

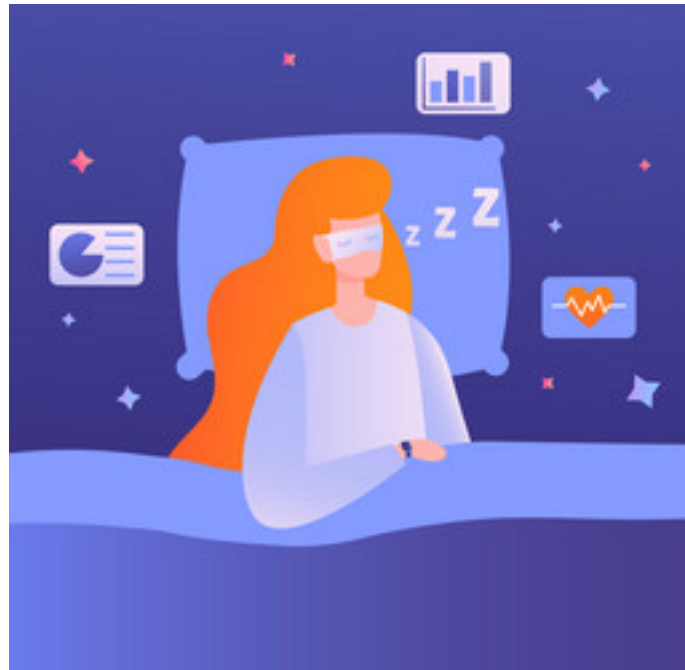
# Sleep Quality Monitoring System: A Survey

*Research Paper Summary*

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## 0.1 Summary

IoT is becoming a popular subject in research field. The emergence of IoT is stimulated by the rapid growing of wireless sensor network, cloud computing, and high-throughput network technology. Sleep plays an important role to maintain health, mental, day-time productivity, and safety of human being. Lack of sleep causes many major problems in human health. Therefore with the help of IoT technology, a Sleep Quality Monitoring System is designed where the quality of sleep is analysed using various aspects like sleep duration, posture, frequency, etc.,.

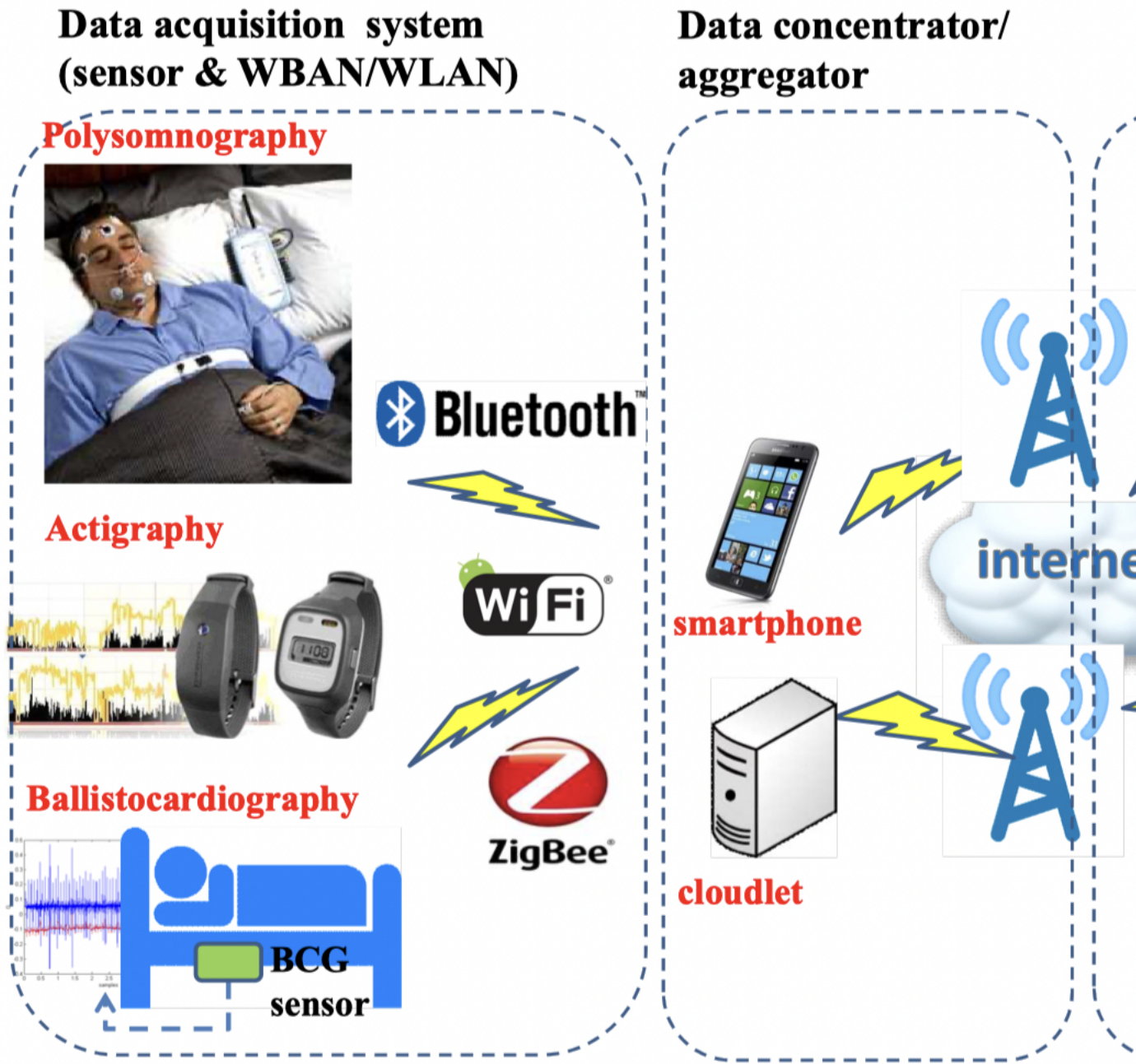
The paper talks about the various sleep disorders like Insomnia, Narcolepsy, Restless legs syndrome and Sleep apnea. Sleep disorder potentially increases the risk of chronic diseases, mental problem, and number of accident. Many physiological parameters can be monitored during sleep in order to gain insight about the sleep quality of the patient. The various methods used in monitoring the physiological parameters of the person are Polysomnography, Actigraphy, Ballistocardiography (BCG), etc.,.

There are four components of the architecture of the system, i.e. data acquisition system, data concentrator/aggregator, cloud storage/processing, and monitoring applications. The medical data and real-time location of the patient is acquired and transmitted to smartphone that is located near the patient then sent to cloud system for storage and processing.

There are several open issues and challenges for sleep quality monitoring with IoT concepts. There are various similar devices available in the market. But they are not standardized. Polysomnograph appears as the most comprehensive sensing method with extensive capability and high accuracy. But they disturb the regular sleep of the person and is also difficult to be set at home. Reliable and low-power communication protocol needs to be defined to the system. Data security must be ensured as large amount of important and sensitive data is exchanged.

Future research plan is proposed with an embedded system that includes contactless ballistocardiography sensor, microcontroller, WiFi transceiver, etc.,.

Sleep quality is one of main factor to determine human health and well-being. Sleep quality monitoring is one the solution to maintain the quality of sleep and prevents chronic diseases, mental problem, or accidents caused by sleep disorder. The emergence of IoT technology offers a great solution for real-time and continuous monitoring system due its M2M nature and high capacity cloud storage and processing.



## Key contribution/ideas from the author

The author have described importance of sleep and the effects that has on human health if sleep is not proper. The author have also briefed regarding various sleep disorders that will be caused. The author suggests various areas where the system can be improved in the future scope.

1. **Standardization** - Standardization is required to regulate about communication and protocol, including phy and media ac-

cess control (MAC) layer, data aggregation, device and gateway interfaces, value added services and many more.

2. **User-friendly data sensing method** - Polysomnograph appears as the most comprehensive sensing method with extensive capability and high accuracy. But it is not appropriate for regular monitoring method at home because of the lack of convenience and troublesome setup.
3. **Reliable and low-power communication protocol** - Reliable MAC and rout-

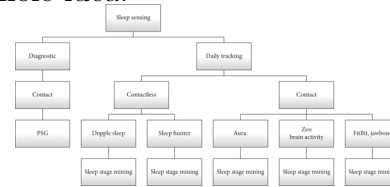
ing protocol must support multihop communications, low end-to-end delay, low packet-delay, and low-power communication.

4. **Data security** - Data security becomes one of the main concern for this monitoring system. Firstly, secure routing protocol is required. Secondly, the security of handling IoT big data is also important.

## My views about this paper

According to my opinion, this system is a very much needed one in the present life where people face many number of problems due to lack of sleep. Using the application of IoT, we develop system that predicts the quality of sleep based on various parameters. But according to my opinion, the methods described in this paper can be made even more user friendly so that the whole process doesn't cause any trouble to the user. And even more better technologies can be introduced to improve the system to increase the accuracy of the prediction. When the whole system is about making the user have a better sleep, that itself shouldn't disturb the quality of sleep that leads to malfunction of the

whole idea.



## Agreement, Pitfalls and Fallacies

The following are some of the areas where I don't feel that the author completely conveys the intended information or the ways in which I feel it could have been better.

- There might have been a simpler method of analysing the reports of the user as the caretaker cannot manage a whole lot amount of data at a time.
- The complete workflow can be divided further in order to have an immediate response in case of emergency.

This paper describes a fantastic idea which was clearly brought forth by the author, though it doesn't fit every case into it, it will still provide way for others to work on similar ideas to create more improved applications on sleep quality monitoring system.