Department of Electrical and Computer Engineering
North South University

Senior Design Project

Development of An IoT Based Sleep-Apnea Monitoring System

HASIBUL ISLAM SHANTO **1912212642**

RUBAIYAT SHARMIN **1911170642**

ILMOON JAHAN **1911244042**

Faculty Advisor:

Dr. Mohammad Monirujjaman Khan

Associate Professor

ECE Department

Spring, 2023

LETTER OF TRANSMITTAL

June, 2023

To

Dr. Rajesh Palit
Chairman,
Department of Electrical and Computer Engineering
North South University, Dhaka

Subject: **Submission of Capstone Project Report on "Development of An IoT Based Sleep Apnea Monitoring System"**

Dear Sir,

With due respect, we would like to submit our **Capstone Project Report** on **"Development of An IoT Based Sleep Apnea Monitoring System"** as a part of our BSc program. The report deals with Internet of things-based sleep apnea monitoring system. This project was very much valuable to us as it helped us gain experience from practical field and apply in real life. We tried to the maximum competence to meet all the dimensions required from this report.

We will be highly obliged if you kindly receive this report and provide your valuable judgment. It would be our immense pleasure if you find this report useful and informative to have an apparent perspective on the issue.

Sincerely Yours,

.....

Rubaiyat Sharmin
ECE Department
North South University, Bangladesh

.....

Hasibul Islam Shanto
ECE Department
North South University, Bangladesh

.....

Ilmoon Jahan
ECE Department
North South University, Bangladesh

APPROVAL

Hasibul Islam Shanto (ID #1912212642), Rubaiyat Sharmin ((ID # 1911170642) and Ilmoon Jahan (ID # 1911244042) from Electrical and Computer Engineering Department of North South University, have worked on the Senior Design Project titled "Development of An IoT Based Sleep-Apnea Monitoring System" under the supervision of Dr. Mohammad Monirujjaman Khan partial fulfillment of the requirement for the degree of Bachelors of Science in Engineering and has been accepted as satisfactory.

Supervisor's Signature

…….

Dr. Mohammad Monirujjaman Khan

Associate Professor

Department of Electrical and Computer Engineering

North South University

Dhaka, Bangladesh.

Chairman's Signature

…….

Dr. Rajesh Palit

Professor

Department of Electrical and Computer Engineering

North South University

Dhaka, Bangladesh.

DECLARATION

This is to declare that this project is our original work. No part of this work has been submitted elsewhere partially or fully for the award of any other degree or diploma. All project related information will remain confidential and shall not be disclosed without the formal consent of the project supervisor. Relevant previous works presented in this report have been properly acknowledged and cited. The plagiarism policy, as stated by the supervisor, has been maintained.

Students' names & Signatures

1. Hasibul Islam Shanto

_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

2. Rubaiyat Sharmin

_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

3. Ilmoon Jahan

ACKNOWLEDGEMENTS

The authors would like to express their heartfelt gratitude towards their project and research supervisor, Dr. Mohammad Monirujjaman Khan, Associate Professor, Department of Electrical and Computer Engineering, North South University, Bangladesh, for his invaluable support, precise guidance and advice pertaining to the experiments, research and theoretical studies carried out during the course of the current project and also in the preparation of the current report.

Furthermore, the authors would like to thank the Department of Electrical and Computer Engineering, North South University, Bangladesh for facilitating the research. We would also like to thank my friends Hasib, Rubaiyat, and Hafsa for helping us in this project. The authors would also like to thank their loved ones for their countless sacrifices and continual support.

ABSTRACT

Development of An IoT Based Sleep-Apnea Monitoring System

Sleep apnea is a common and potentially serious sleep disorder that affects an estimated 22 million Americans and is characterized by repeated episodes of shallow or stopped breathing during sleep. These episodes can lead to disrupted sleep and decreased oxygen levels in the blood, which can have serious consequences including high blood pressure, heart disease, stroke, and even death. A real-time sleep monitoring system using Internet of Things (IoT) technology has been developed to detect and alert individuals to sleep disorders such as sleep apnea.The system developed in this study includes sensors that measure various physiological parameters, including electrocardiogram (ECG), heart rate, pulse rate, skin reaction, humidity, temperature, and SpO2, during sleep. These parameters are continuously monitored and any unusual patterns or events are detected and alerted through a mobile application. The mobile application has been developed using MIT app inventor. It shows us the level of the parameters and any abnormality in health can be detected through it. This study is particularly valuable since it can test sleep indices without waking the user and display them in a mobile application at the same time using a Bluetooth module. The system has been designed in such a way that it may be utilized by anyone. Multiple analogue sensors are used in conjunction with the Arduino UNO to measure various sleep factor factors. The method was evaluated and tested on the bodies of many persons. The device watches multiple people as they sleep in order to evaluate and identify sleep apnea in real time. According to our findings, persons with significant heart and lung problems suffer sleep apnea. Sleep apnea is more common in persons over the age of 60. This study also examines those who are not at risk of sleeping disorders based on the data obtained. This document will help everyone learn about sleep apnea and will assist individuals in detecting and preventing it.