Smart-Pillow: A Stress Monitoring System through the IoT

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Abstract

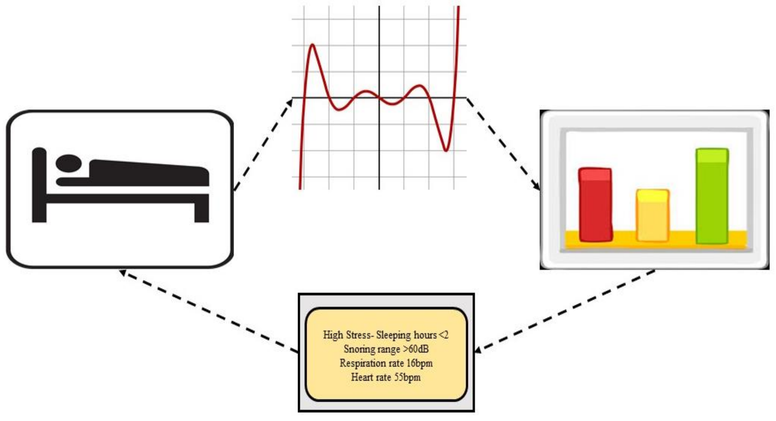
- Quality of sleep during the night reflects the productivity of the day.
- Lack of sleep, anxiety, work tensions, and improper food consumption could be some stressors which trigger stress hormones.
- Uncontrollable or unmonitored sleep variations during the night can lead to a disturbed productivity during the day.

Problem Overview

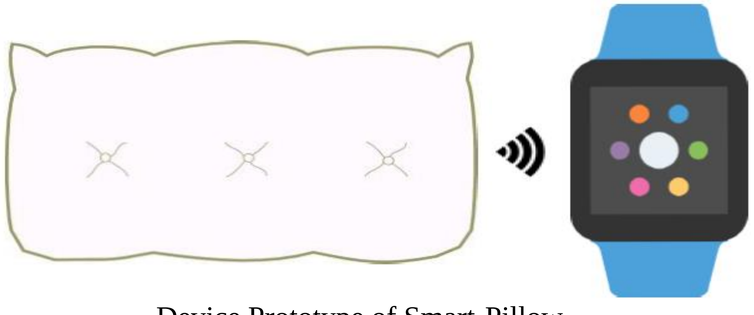
- Sleep apnea, also known as lack of sleep, is one of the major reasons that cause fluctuations in the stress levels of a person.
- Acknowledging the variations of sleep without help is considered as the main problem here.

Research Work

- In the Smart-Pillow system, data are collected from a pillow and a wearable and are transmitted, stored and processed in the cloud.
- The processed data is then sent back to the wearable and also to a mobile application based upon convenience.



Schematic Representation of the Smart-Pillow System



Device Prototype of Smart-Pillow

Analyses and Results

Broad Picture of the Smart-Pillow System

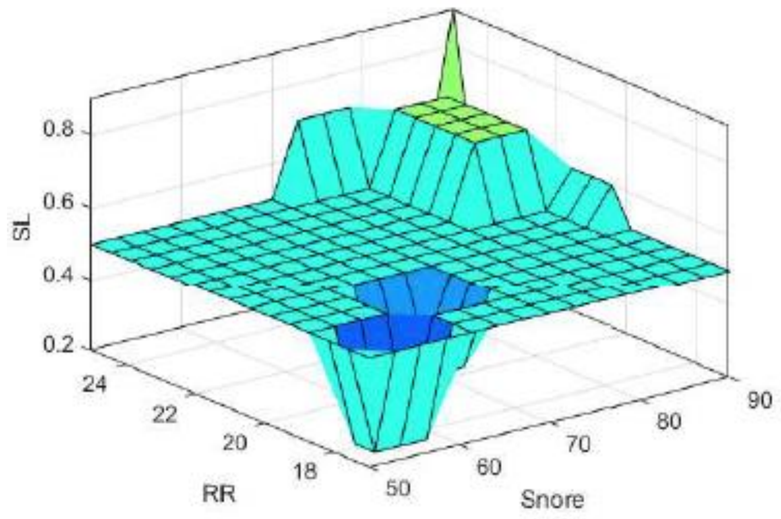
Fuzzy Output Range Specification of Smart-Pillow

Stress State	Output Range
Low Stress State (LSS)	0.00-1.00
Medium Low Stress State (MLSS)	1.01-2.00
Medium Stress State (MSS)	2.01-3.00
Medium High Stress State (MHSS)	3.01-4.00
High Stress State (HSS)	4.01-5.00

Rules of Fuzzy Logic Design of Smart-Pillow

Parametrized Ranging of Smart-Pillow

Number of Hours	Snoring Range (dB)	Respiration Rate (bpm)	Heart Rate (bpm)	Stress State
6-7	50-80	17-22	54-64	LSS, MLSS, MSS
4-6	80-89	23-25	65-70	MHSS
0-4	90+	25+	70+	HSS



Surface View of the Smart-Pillow

Conclusion

- A system-level design of the proposed system is prototyped in the Simulink® framework. The proposed system gives an overall efficiency of 91%..

References

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