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STRESS ANALYSIS AND CARE PREDICTION SYSTEM FOR ONLINE WORKERS

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Abstract: **- Working from home (WFH) online during the covid-19 pandemic has caused increased stress level. Online workers/students have been affecting by the crisis according to new researches. Natural response of body, to external and internal stimuli is stress. Even though stress is a natural occurrence, prolonged exposure while working Online to stressors can lead to serious health problems if any action will not be applied to control it. Our research has been conducted deeply to identify the best parameters, which have connection with stress level of online workers. As a result of our research, a desktop application has been created to identify the users stress level in real time. Our main goal is to provide best solution for the online workers to have healthy lifestyles. Stress is commonly defined as a feeling of strain or pressure felt by a person which occurs from any event or thought that makes you feel frustrated, angry, or nervous. In the present situation many people have succumbed to stress especially the adolescent and the working people on various occasions. Stress is a part of our daily life, but having stress for a long time can leads to many problems like depression, suicidal thoughts, heart attack and stroke. We can use the current technology like machine learning and IOT devices to detect stress. In this project we use Galvanic skin response (GSR) sensor, Heart rate variability (HRV) Sensor, and Temperature Sensor which are connected to arduino board which process the data and help us to detect stress. Stress is related to life style; therefore, especially for mobile automated lifestyle counselling and analysis services, the need arises to identify stress automatically during daytime, using physiological data from various sensors which helps to know reduce stress.**

Index Terms **– Arduino, GSR Sensor, HRV, IoT , Stress, Temperature sensor etc.**

1. INTRODUCTION

In the modern life, stress has become more and more prevalent. Even though it can lead to serious physical and psychological issues, its sources are difficult to identify. The human environments including worksite, home or society can induce stress on an individual to some extent. There are many ways that our body can react to stress; these reactions are mainly classified such as Heart rate (HR), Temperature and Pulse are taken into consideration. IOT platform 'ThingSpeak' is utilized in this work. Physiological sensing based stress analysis during assessment was studied by conducting an evaluation study on the performance of GSR with respect to stressful events Various other physiological parameters like Blood pressure, Heart rate variability (HRV) are also being used along with GSR for stress monitoring. Blood pressure reading along with GSR reading can classify the stress levels into mentally, physically or normal states.

The project titled as "Stress Analysis and Care Prediction System for Online Workers" it is used to detect the stress level. In this report, the design of arduino based Body Stress Detection that monitors the Stress level of a human in real time is presented. This system consists of different sensors which measures the stress level based on temperature values, Heart Rate and Resistance of a skin. The measured values are used to determine the stress level of an every individual. This project is used to alter us to current, ongoing, and emerging problems regarding stress Certain amount of stress is necessary for our lives, but too much stress brings negative consequences such as decrease in level of concentration, mental health issues such as anxiety and depression. The core features of this project is to develop a continuous stress monitoring system and thereby reduce the adverse effects of stress on mental health as well as physical health of a person. The physiological parameters such as Heart rate, Temperature and skin resistance are taken into consideration, since they are directly linked to the sympathetic nervous system which is being activated during the stress response.

Motivation

The project is used to alter us to current, ongoing, and emerging problems; certain amount of stress is Necessary for our lives, but too much stress brings negative consequences such as decrease in level of concentration, mental health issues such as anxiety and depression. The core features of this project is to develop a continuous stress monitoring system and thereby reduce the adverse effects of stress on mental health as well as physical health of a person. the physiological parameters such as heart rate, temperature and skin resistance are taken into consideration, since they are directly linked to the nervous system which helps us to detect the stress in the body. stress can occur due to many reasons like the environment around us or if your working in an organization and the work load or pressure is too high which increases the stress level in a human being

which is not at all good for any person and may cause some serious health issue .we daily see a lot of people suffering from stress which they them self cannot find out about it , so we came up with a project to detect stress in human body with their heart rate and temperature using sensors which people cannot fake and the right values is obtained so that treatment is given to them to avoid further consequences regarding mental health or other issues.

The organizational framework of this study divides the research work in the different sections. The Literature survey is presented in section 2. Further, in section 3 shown Existing System is discussed and in section 4 shown in proposed system, In section 5 Experimental Results work is shown. Conclusion and future work are presented by last sections 6.

2. LITERATURE SURVEY

S. Elzeiny and M. Qaraqe outlined the importance of identifying mental stress stimuli and the use of early recognition techniques in working places. They suggested some stress prevention strategies for the organization and its workers. The limitations of this study are namely lack of focus on a particular method or approach for detection of stress, use of many physiological and physical signals, and inadequate literature review.

S. Panicker and P. Gayathri presented a survey on the role of machine learning in emotional and mental stress detection systems, popular feature selection methods, various measures, challenges, and applications. They also explored links between the biological features of humans with their mental stress and emotions. They briefly reviewed various machine learning algorithms used for emotion and stress detection which included the features extracted, class labels, datasets, results, advantages, and disadvantages, and also briefly studied the literature and explained the research gap very well.

Alireza Bolhari et al. (2012) have studied workplace stress. Panagiotis Kostopoulous et al. (2016) designed a stress detection system, Stay Active, which uses sleep patterns, physical activities and social interactions to detect stress.

Enrique Garcia-Ceja et al. (2016) used smartphones as a potential tool to detect behavior that is correlated with stress level.

Yekta Said Can et al. [14] presented a review of the recent works on stress detection in daily life using wearable devices and smartphones. They categorized and investigated the literature according to their physiological modality and utility environments like office, campus, car, unrestricted daily life conditions, and briefly discussed and listed the promising techniques used, research challenges, and stress alleviation methods. ECG measures the electrical activity of the heartbeat where mostly HRV parameters are derived from ECG signals for detecting mental stress which is further divided into Time-domain and Frequency-domain for further investigation .According to previous research, time-domain methods showed to be the most robust in stress detection as compared to others.

3. EXISTING SYSTEM

Now a day's most of the people working from home, because of their work stress levels are increased. Because of work they can't check their health until it become a sever issue. To overcome this, we are implementing the proposed method.

A. Block Diagram

In the proposed method we are using Arduino as a main controller. For the Arduino we are connecting sensors like GSR sensor, Temperature sensor and heart beat sensor to check the stress level, temperature and Heart rate respectively. These sensors data will continuously upload to the server through NodeMCU. The sensors data will be displayed on LCD whenever the data exceed from threshold LCD will display a message like "stress level increased" or "temperature increased". So that they can easily monitor their stress level.

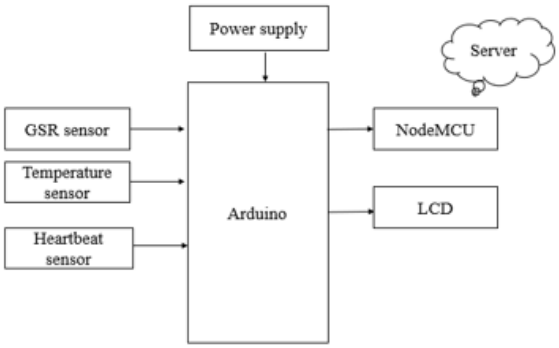

Fig.1: Proposed Block Diagram

A. METHDOLOGY

To develop a stress analysis and care prediction system for online workers using Arduino, GSR sensor, temperature sensor, heart rate sensor, NodeMCU (Wi-Fi), and LCD, you can follow the following methodology:

1. Gather requirements: The first step is to gather the requirements for the system. This includes understanding the types of stress that online workers face, the parameters that need to be monitored, and the kind of data analysis that needs to be performed.
2. Identify components: Once the requirements are understood, the next step is to identify the components required for the system. In this case, the components would include an Arduino board, GSR sensor, temperature sensor, heart rate sensor, NodeMCU (Wi-Fi), and LCD.
3. Set up the hardware: The next step is to set up the hardware. This involves connecting the GSR sensor, temperature sensor, heart rate sensor, and LCD to the Arduino board. The NodeMCU can be connected to the Arduino board via a serial interface.
4. Write the code: The code for the system can be written in the Arduino IDE. The code should include

functions to read data from the sensors and display it on the LCD. It should also include functions to transmit the data to a remote server via Wi-Fi.

5. Calibrate the sensors: Once the code is written, the sensors should be calibrated to ensure accurate readings. This involves measuring the output of the sensors and adjusting the code to compensate for any variation.
6. Test the system: The final step is to test the system. This involves monitoring the output of the sensors and verifying that the data is being transmitted correctly to the remote server. Any issues should be identified and addressed.

Overall, this methodology involves understanding the requirements, identifying the components, setting up the hardware, writing the code, calibrating the sensors, and testing the system. With this approach, you can develop a stress analysis and care prediction system for online workers that can help improve their health and well-being.

B. HARDWARE DESCRIPTION

1. Arduino Uno

Arduino Uno shown in figure is a microcontroller board based on the ATmega328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller shown in fig.2.

Fig.2: Arduino Micro Controller

2. DS18B20 Temperature Sensor

The digital temperature sensor like DS18B20 follows single wire protocol and it can be used to measure temperature in the range of -67oF to +257oF or -55oC to +125oC with +-5% accuracy. The range of received data from the 1-wire can range from 9-bit to 12-bit. Because, this sensor follows the single wire protocol, and the controlling of this can be done through an only pin of Microcontroller. This is an advanced level protocol, where each sensor can be set with a 64-bit serial code which aids to control numerous sensors using a single pin of the microcontroller. This article discusses an overview of a DS18B20 temperature sensor

Fig.3: Temperature Sensor

3.Heartbeat Sensor:

Heartbeat Sensor is an electronic device that is used to measure the heart rate i.e. speed of the heartbeat. Monitoring body temperature, heart rate and blood pressure are the basic things that we do in order to keep us healthy. In order to measure the body temperature, we use thermometers and a sphygmomanometer to monitor the Arterial Pressure or Blood Pressure. Heart Rate can be monitored in two ways: one way is to manually check the pulse either at wrists or neck and the other way is to use a

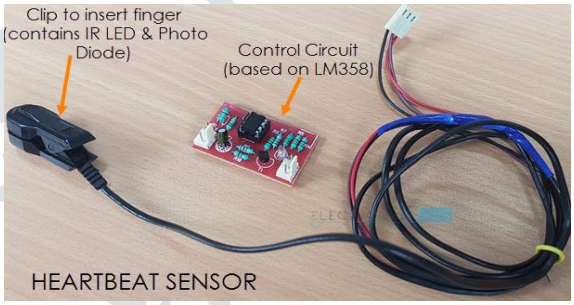

Fig.4: Heart Beat Sensor

4. GSR Sensor:

A galvanic skin response sensor (GSR) measures the skin's electrical resistance to different levels of electricity. When an electric current is applied to the surface of the skin, it causes small nerve cells in that area to fire off messages. These messages are then measured and used to calculate the resistance between two acupoints on the body.Skin conductance can measure various physiological responses, including stress levels, heart rate, blood pressure, and muscle tension. GSR sensors are often found in wearable technology products like smartwatches and fitness trackers because they provide an accurate way to monitor these response parameters without taking multiple measurements manually.

Fig.5: GSR Sensor

5. Power Supply

Power Supply shown in figure 5 The system is powered by a battery source of 9 V that is connected to the input pin of voltage regulator (L7805) to get a proper output voltage at the output pin of voltage regulator equal to 5 V or

to step down the voltage from 9 V to 5 V, which is required for Arduino microcontroller, one RFID readers and RFID Cards.

Fig.6: Power Supply

6. LCD Display

LCD stands for liquid crystal display, which is used to show the status of an application, displaying values, debugging a program, etc.A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. The 16 x 2 intelligent alphanumeric dot matrix display is capable of displaying 224 different characters and symbols. This LCD has two registers, namely, Command and Data. Shown in fig.9.

Fig.7: 16x2 LCD Display

5. EXPERIMENTAL RESULTS

When we have placed the finger inside the GSR (Galvanic Skin Response).It will measures our GSR sensor value. If it is less than 500 then LCD will be displayed a message like "Galvanic Skin Response is HIGH", It means user's having the stress. Suppose sensor value is greater than the 500 then, LCD will never displayed NORMAL, It means user's doesn't have the stress. Temperature and heart rate will be measure either GSR HIGH or NORMAL. It means Temperature and heart rate is not mandatory it's an optional. We can measure the stress level by using GSR sensor value. GSR Sensor value:

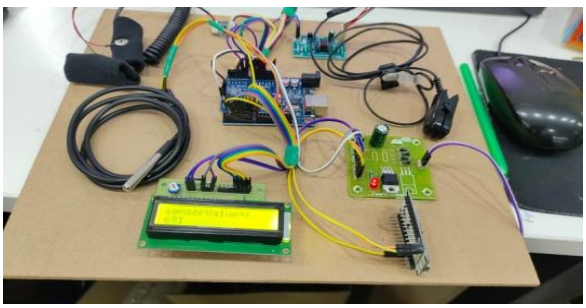

Fig.8: Hardware setup

Temperature:

If temperature is greater than 34°c LCD will displayed HIGH TEMPERATURE.

Fig.9: LCD Shows that the Value of Temperature

Heart rate:

If heart rate is greater than the 115 then LCD will displayed ABNORMAL.

Fig.9: LCD Shows that the Heart Rate Value

Graph:

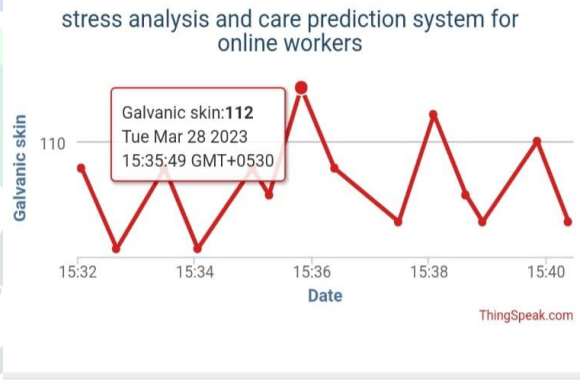

Fig.10: Graph shows the stress analysis and care prediction system for online worker based on GSR Sensor Values

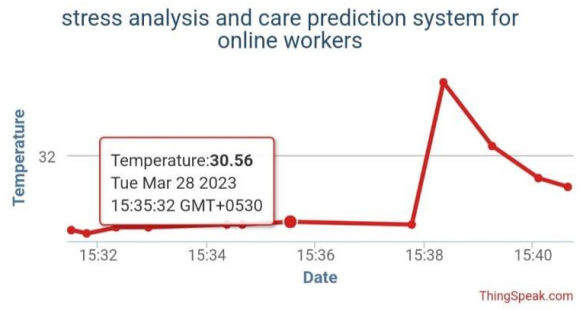

Fig.11: Graph shows the stress analysis and care prediction system for online worker based on Temperature Sensor Values

Classification of parameters:

If the GSR sensor is less than 500 it will indicate stress, Suppose GSR sensor value will greater than 500 then it will indicate normal. Temperature is greater than 34°c then LCD will displayed "HIGH TEMPERATURE". Heart rate is greater than 115 then LCD will displayed "ABNORMAL".

How to identify stress level:

S.NO	GSR values	Stress level
1.	353	HIGH
2.	368	HIGH
3.	580	NORMAL
4.	620	NORMAL

S.NO	**Parameters**	**value**	**Status**
1.	GSR sensor value	<500	GSR HIGH
2.	Temperature	>34 deg c	HIGH TEMPERATURE
3.	Heart rate	>115 bpm	ABNORMAL

Our project aim is to identify the user's stress level in real time. Either user's having stress or doesn't. we won't identify accurate value of users stress level.

6. CONCLUSION

In conclusion, the Stress Analysis and Care Prediction System for Online Workers using GSR sensor, Temperature sensor, Heart rate sensor, LCD, NodeMCU (Wi-Fi), and IoT is a useful tool for monitoring and predicting the stress levels of online workers. The system uses various sensors to gather data on physiological responses such as skin conductance, temperature, and heart rate, which are then analyzed to determine the worker's stress levels.

The NodeMCU and Wi-Fi connectivity allow the system to transmit data to the cloud and store it in a database for further analysis. The data can be visualized on an LCD screen or accessed remotely using a web-based dashboard, which provides real-time feedback to the worker and their employers.

Overall, the system can help online workers manage their stress levels, improve their well-being, and increase productivity by alerting them when their stress levels exceed certain thresholds. The system can also provide valuable insights into the causes of stress in online work environments, which can help employers develop strategies to mitigate stress and improve employee satisfaction.

Future Scope

The system can be integrated with other wearable devices such as smart watches or fitness trackers to gather more data on the user's physical activity levels and sleep patterns, which can provide a more comprehensive understanding of their overall well-being. The system can be enhanced by incorporating machine learning algorithms to analyze the collected data and provide more accurate predictions of stress levels. The machine learning algorithms can also help to identify patterns and trends in the data, which can provide valuable insights into the causes of stress.

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