PORTABLE AI-BASED VOICE ASSISTANT FOR STRESS LEVEL MONITORING

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ABSTRACT

A handheld AI-powered voice assistant has been created to detect and manage stress in real time. It is built on a Raspberry Pi with a camera and biometric sensors integrated in order to monitor heart rate, SpO2 and body temperature. The system includes Raspberry Pi combined with an integrated camera along with biometric sensors. This device uses Raspberry Pi to track heart rate in addition to SpO2 measurements and body temperature. The system uses facial expression analysis through a Convolutional Neural Network (CNN) in combination with biometric feed for improved accuracy. Based on the data gathered, the system calculates a stress score and gives personalized recommendations, such as relaxation techniques or medical recommendations. User privacy is preserved, with encrypted data storage and consent-based collection. Extensive testing in controlled and real-world settings provides reliability and continued improvement. With a voice-guided interface, the product is easy to use and accessible to all ages.

INTRODUCTION

This project presents a smart, AI-powered stress monitoring system that uses biometric sensors and facial recognition to detect stress in real time. It combines inputs from temperature,SpO2, and heart rate sensors, along with CNN-based facial analysis, to accurately assess stress levels. The device offers personalized relaxation techniques and voice-guided support for users. With its portable design and machine learning capabilities, it promotes better mental and emotional well-being.

Key Steps:
- Data Collection: Biometric sensors monitor physiological signals and camera capture facial expressions for analysis.
- Stress Detection: The system uses CNN for facial recognition and KNN for sensor classification and evaluate user's stress level in real time.
- Intervention and Feedback: Stress management solutions like breathing exercise, listening to song and booking an appointment with doctor is provided.
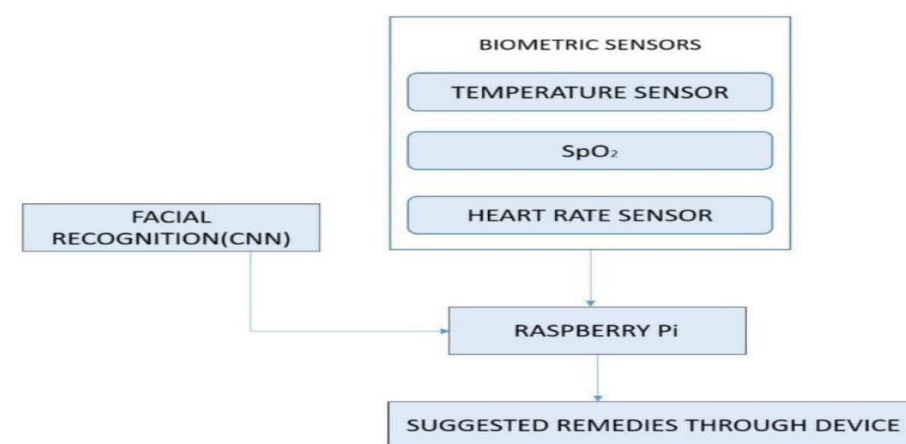
BLOCK DIAGRAM

Fig 1:Block diagram

METHODOLOGY

- Biometric sensors (MAX30100, PPG and DHT11) capture heart rate, SpO2 and temperature readings and the LCD displays the real time sensor values.
- After displaying the biometric data, the LCD shows a "Show Face" message.
- The user presents their face to the camera for stress detection.
- The system detects and boxes the face in the captured image.
- Facial features are analyzed using CNN model to identify stress indicators.
- The system calculates the average stress value by combining biometric and facial recognition data.
- The stress value is categorized into 3 levels : Low (0-0.3), Moderate (0.4-0.6) and High (0.7-1).
- In case of low stress it is a normal condition and no remedy is suggested.
- In case of moderate stress breathing exercise is the remedy suggested.
- In case of high stress listening to song and consultation with doctor is done.

BENEFITS

- Real-time stress monitoring helps in early detection and timely intervention.
- Personalized relaxation techniques improve mental well-being.
- Portable and user-friendly design makes it accessible for all age groups.
- Continuous biometric and facial analysis ensures comprehensive stress evaluation.
- Voice-guided interface offers easy operation without disrupting daily activities.
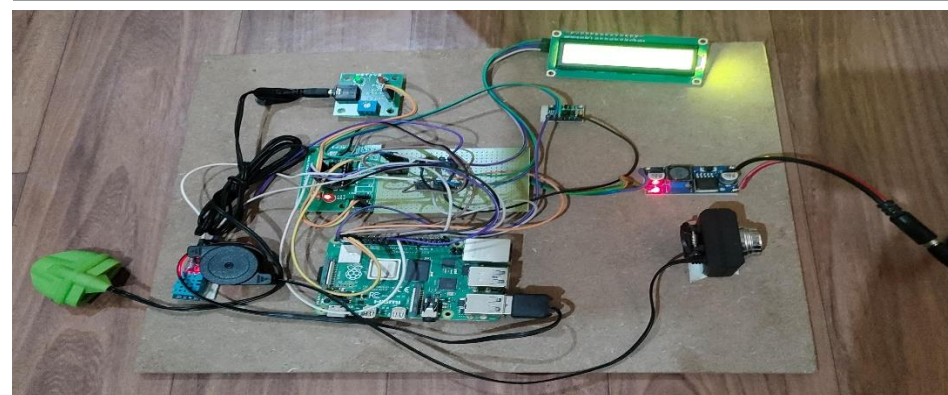
DEVELOPED MODEL

Fig 2: Hardware Model

Fig 3: Sensor Readings

Fig 4: Youtube song being played

Fig 5: Hospital Appointment Booking Slip

CONCLUSION

The proposed AI-based stress monitoring system offers a smart and effective solution for detecting and managing stress in real time. It combines biometric sensors and facial recognition with machine learning to provide accurate stress analysis. With its portable, voice-guided, and user-friendly design, the system is practical for daily use and suitable for all age groups. In addition to detection, it offers personalized responses like music or relaxation techniques. Overall, it promotes mental well-being and helps improve the quality of life. This project can be further developed for use in workplaces, schools, and healthcare settings.

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