontroller. Here we are using RF433MHz Receiver for receiving purpose.

Specifications RF 433MHz Receiver

- Frequency Range: 433.92 MHz
- Modulation: ASK

- Input Voltage: 5V

IR LED

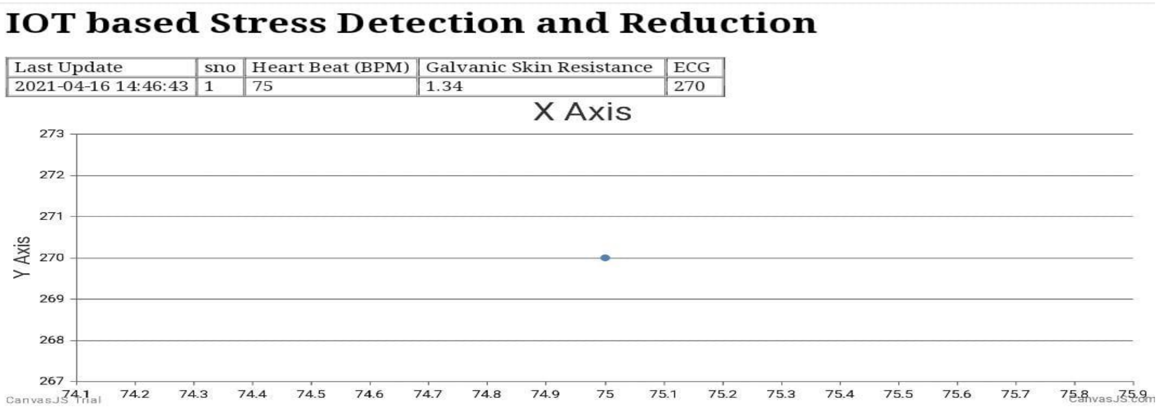
In order to reduce the stress we use IR LED which produce IR Light emission that will minimize the level of stress.

5.2 MODULE DESIGN SPECIFICATION

Our project is having following module:

1. Detecting Stress

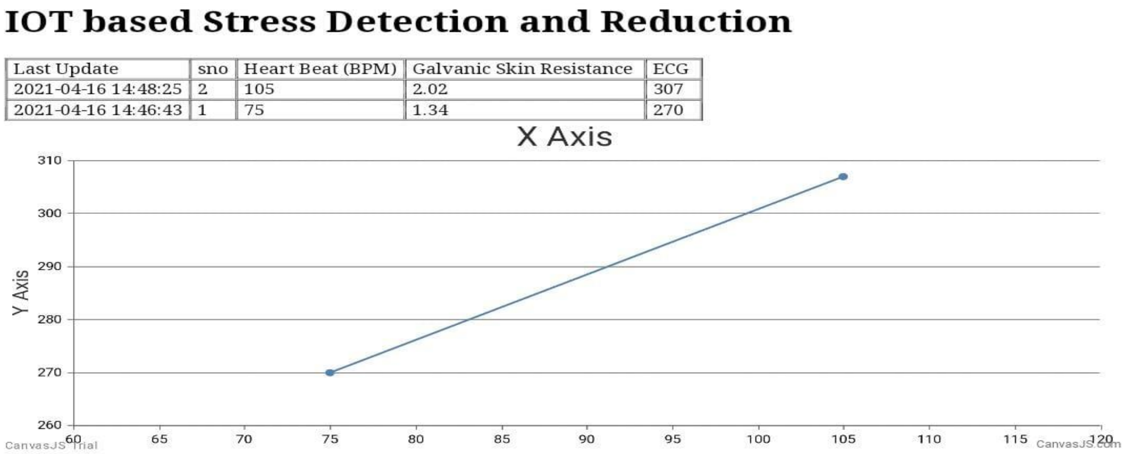
Heartbeat level and pulse rate increases during stress, here we monitor the heartbeat rate using heartbeat sensor and pulse rate using ECG sensor. Stress causes sweating to increase on palms and soles. Changes in the rate of sweat it increases the skin resistance. Using GSR sensor we are checking the skin resistance level. All the sensors values are sent to Microcontroller1. When the sensor values exceeds threshold values, stress in the user is detected and sent to RF Transmitter in Microcontroller1 (Arduino). If the threshold value for heart rate exceeds 100 bpm , ECG value exceeds 300 and the GSR rate exceeds 2.5 v , it indicates that the person is in stress. The heart rate and the GSR values are checked first .If any one value is detected to be in normal range then the ECG sensor value is checked for accuracy. If ECG value exceeds the threshold value then it concluded that the person is in stress. So the person in stress only if any two out three or all the three values exceeds the threshold value.



IOT based Stress Detection and Reduction

Last Update	sno	Heart Beat (BPM)	Galvanic Skin Resistance	ECG
2021-04-16 14:46:43	1	75	1.34	270

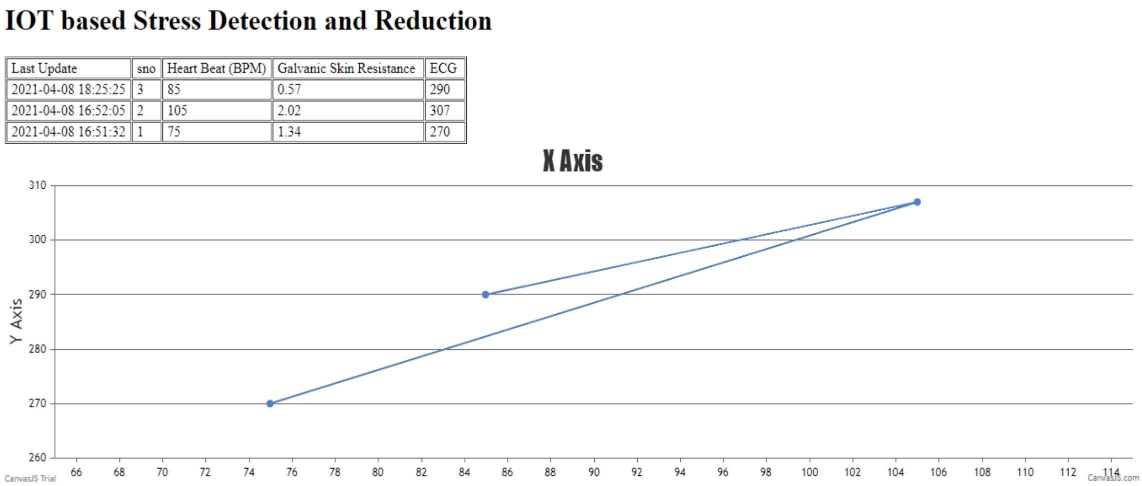
Figure :5.2 NORMAL RANGE OF STRESS INDICATION IN ONLINE



IOT based Stress Detection and Reduction

Last Update	sno	Heart Beat (BPM)	Galvanic Skin Resistance	ECG
2021-04-16 14:48:25	2	105	2.02	307
2021-04-16 14:46:43	1	75	1.34	270

Figure :5.3 STRESSFUL RANGE OF STRESS INDICATION IN ONLINE



IOT based Stress Detection and Reduction

Last Update	sno	Heart Beat (BPM)	Galvanic Skin Resistance	ECG
2021-04-08 18:25:25	3	85	0.57	290
2021-04-08 16:52:05	2	105	2.02	307
2021-04-08 16:51:32	1	75	1.34	270

Figure :5.4 REDUCED TO NORMAL RANGE OF STRESS INDICATION IN ONLINE

2. STRESS INDICATION IN ONLINE:

Once Microcontroller receives the stress indication it automatically sends the time when it got the indication and how many times stress has been detected to the Internet of things [IoT] server through WIFI module. Those indications will be stored in the online and can be viewed whenever needed. The webpage consists of a table containing the values detected by the sensors. For each detection, simultaneously a graph is plotted against heartrate value in X-axis and ECG value in Y-axis. Apart from webpage the user can view the most recently detected stress values in the android application. If the person is found to be in stress then user's detected values will displayed in RED in the mobile application. If the person is stress free, then the detected values will be displayed in GREEN for better clarity.

3.REDUCING STRESS:

Stress Indication is done in the first Microcontroller using sensors and sends wireless signal to the RF Receiver in the second Microcontroller through RF Transmitter. Once the signal is received in second microcontroller, it will switch on the IR LED to reduce the stress level which is attached in the user thumb finger. Using IR LED (9000nm – 12000nm) light allows light energy to penetrate one to three inches into your muscle tissue. The muscles use the energy to create their own heat, which causes them to relax naturally. The IR LED is ON for two minutes. The sensor values will be updated on the server for that two minutes and the IR LED penetration is stopped. Based on the updated values in the server, if the most recently detected value is found to be normal the process is stopped. Else the IR LED penetration process is repeated until the stress values becomes normal.

CHAPTER 6

CHAPER 6
SYSTEM IMPLEMENTATION

6.1 Client Side Coding

```
<html xmlns="http://www.w3.org/1999/xhtml">
<head><meta http-equiv="Content-Type" content="text/html; charset=windows-1252">
<title>Stress Detection and Reduction</title>
</head>
<body>
<form name="loginform" action="add.php" method="post">
hb<input name="hb" type="text" /><br />
gsr<input name="gsr" type="text" /><br />
ecg<input name="ecg" type="text" /><br />
<input name="update" type="submit" value="update" />
<input name="" type="reset" value="Clear" />
</form>
<br />
<br />
<form name="deleteform" action="delete.php" method="post">
<input name="delete" type="submit" value="Delete all rows" />
</form>
</body>
</html>
```

Web1.GotText

```
do set global name2 to get responseContent
set TextBox1.Text to get global bpm
set  TextBox1.Text to get global gsr
set  TextBox1.Text to get global ecg
```

if get global bpm >=100

then set TextBox4.Text to “Please relax,listen some music&yoga.”Give your stress wings and let it fly away” ”

else set TextBox 4.Text to “Normal”

6.2 Server Side Coding

```
<?php

 include("connect.php");

 $link=Connection();

 $result=mysqli_query($link,"SELECT * FROM stressdr order by sno desc limit 10");

?>
<html>
   <head>
      <title>IOT based Stress Detection and Reduction</title>
      <meta http-equiv="refresh" content="10">
   </head>
<body>
   <h1>IOT based Stress Detection and Reduction</h1>

   <table border="1" cellspacing="1" cellpadding="1">
         <tr>

               <td> Last Update </td>
               <td> sno </td>
                  <td> Heart Beat (BPM) </td>
```

```
            <td> Galvanic Skin Resistance  </td>
            <td> ECG  </td>


          </tr>
<?php
$dataPoints = array();
  if($result!==FALSE){
              while($row = mysqli_fetch_array($result)) {


                     $lastupdate=$row["lastupdate"];
                                   $sno=$row["sno"];
                             $hb=$row["hb"];
                             $gsr=$row["gsr"];
                             $ecg=$row["ecg"];


          array_push($dataPoints, array("x" => $hb, "y" => $ecg));
?><tr>
                    <td> <?php echo $lastupdate ?> </td>
                    <td> <?php echo $sno ?> </td>
                    <td> <?php echo $hb ?> </td>
            <td> <?php echo $gsr ?> </td>
            <td> <?php echo $ecg ?> </td>
                    </tr>
                    <?php
                             }
              mysqli_free_result($result);
              mysqli_close($link);
            }
                  ?>
 </table>
```

CHAPTER 7

CHAPTER 7
SYSTEM TESTING

Testing is a process used to help identify the correctness, completeness and quality of developed computer software. Testing is "the process of questioning a product in order to evaluate it", where the "questions" are things the tester tries to do with the product, and the product answers with its behavior in reaction to the probing of the tester.

INTEGRATION TESTING

Testing is done for each module. First module is detecting stress. The purpose of detecting stress is to check whether sensors values are detected properly from the connected person. The expected result is to get the heartbeat rate, skin respiration rate and ECG level correctly from the connected person. The actual result passed the expected result. Remarks was satisfied and ok. The Second module is stress indication in online. The purpose of stress indication in online is to Monitor stress occurrence frequency in online. The excepted result is stress occurrence indication in online. The actual result passed the expected result. Remarks was satisfied and ok. The Third module is reducing stress. The purpose of reducing stress is to reduce the stress using IR LED. The expected result is to Trigger the IR LED to penetrate in thumb finger to reduce the stress. The actual result passed the expected result. Remarks was satisfied and ok.

VALIDATION TESTING

The final step involves Validation testing, which determines whether the software function as the user expected. In this project the validation testing is done to check whether the system detects and reduces stress. First step is to find the heart Beat rate of the connected person with heart rate sensor. Second step is to find skin respiration level from GSR sensor. Third step is to find the ECG level from ECG sensor. Fourth step is to send sensor values to server from Microcontroller 1 via WIFI Module.Fifth step is to check the stress occurrences in Web application ,Android application and LED Display. Sixth step is to find whether the IR LED triggered to penetrate in thumb finger to reduce the stress. The expected result is to detect and reduce the stress. The actual result passed the expected result.Remarks was working condition of the system was ok and sample test case was passed.The second test case was to find the defect or any crash in the applications. Expected result is to get no bugs. The actual result was with bugs. Remarks was Need to clear the bug to make the system to work normally.

7.1 Sample Test cases

Table: 7.1.SAMPLE TEST CASE

Test Case ID	1
Test case Description/Purpose	To check whether the system detects and reduces stress.
Dependencies/Prerequisites	The sensor’s values must be loaded.
Test Data	Sensor values and IR LED.
Steps	1. Find Heart Beat Rate. 2. Find Skin Respiration level. 3. Find ECG level. 4. Send sensor values to server from Microcontroller 1 via WIFI Module. 5. Can check stress occurrences in Web,Android App and LED Display. 6. Trigger the IR LED via Microcontroller 2
Expected result	The system must detect and reduce the Stress.
Actual Result	Our system has detected and reduced the Stress.
Remarks	Working condition of the system is ok.

7.1.1 Defect Report Table

Table: 7.2 DEFECT REPORT

Test Case ID	2
Bug name	Application Crash on detecting the Stress.
Status	New
Severity	Major
Priority	1
Comments	Need to clear the bug to make the system to work normally.

7.1.2 Test Report

Module 1: Detecting Stress

Table: 7.3 DETECTING STRESS

Test Case ID	3
Test Case	Get the sensors values connected to a person
Expected Result	Heartbeat rate, Skin respiration rate and ECG level
Actual Result	Heartbeat rate, Skin respiration rate and ECG level
Pass/Fail	Pass
Remarks	OK

Module 2: Stress Indication In Online

Table: 7.4 *STRESS INDICATION IN ONLINE*

Test Case ID	4
Test Case	Monitor stress occurrence frequency in online
Expected Result	Stress occurrence
Actual Result	Stress occurrence
Pass/Fail	Pass
Remarks	OK

Module 3: Reducing stress

Table::7.5 *REDUCING STRESS*

Test Case ID	5
Test Case	Reduce the Stress using IR LED
Expected Result	Trigger the IR LED to penetrate in thumb finger to reduce the stress
Actual Result	Trigger the IR LED to penetrate in thumb finger to reduce the stress
Pass/Fail	Pass
Remarks	OK

7.1.3 Traceability matrix Report

The concept of Traceability Matrix is very important from the Testing perspective.

It is document which maps requirements with test cases. By preparing Traceability matrix, we can ensure that we have covered all the required functionalities of the application in our test cases. Functionalities tested in the traceability matrix:

- In the first functionality we covered to send the sensor values to server from microcontroller with high priority. The test condition is that the value must be transmitted to server. The phase of testing was black box testing.
- In the second functionality we covered to reduce the stress level with high priority.The test condition is that system must reduce the stress level. The phase of testing was black box testing.

Table:7.6 TRACEABILITY MATRIX TABLE

Requirement ID	SD4-01
Description	Send Sensor values to Server from Microcontroller
Priority	H
Test conditions	Values must be transmitted to server
Test case ID	Lock-01
Phase of testing	black box
Requirement ID	SD-02
Description	Reduce the stress level
Priority	H
Test conditions	Must reduce the stress level
Test case ID	Lock-02
Phase of testing	black box

CHAPTER 8

8.1 CONCLUSION

Stress increases muscle tension and causes impairment in daily physical activity. Increase in stress levels can push a person to complex mental illnesses such as borderline personality disorder (BPD) which causes dangerous mood swings, change in behavioural patterns, eating disorders and provoke the stressed person to take unhealthy decisions. The Internet of Things (IoT) helps in creating seamless wireless monitoring systems. IoT includes a wide range of sensors where in edge computations are performed. The main objective of stress detector and reducer wearable device using IoT is to significantly find the stress in human being and reduce it. Our system predicts the human stress level using heartbeat and skin respiration rate, pulse rate, once stress is detected then immediately it will switch on the IR LED which is will reduce the stress through light waves penetration. We developed a stress detection scheme to be used in real life. Since our system employs unobtrusive wearable devices, it can easily be used in the daily life of individuals. It can track the stress in real-time and intervene if an extreme of stress is detected.

FUTURE ENCHANCEMENTS

We can enhance our approach furtherly by upgrading it to monitor and maintain the stress efficiently in particular timing. It can be added in our proposed system to improve it effortlessly versatile by including more propelled sensors. The model is expected to track and sense the ongoing information with the assistance of various sensors and help to enhance the stress reduction.

APPENDICES

APPENDICES

A1. SAMPLE SCREENS

Figure: A1.1 PROJECT SETUP

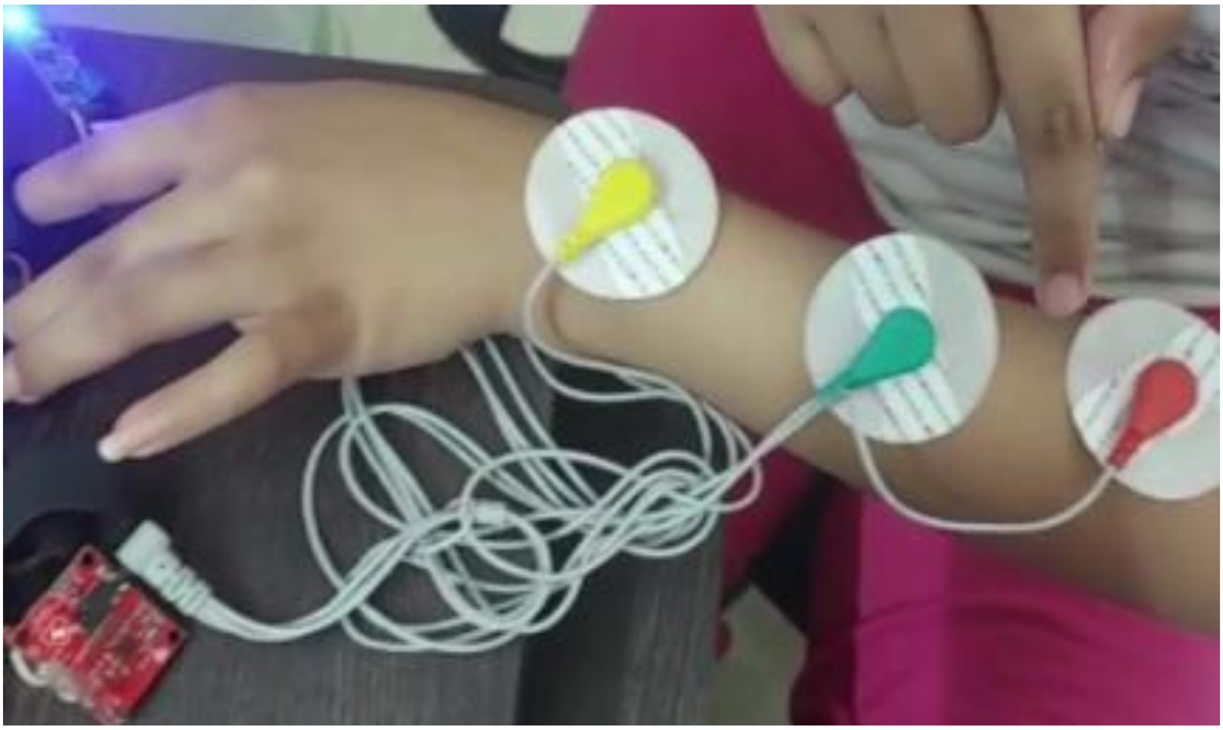


Figure: A1.2 STRESS DETECTION USING SENSOR

Figure: A1.3   IR LED TO REDUCE THE STRESS

Figure: A.1.4 STRESS DETECTION FOR NORMAL RANGE

Figure : A1.5 STRESS DETECTION FOR HIGH RANGE

Figure A1.6 STRESS REDUCED TO NORMAL RANGE

IOT based Stress Detection and Reduction

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2021-04-08 18:25:25	3	85	0.57	290
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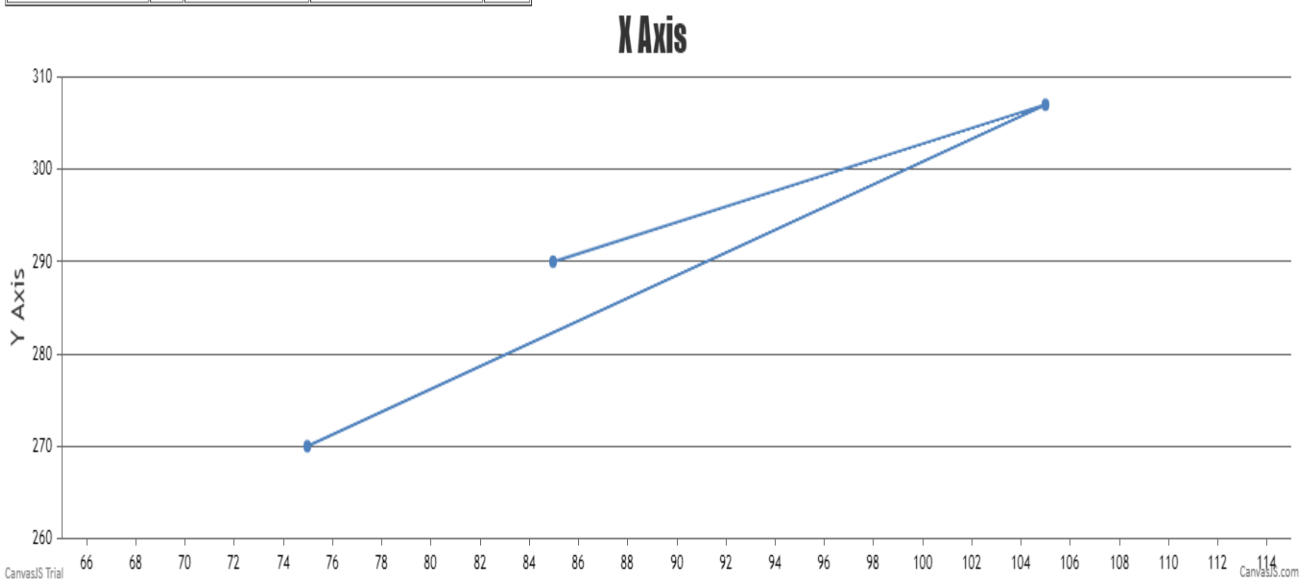

Figure A1.7 IOT BASED STRESS DETECTION AND REDUCTION

Figure A1.8 STRESS DETECTED VALUE FOR DESTRESS PERSON

Figure A1.9: STRESS DETECTED VALUE FOR DESTRESS PERSON

Figure A1.10 REDUCED STRESS VALUE FOR STRESS PERSON

A2. PUBLICATIONS

Journal name- International Journal Of Research And Analytical Reviews

Paper title- Stress Detector and Reducer Wearable Device Using IOT

Publication issue - Volume 8, Issue 2, May – 2021

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Stress Detector And Reducer Wearable Device Using IOT

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[2](Computer Science Engineering, Panimalar Engineering College/ Anna University, Chennai, India)

***Abstract*— wearable devices have recently received hefty interest because of their nice promise for a inordinateness of applications. a large vary of wearable sensors are being developed for period non-invasive watching. This project provides comprehensive review of sensors used in wrist-wearable devices, methods used for the visualization of parameters measured as well as methods used for intelligent analysis of data obtained from wrist-wearable devices. Aim of our proposed system is to build a device used to identify human stress level and to reduce it. Here we are using the galvanic sensor, heart rate sensors and ECG sensors are used to identify human stress level by monitoring the heart rate, skin resistance level and pulse rate. We are using IR LED (9000nm – 12000nm) light allows light energy to penetrate one to three inches into your muscle tissue. Using energy our muscle creates their own heat .It is one of the best ways to relax. The collected sensors data will be displayed in the web page, LED screen using IoT (Internet of Things). Suggestions to be placid will be displayed and recently collected sensors data will be displayed in android applications**

Index Terms*— *Galvanic sensors, Heart rate sensors , ECG sensors ,IR LED,LED display.

I.INTRODUCTION

Stress detection is the proceeding analysis subjectamong researchers. Diversity automation evolves on person stress detection using wearable sensors. Here we are using the galvanic sensor, heart rate sensors and ECG sensors .These sensors are used to identify human stress levels by monitoring the heart rate, skin resistance level. Monitoring the stress with individual parameter is sufficient for exact detection of stress. However, using multiple parameter aids in superior detection of stress. A combination of parameters such as heart rate, skin resistance level and pulse rate additionally increases the accuracy.

Stress reduction with physical activity in today's busy life is difficult. We are using IR LED (9000 nm-12000 nm) light allows light energy to penetrate one to three inches into your muscle tissue. Using energy our muscle creates their own heat.It is one of the best ways to relax.The collected sensors data will be displayed in the web page,LED screen using IoT (Internet of Things). estions to be placid will be displayed and recently collected sensors data will be displayed in android applications.

The Existing stress detection system was performed in the laboratory environments, while the current analysis continues on real-life environments. The Current EEG (Electroencephalogram) measuring devices are obtrusive for individuals and they are not applicable to daily life routines. So we don't have an efficient device for reducing the stress level. To overcome the disadvantage in the existing system we are going to propose this automation detection system.This is cost efficient compare to all the other existing systems.

II.RELATED WORKS

[1] Nurdina Widanti; Budi Sumanto; Poppy Rosa; M. Fathur Miftahudin Automatic Stress Detection Using Wearable Sensors and Machine Learning: A Review.(2020)Advantage: Detecting Stress of an individual with the help of wearable sensors and machine learning algorithms are effective and affordable. Disadvantage: Used multiple features correlated with each other increases computation time and used some costly commercial devices for physiological signal collection. https://ieeexplore.ieee.org/document/9225692.

[2] Murat Yuksel; Wei Wang; Shafaq Chaudhry; Damla Turgut; Naim KapucuChallenges and Opportunities in Utilizing IoT-Based Stress Maps as a Community Mood Detector(2019). Advantage: a time series of national maps of happiness and negative emotions.Disadvantage: Need to aggregate data and transfer it with a high enough frequency to adhere to the real-time nature of collecting and monitoring stress data. https://ieeexplore.ieee.org/document/9032995

[3] Bhagyashree Shirke; Jonathan Wong; Kiran George. Acute Mental Stress Measurement using Brain-IoT System (2019). Advantage: Non-invasive method for individuals to diagnose and cope with their stress levels. Disadvantage: reading may be slightly inaccurate by EEG headset due to the inference of the hair and high sensitivity to muscle movement. https://ieeexplore.ieee.org/document/8998992

[4] Vasilii G Arkhangelsk Sergey A. Alyushin Alexander V. AlyushinDevelopment and Analysis of Analog-Digital Neural Net for Speech Stress Detection(2018)Advantage: supports self-organization process in speech stress detection during speech analysis.Disadvantage: Cannot able to detect stress by body condition. https://ieeexplore.ieee.org/document/8317460

[5]LaavanyaRachakonda;PrabhaSundaravadivel;SarajuP. Mohanty; Elias Kougianos; Madhavi Ganapathiraju (2018) A Smart Sensor in the IoMT for Stress Level Detection.Advantage: Monitors stress levels through body temperature, rate of motion and sweat during physical activity. Disadvanatge: Detects stress only through physical

activities https://ieeexplore.ieee.org/document/8719525

III. PROPOSED WORKS

The negative effects of mental stress on human health has been known for many years . High-level stress must be detected at early stages to prevent these negative effects. In our proposed system we are becoming to develop an automatic stress detection system using smart wearable devices which can be carried during the life-style routines of individuals . Here we are using galvanic sensor and pulse sensor to detect thecenter beat count and vital sign level. which we are using IR sensor to reduce the strain level. All the knowledge from the sensors are sent to the online page using IoT Server. Sensors data are going to be displayed in led screen.android application is employed to display recent stress detection information and suggestion to be placid also will be displayed in android application.This is cost efficient compare to all or any or any the other existing systems.

A. *DETECTING STRESS*

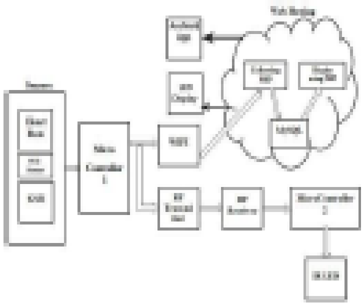
Heartbeat level and pulse increases during stress, here we monitor the heartbeat rate using heartbeat sensor and pulse using ECG sensor. Stress causes sweating to extend on palms and soles. Changes within the rate of sweat it increases the skin resistance. Using GSR sensor we are checking the skin resistance level. When the sensor values exceeds threshold values. stress within the user is detected and sent to Microcontroller (Arduino)

B. *STRESS INDICATION IN ONLINE*

Once Microcontroller receives the strain indication it automatically sends the time when it got the indicationand the way repeatedly stress has been detected to the web of things [IoT] server through WIFI module. Those indications are going to be stored within the online and may be viewed whenever need . And also they will check it in their mobile phones through android app. it'll be helpful for the user to require medication

C. *REDUCING STRESS*

Stress Indication is completed within the first Microcontroller using sensors and sends wireless signal to the RF Receiver within the second Microcontroller through RF Transmitter. Once the signal is received in second microcontroller, it'll turn on the IR LED to scale back the strain level which is attached within the user toe



SYSTEM ARCHITECTURE

IV.IMPLEMENTATION DETAILS

A. *HARDWARE DETAILS*

Hardware tools used in the project are Microcontroller ,heart rate sensor, Galvanic skin response(GSR), Electrocardiogram (ECG) sensor, RF Transceiver, Infra red LED

a. *MICROCONTROLLER*

Arduino IDE is open source software available for programming an Arduino board. It runs on any operating system such as Windows, Linux or MAC OS X. The data collection is performed using an "analogRead" function which enables the Arduino board to read an analog input pin to which the sensor is connected. enables Arduino board to IoT platform Wi-Fi module in the program

b. HEART RATE SENSOR

Heart beat sensor is designed to give digital output ofheat beat when a finger is placed on it. When the heart beat detector is working, the beat LED flashes in unison with each heart beat. This digital output can be connected to microcontroller directly to measure the Beats Per Minute (BPM) rate. It works on the principle of light modulation by blood flow through finger at each pulse

c. GALVANIC SKIN RESPONSE SENSOR

Galvanic skin response readings are simply the measurement of electrical resistance through the body. Two leads are attached to two fingertips. One lead sends current while the other measures the difference. This setup measures GSR every 50 milliseconds. Each reading is graphed, while peaks are highlighted and an average is calculated to smooth out the values. A baseline reading is taken for 10 seconds if the readings go flat (fingers removed from leads).

D.ELECTROCARDIOGRAM

ECG Monitor Sensor Module is based on AD8232 Analog Device IC. This is a cost-effective ECG Sensor used to measure the electrical activity of the heart. This electrical activity can be charted as an ECG or Electrocardiogram and output as an analog reading. ECGs can be extremely noisy, out AD8232 Single Lead Heart Rate Monitor acts as an op amp to help obtain a clear signal. This sensor can be connected to an Arduino/Raspberry Pi, etc. Sample codes are easily available on the internet.

The AD8232 is an integrated signal conditioning block for ECG and other biopotential measurement applications. It is designed to extract, amplify, and filter small biopotential signals in the presence of noisy conditions, such as those created by motion or remote electrode placement The AD8232 module breaks out nine connections from the IC that you can solder pins, wires, or other connectors to. SDN, LO+, LO-, OUTPUT, 3.3V, GND provide essential pins for operating this monitor with an Arduino or other development board. Also provided on this board are RA (Right Arm), LA (LeftArm), and RL (Right Leg) pins to attach and use yourown custom sensors. Additionally, there is an LED indicator light that will pulsate to the rhythm of a heart beat.

e. RF TRANSCEIVER

This hybrid RF Transceiver Module provides an entire RF transmitter and receiver module solution which may be wont to transmit data at up to 3KHz from any standard CMOS/TTL source.The transmitter module is extremely simple to work and offers low current consumption (typical. 11mA).Data are often supplied directly from a microprocessor or encoding device, thus keeping thecomponent count and ensuring a coffee hardware cost.The RX – ASK is an ASK Hybrid receiver module. The RF Transmitter Receiver Module is an efficient low-cost solution for using 433 MHz. The TX-ASK is an ASK hybrid transmitter module. TX-ASK is meant by the saw resonator, with an efficient low cost, small size and straightforward to use for designing.

F. IR LED

Infrared (IR) radiation is electromagnetic radiation with wavelengths between 760 nm and 100,000 nm.Here we are using ir led with wavelengths between 9000nm and 12000 nm. infrared light also improves the circulation of oxygen-rich blood in the body, promoting faster healing of deep tissues and relieving pain.It also helps to relieving stress.

B.SOFTWARE DETAILS

Software Elements consists of Arduino IDE software for data collection and transmission and IOT platform With Wampserver for data storing.

a. Arduino IDE

Arduino board. It runs on any OS like Windows, Linux or MAC OS X. the info collection is performed using an "analogRead" function which enables the Arduino board to read an analog input pin to which the sensor is connected. enables Arduino board to IoT platform Wi-Fi module within the program and transmission and IOT platform .

b. WAMP SERVER

WampServer refers to an answer stack for the Microsoft Windows OS ,created by Romain Bourdon and consisting of the Apache web server, OpenSSL for SSL support, MySQL database and PHP programing languageand IOT platform .

V.CONCLUSION

We developed a stress detection scheme to be utilized in real world. Since our system "STRESS DETECTOR AND REDUCER WEARABLE DEVICE USING IOT" employs unobtrusive wearable devices, it can easily be utilized in the lifestyle of people. It can track the strain in real-time and intervene if an extreme of stress is detected. After the detection, some stress management methods also can be offered to alleviate the high level of stress.

REFERENCES

[1] Nurdina Widanti; Budi Sumanto; Poppy Rosa; M. Fathur Miftahudin Automatic Stress Detection Using Wearable Sensors and Machine Learning: A Review,2020.

[2] Murat Yuksel; Wei Wang; Shafiq Chaudhry; Damla Turgut; Naim KapucuChallenges and Opportunities in Utilizing IoT-Based Stress Maps as a Community Mood Detector,2019.

[3] Bhagyashree Shirke; Jonathan Wong; Kiran George. Acute Mental Stress Measurement using Brain-IoT System ,2019.

[4] Vasilii O. Arkhangelsk Sergey A. Alyushin Alexander V. AlyushinDevelopment and Analysis of Analog-Digital Neural Net for Speech Stress Detection,2018.

[5] LaavanyaRachakonda;PrabhaSundaravadivel;SarajuMohanty;Elias Kougianos; Madhavi Ganapathiraju. A Smart Sensor in the IoMT for Stress Level Detection,2018

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[1]Nurdina Widanti; Budi Sumanto; Poppy Rosa; M. Fathur Miftahudin "Automatic Stress Detection Using Wearable Sensors and Machine Learning: A Review",2020.

[2] Murat Yuksel; Wei Wang; Shafaq Chaudhry; Damla Turgut; Naim Kapucu "Challenges and Opportunities in Utilizing IoT-Based Stress Maps as a Community Mood Detector",2019.

[3]Bhagyashree Shirke; Jonathan Wong; Kiran George. "Acute Mental Stress Measurement using Brain-IoT System" ,2019.

[4]Vasilii G. Arkhangelsk Sergey A. Alyushin Alexander V. Alyushin "Development and Analysis of Analog-Digital Neural Net for Speech Stress Detection",2018.

[5]LaavanyaRachakonda;PrabhaSundaravadivel;SarajuP. Mohanty; Elias Kougianos; Madhavi Ganapathiraju. "A Smart Sensor in the IoMT for Stress Level Detection",2018.

[6] Qianli Xu, Member, IEEE, Tin Lay Nwe, Member, IEEE, and Cuntai Guan, Senior Member, IEEE, "Cluster-Based Analysis for Personalized Stress Evaluation Using Physiological Signals", IEEE Journal of Biomedical And Health Informatics, Vol. 19, No. 1, January 2015.

[7] Chee-Keong Alfred Lim and Wai Chong Chia, "Analysis of SingleElectrode EEG Rhythms Using MATLAB to Elicit Correlation with Cognitive Stress", International Journal of Computer Theory and Engineering, Vol. 7, No. 2, April 2015.

[8] Tong Chen, Peter Yuen, Mark Richardson, Guangyuan Liu, and Zhishun She, Senior Member, IEEE, "Detection of Psychological Stress using a Hyper spectral Imaging Technique",IEEE Transactions on Affective Computing, Vol. 5, No. 4,

October-December 2014.

[9] Cornelia Setz, Bert Arnrich, Johannes Schumm, Roberto La Marca, Gerhard Tr¨oster, Member, IEEE, and Ulrike Ehlert, “Discriminating Stress from Cognitive Load Using a Wearable EDA Device”, IEEE Transactions On Information Technology In Biomedicine, Vol. 14, No. 2, March 2010.

[10] Awanis Romli, Arnidcha Peri Cha, “An Expert System for Stress Management”, November 2009.

[11] Jennifer A. Healey and Rosalind W. Picard, “Detecting Stress during Real-World Driving Tasks using Physiological Sensors”,IEEE Trans. Intell. Transp. Syst., vol. 6, no. 2, pp. 156–166, Jun. 2005.

[12] Prof. Shamla Mantri1,Vipul Patil2, Rachana Mitkar3, “EEG Based Emotional Distress Analysis – A Survey”, International Journal of Engineering Research and Development, Volume 4, Issue 6 (October 2012).

[13] Yvan Saeys, Inaki Inza and Pedro Larranaga, “A review of feature selection techniques in bioinformatics”, Bioinformatics, vol. 23, no. 19, pp. 2507–2517, 2007.

[14] Mariya Khan, Zoha Rizvi, Muhammad Zakir Shaikh, Warda Kazmi, and Anum Shaikh, “Design and Implementation of Intelligent Human Stress Monitoring System”, International Journal of Innovation and Scientific Research, ISSN 2351-8014 Vol. 10 No. 1 Oct. 2014, pp. 179-190.

[15] Burcu Cinaz, Bert Arnrich, Roberto La Marca, Gerhard Troster, “Monitoring of mental workload levels during an everyday life office-work scenario”, Pers. Ubiquit. Comput., vol. 17, no. 2, pp. 229–239, 2013.