**Title: Cost effective Stress monitoring system**

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**ABSTRACT**

In reality, circumstances that cause anxiety or anger are more likely to cause stress. Fear, concern, or uneasiness are all examples of anxiety. The price of healthcare is continuously falling as the world's population rises. New technologies must be developed as soon as it is feasible to monitor people's physical and mental health throughout their everyday lives. A stress detector is a gadget that keeps track of physiological stress indicators. These methods mostly concentrate on heart. Heart rate monitors keep tabs on pulse. They give analysis and serve as monitors. A promising technology for healthcare, wellness monitoring, and stress detection is the heart rate monitoring and Galvanic Skin Response (GSR) sensor.

Application includes healthcare, where it supports individualized treatment by monitoring patient stress levels throughout procedures. Individuals may quantify stress, identify causes, and create approaches by engaging in wellness monitoring.

On-the-go stress monitoring is made probable by enclosure of wearables or mobile apps, encouraging self-awareness and reasoned decision-making. Employers may measure employee stress levels and adopt interventions to increase productivity and well-being. This technology can improve stress reduction methods, wellness monitoring, and healthcare procedures.

INTRODUCTION

 Stress can manifest in numerous ways, including physical, emotional, and behavioral symptoms. It is important to manage stress efficiently to maintain overall well-being and avoid its negative impact on mental and physical health.

 Stress management

#  Stress, when long-lasting and unmanaged, can disrupt the body's equilibrium and leads to variety of health issues, including cardiovascular problems, weakened immune system, mental health illnesses, and reduced quality of life. Real stress managing practices can support restore balance, enhance resilience, and improve overall well-being.

# Heartrate Monitoring

#  Monitoring heart rate provides insights into your cardiovascular health, fitness level, and recovery status, allowing to make well-versed decisions about training, volume, and overall well-being. A lower resting heart rate is generally associated with better fitness and overall cardiovascular health.

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#  Blood Pressure monitoring

#  Accurate blood pressure readings are crucial for assessing and managing cardiovascular health effects. An erroneously lower reading can lead to underestimating the risk of heart disease and stroke, potentially delaying necessary interventions and treatments.

#  The main objective here is to produce a strategy that utilizes BP, GSR, and heart rate sensors connected to an Arduino Uno, displaying the data on an LCD display with a graph, and incorporating a GSM unit to guide messages for real-time monitoring or alerts which is cost effective and accurate.

Currently a compact and cost-effective system for measuring physiological signals is required which has applicability in stress management systems developed. This scheme objects to afford an accessible solution for persons seeking to monitor and manage their stress levels efficiently. By incorporating various sensors and advanced data processing techniques, this scheme can precisely measure physiological signals such as heart rate, skin conductance, and respiration rate. These signals are key indicators of stress and can help people gain considerations into their own physiological responses. The compact design of this system guarantees portability and ease of use, allowing users to monitor their stress levels in real-time and make well-versed decisions about their well-being. With this innovative approach, empowering individuals with the tools they need to manage their stress more efficiently and improve their overall quality of life can be developed.

**SYSTEM REQUIREMENTS**

**HARDWARE REQUIREMENTS**

The basic requirements of a project typically include:

**GSR SENSOR**

The GSR sensor measures the varying levels of the skin conductivity of electric current. Higher levels of perspiration on the skin lead to a greater conductance of electrical currents. A higher level of conductivity of the skin after an event can be interpreted as either positive/negative emotional arousal.

GSR measurements work by detecting changes in electrical (ionic) activity resulting from changes in sweat gland activity. It is noteworthy that both positive (“happy” or “joyful”) and negative (“threatening” or “saddening”) stimuli can result in an increase in arousal – and in an increase in skin conductance. The GSR signal is therefore not representative of the type of emotion, but the intensity of it.

**HEART RATE SENSOR**

The photoplethysmography theory serves as the foundation for the heartbeat sensor. Any organ in the body that experiences a change in light intensity due to a change in blood volume is measured (avascular area). The timing of the pulses is especially crucial in situations where the heart rate is to be tracked. The pace of heartbeats determines the volume of blood that flows, and because blood absorbs light, signal pulses are comparable to heartbeat pulses.

**SPO2 SENSOR**

The Oxygen saturation (SPO2) of hemoglobin in blood is continually measured using pulse oximeters which are inexpensive and non-invasive medical sensors. It shows what proportion of blood is oxygenated.

The difference in absorption of hemoglobin by oxygenated and deoxygenated blood is the foundation of the pulse oximetry theory. Much infrared light is absorbed by oxygenated hemoglobin while less red light is let through. In contrast, deoxygenated hemoglobin lets more infrared light and absorbs more red light while.

**BP Sensor**

The Blood Pressure Sensor is a non-invasive sensor designed to measure human blood pressure. It measures systolic, diastolic, and mean arterial pressure utilizing the oscillometric method. Pulse rate is also reported.

The idea behind oscillatory devices is that, as blood is flowing through an artery between the systolic and diastolic pressures, it creates vibrations in the arterial wall which may be observed and converted into electrical signals.

**Temperature Sensor**

A temperature sensor is a expedient used to measure temperature. This can be air temperature, liquid temperature, or the temperature of solid matter. There are diverse types of temperature sensors available and they each use different technologies and principles to take the temperature measurement. The sensor works by reading and converting the temperature and storing this value in scratchpad memory. The scratchpad memory is then read via the One-wire bus by the Dallas library. The power-on value in the scratchpad memory is 85 °C.

 **Arduino Board**

The finest board for learning electronics and coding is the Arduino UNO. The UNO is the most durable board you may start playing with if this is your first time dabbling with the platform. The Arduino family's UNO board is the prevalent and well-documented model.

 A microcontroller board named Arduino UNO is based on the ATmega328P. It contains a 16 MHz ceramic resonator, 6 analog inputs, 14 digital input/output pins (of which 6 may be used as PWM outputs), a USB port, a power connector, an ICSP header, and a reset button. It comes with everything required to support the microcontroller; to use it, just use a USB cable to connect to a computer, or an AC-to-DC converter or battery to power it.

**LCD Display**

Liquid crystal display is referred to as LCD. This particular type of electronic display module used in a wide array of circuits and devices, including mobile phones, calculators, computers, TVs, and other electronics. These displays are mostly favored for seven segments and other multi-segment light-emitting diodes. The primary advantages of adopting this unit are its small cost, ease of programming, animation capabilities, and lack of any restrictions on the display of customized characters, unique animations, etc.

**SOFTWARE REQUIREMENTS**

Arduino was created at the Ivrea Interaction Design Institute, as a modest tool for rapid prototyping geared by students. The Arduino board started altering as soon as it gained a larger following, distinguishing its offering from basic 8-bit boards to items for IoT applications, wearables, embedded settings and 3D printing.

An open-source electronics platform called Arduino is built on simple hardware and software. Presence or absence of light, a key press are examples of inputs that an Arduino board may receive and convert into an output, such as starting a motor, controlling an LED, or posting something online. Sending a set of commands to the board's microcontroller will instruct your board what to do. You achieve this by using the Arduino software (IDE), which is based on Processing, and the Wiring-based Arduino Programming Language.

**SYSTEM DESIGN**

 **BLOCK DIAGRAM**



Figure1.1 Block Diagram of Prototype

**WORKING**

In this development, various sensors are associated to an Arduino board, and a supply voltage is provided to power the system. The sensors used include a temperature sensor, a blood pressure (BP) sensor, a SPO2 sensor (which measures oxygen level in the blood), and a GSR sensor (which measures stress level).

The Arduino board runs a program code that interacts with each sensor, retrieves the necessary data, and performs required calculations or conversions. The temperature sensor provides readings of the body temperature, the BP sensor measures the blood pressure, the SPO2 sensor detects the oxygen level in the blood, and the GSR sensor determines the stress level.

**FLOWCHART**

The obtained sensor readings are displayed on an LCD screen, providing users with real-time information about the body temperature, BP, SPO2 levels, and stress level. Additionally, the stress level data is graphically denoted on the LCD, allowing users to observe and analyze their stress levels over time.

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Figure 1.2 Flowchart of the Procedure

To enable remote monitoring or data transmission, the system incorporates a GSM module and a Wi-Fi module. These modules facilitate communication amid the Arduino board and a mobile phone. The sensor readings, including body temperature, BP, SPO2 levels, and stress level data, are sent to the mobile phone through the GSM module or Wi-Fi module. This allows users to remotely access and monitor their vital signs and stress levels using a mobile application or a web interface.

By combining sensor integration, data processing, LCD display, and wireless communication, this project creates a complete system that permits users to monitor their health parameters and stress levels in real-time, providing valuable insights and facilitating proactive healthcare management.

By combining sensor integration, data processing, LCD display, and GSM communication, this project showcases a practical application for monitoring and tracking vital signs and stress levels. It provides users with accessible and timely information in real time, empowering them to take proactive measures for their health and well-being.



Figure 1.3 Message received on integrated mobile device through GSM



Figure 1.4 Working Model

CONCLUSION

In conclusion, this Prototype successfully demonstrates the functionality of multiple sensors by displaying their readings on an LCD display and transmitting them to a mobile phone using a GSM module. By integrating sensors such as the temperature sensor, BP sensor, SPO2 sensor, and GSR sensor, users can monitor the vital signals and stress levels in real-time. The LCD display provides immediate access to the sensor readings, while the graph representation of stress levels allows users to analyze patterns over time. The usage of GSM module enables remote monitoring, as the sensor readings are sent as messages to a mobile phone. This developed prototype can also act as IOT node in Healthcare applications and offers a practical solution for health monitoring and stress management, empowering individuals to make knowledgeable decisions about their well-being.

REFERENCES

1. Talaat, F.M., El-Balka, R.M. “Stress monitoring using wearable sensors: IoT techniques in medical field”. Neural Comput & Applic 35, 18571–18584 (2023). https://doi.org/10.1007/s00521-023-08681-z

2. R. Singh et al., “Cloud Server and Internet of Things Assisted System for Stress Monitoring,” Electronics, vol. 10, no. 24, p. 3133, Dec. 2021, doi: 10.3390/electronics10243133

3. Rajesh kumar.M et al., “IOT Based Physiological Stress Monitoring and Managing Device” International Journal of Innovative Research in Advanced Engineering (IJIRAE) ISSN: 2349-2163 Issue 03, Volume 6 (March 2019)

4. Pijush Sarkar, Abojit Boro ,Gunindra Pegu “Heartbeat Sensor Using Arduino” Department of Electronics and Communication Engineering, Central Institute of Technology Kokrajhar, India(2020)

5. Michal T. Tomczak et al.,“Stress Monitoring System for Individuals With Autism Spectrum Disorders” National Centre for Research and Development, Poland (NCBiR) (2020)

# 6. Minal Patil, Abhishek Madankar ,Dr. P. D. Khandait, “Heart Rate Monitoring System”, Dept. of E and TC Engineering Y. C. College of Engineering Nagpur, India (2020)