I-Stress: A Stress Monitoring System using the Internet of Things (IoT)

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Abstract

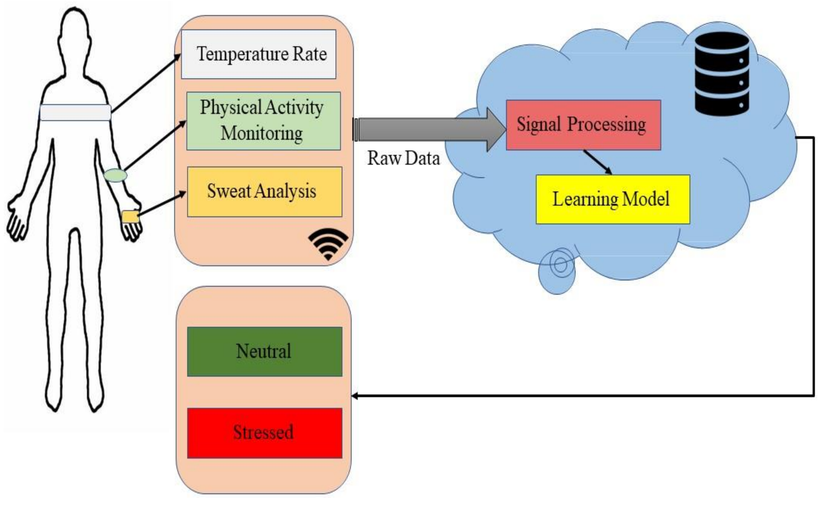
- A state of emotional or mental strain, experienced due to internal or external circumstances is referred to as Psychological stress.
- Under this stress, the human body releases complex hormones and chemicals such as adrenaline and cortisol.
- Humans with extreme high stress experience Borderline Personality disorder (BPD).
- Acute levels of stress in people who are already diagnosed with borderline personality disorder or schizophrenia, can cost their lives.

Problem Overview

- Practicing meditation, encourages the mind to relax but monitoring stress levels when a person is engaged in high intensity physical activities, still remains a challenge.
- Mental and emotional disorders, depression, anxiety, panic attacks and phobias generally affect the human body.

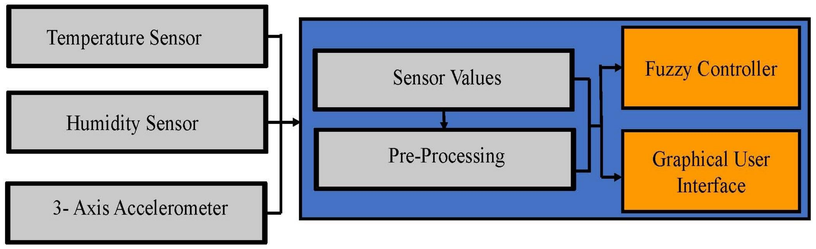
Research Work

- In the I-Stress system, the data are collected from temperature, humidity and accelerometer sensors, preprocessed and are processed wirelessly.
- By applying fuzzy logic, the sensor data are classified into low stress, normal stress and high stress.



High-Level Architecture of I-Stress System

Main Module



Different sensors used in the I-Stress system

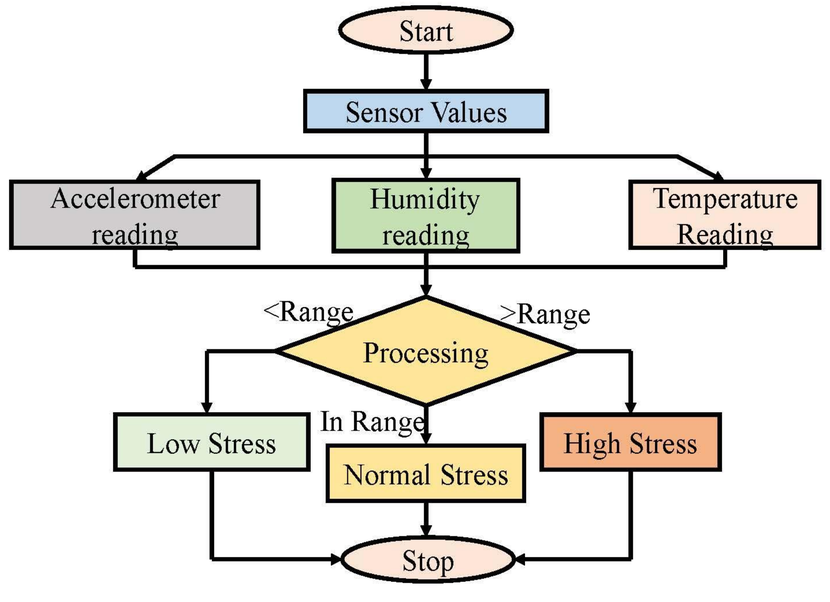
Pre-Processed Sensor Values

Sensors	Low Stress	Normal Stress	High Stress
Accelerometer(steps/min)	50-75	75-100	101-120
Humidity (mg/min)	9-11.9	12-15	15-20
Temperature ℉	98-100	90-97	80-90

Pre-Processed Stress Values

Stress Level	No/Low Stress	Normal Stress	High Stress
Range	50-75	75-100	101-120

Simulation Framework Design

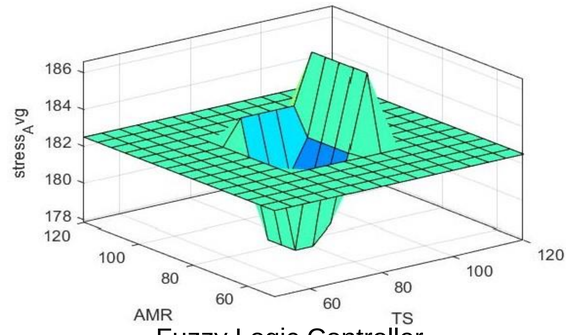


Proposed Stress Detection System

Results

Logical Analysis

Accelerometer Sensor Reading	Humidity Sensor Reading	Temperature Sensor Reading	Stress Level
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1



Fuzzy Logic Controller

TR Value	AMR Value	HR Value
85	90	97
Analyze	90.6667	

TR Value	AMR Value	HR Value
TR	AMR	HR
Analyze	Value	

GUI Implementation

Conclusion

- The implementations in Fuzzy controller shows the surface plot with variations of stress which can be experienced by a person.
- By using the GUI implementation, the accurate stress parameter has been derived.
- This stress monitoring system allows the users an easy interface.

References

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[2] E. Kougianos, S. P. Mohanty, G. Coelho, U. Albalawi, and P. Sundaravadivel, "Design of a High-Performance System for Secure Image Communication in the Internet of Things," *IEEE Access*, vol. 4, pp. 1222–1242, 2016.

[3] S. P. Mohanty, Nanoelectronic Mixed-Signal System Design. McGraw- Hill Education, 2015.