

Home Sleep Quality Monitoring

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Abstract

Sleep apnea is one of the most common sleep disorders and is a condition marked by abnormal breathing during sleep. Sleep apnea is said to affect 2 – 9% of the population and if left undiagnosed and untreated, it can increase the risk of other health problems, but it can be monitored and measured. Our goal is to create an application using a wearable ECG device, placed on the user's chest, which will be used to monitor and measure sleep apnea. The mobile app will read the ECG signal via Bluetooth and be responsible for transmitting the information to the cloud for storage to then be processed by an algorithm. This processed information will then be able to be viewed by the users as a report in their iPhone application once they have created their user login and have connected their ECG device to the iPhone.

Keywords: Sleep Apnea, Apnea-Hypopnea Index (AHI), Electrocardiogram Device (ECG), Bluetooth, Azure IOT, Azure SQL, Expo Mobile App

Results

The screenshot shows the Azure Functions portal. On the left, there is a 'Trigger' section with 'HTTP (req)' and an 'Inputs' section with 'No inputs defined'. In the center, a 'Function' is named 'HttpTrigger'. On the right, the 'Outputs' section shows 'HTTP (\$return)'. Below this, there is a 'HttpTrigger | Code + Test' section with a code editor icon. At the bottom, there is a 'SleepApnea SQL database' section with a database icon. On the right side, there is a mobile app interface for 'Sleep Apnea' with a 'Home' screen, a 'LOGIN' button, and a 'NO ACCOUNT? SIGN UP' button.

Architecture

ECG Device

- VivaLNK

Mobile Application

- Expo
- Android Studio

Backend and Database

- Azure
 - Azure Function
 - Azure SQL Database



Impact

This project aims to simplify the process of measuring one's AHI.

Previously, even the most simple sleep tests use invasive tubes and wiring

With this new application, the user only needs to wear a heart rate monitor while they sleep, and still find their AHI with an acceptable degree of accuracy.

Summary

- Created a user-friendly mobile application
 - Connects to ECG device through Bluetooth
 - Connects to Azure Web Services through the internet
- Implemented Azure Web Services

Performance

Final product has all desired features implemented.
Azure functions were tested thoroughly
Speed performance was at an acceptable level
Data was not lost in transactions with the database