Health Companion App

Project Proposal

CS4472 - Mobile Computing

Group : Pirates

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ActiveAware : “Achieve Balance with Sleep Tracking, Physical Activity Monitoring, and Emotional Health Insights"

Introduction

In today's fast-paced world, achieving a balanced lifestyle encompassing proper sleep, physical activity, and emotional well-being is increasingly challenging. To address these concerns, we present “ActiveAware” - an innovative health companion application designed to help users achieve equilibrium through comprehensive sleep tracking, physical activity monitoring, and insights into emotional health.

Traditional pedometer apps have been widely used for tracking physical activity. However, they suffer from several limitations. Firstly, their accuracy is often compromised, leading to unreliable data. Additionally, many of these apps drain the device's battery, causing inconvenience to users. ActiveAware tackles this issue by developing a step counter from scratch, utilizing smartphone gyroscope and accelerometer sensors. By leveraging these advanced technologies, our app ensures precise step tracking without compromising battery efficiency, thus providing users with reliable and long-lasting performance.

Sleep tracking apps often rely on wearable devices, limiting accessibility and convenience for users. ActiveAware takes a different approach by utilizing the accelerometer. This innovative method enables users to track their sleep quality without the need for additional hardware, making it accessible to a wider audience and simplifying the tracking process.

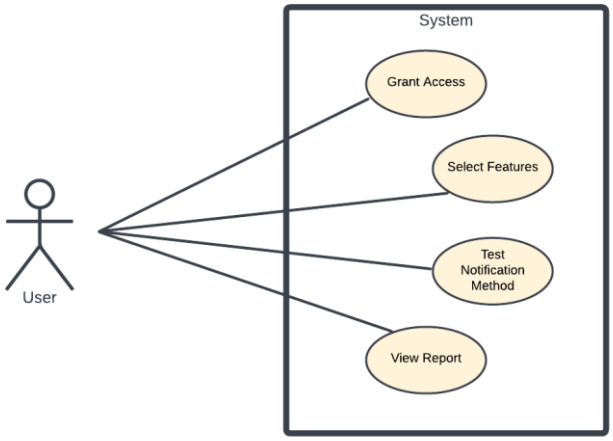
ActiveAware revolutionizes this aspect by analyzing either user texts, emoji usage, or facial emotions over time. By leveraging analytical techniques, the application provides users with insights into their emotional state, helping them identify patterns and triggers for stress or depression. This proactive approach empowers users to take control of their mental health and seek support when needed.

ActiveAware represents a significant advancement in health-tracking technology, offering users a comprehensive solution for monitoring their sleep, physical activity, and emotional well-being. By addressing existing limitations and leveraging innovative approaches, such as smartphone sensors and advanced data analysis techniques, ActiveAware empowers users to achieve balance and well-being in their lives. With its intuitive interface and actionable insights, ActiveAware stands as a beacon of innovation in the realm of health companion applications.

Use Case(s) of proposed application

1. Allow app access to camera and other required accesses
2. Choose/Enable the required features of the app.
   Default - All features are enabled
3. Test sample notification status
4. Enable for recommendations for physical and mental wellbeing sources(Optional)

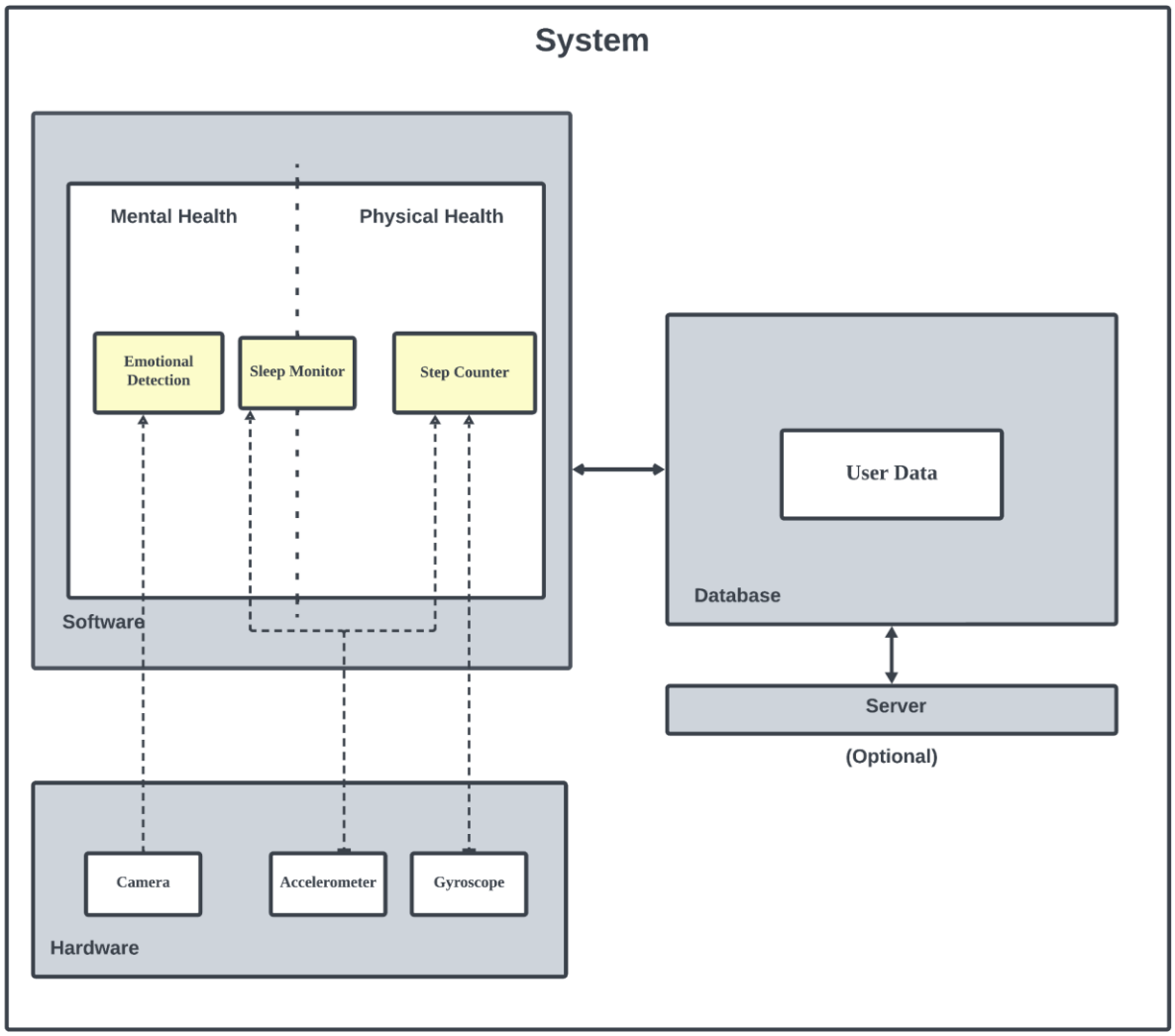
5. View daily or weekly report



Requirements

1. The app should capture images/video clips of the device holder’s face throughout the day.
2. The captured facial images need to be analyzed for emotions and reported for possible emotional health at the end of each day or week.
3. The app should collect sensor information and provide alerts and reminders for the device holder regarding physical and mental health wellbeing.
4. The app should provide a simple and easy to handle interface that allows users to enable and disable the each feature.
5. The app should be compatible with different versions of Android Operating System.
6. The app should be tested thoroughly to ensure its effectiveness and the goals are achieved.
7. The app should have documentation and a user manual for easy handling of the app.

Architecture



The architecture for the application consists of three main components: emotion detection, sleep monitoring, and step counting, each utilizing different sensors available on an Android smartphone.

Emotion Detection:

- Utilizes the camera sensor to capture facial expressions and analyze them using computer vision and machine learning algorithms.
- The captured images are processed to detect key facial features and extract emotional expressions using DeepFace [3].
- The detected emotions are then displayed to the user after instant analysis or stored in a database for further analysis.

- Optionally, a server could be of use if providing the emotion detection analyser as a separate service to which an API call is made from the app.

Sleep/ Monitor:

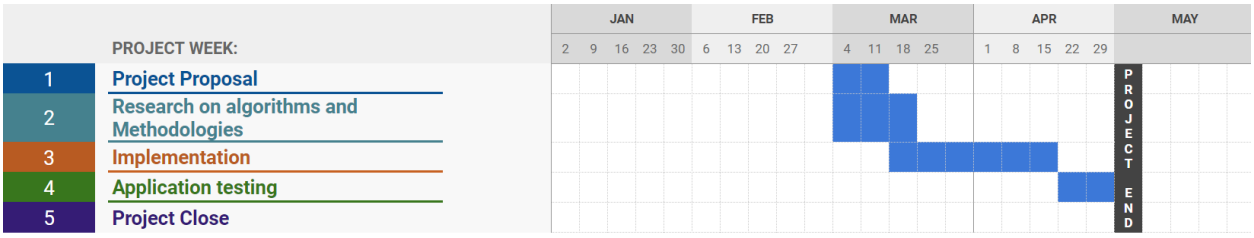
- Utilizes the accelerometer sensor to detect movement patterns during sleep.
- The accelerometer continuously measures changes in the phone's orientation and movement.
- Movement patterns are analyzed to determine sleep and calculate sleep duration and quality.
- Sleep data is presented to the user through visualizations or summaries, providing insights into their sleep patterns and suggesting improvements for better sleep hygiene.

Step Counting:

- Utilizes both the accelerometer and gyroscope sensors to accurately count steps.
- The accelerometer detects the up-and-down motion of the phone as the user walks or runs.
- The gyroscope helps in calibrating and improving the accuracy of step counting by detecting changes in orientation and angular velocity.
- Step count data is tracked over time and displayed to the user as daily, weekly, or monthly summaries, encouraging them to stay active and meet their fitness goals.

Overall, the architecture leverages the capabilities of the camera, accelerometer, and gyroscope sensors available on Android smartphones to provide users with a comprehensive health monitoring solution that includes emotion detection, sleep tracking, and step counting functionalities.

Project Timeline



Deliverables

Proposed health companion app will deliver the following aspects.

1. App will have a user-friendly interface where device holders can enable and disable features.

2. App will collect sensor information in-order to implement the logic of the activity tracking and health status notification parts of the system.
3. Unit tests will be written for each component so that the functionality of each component can be tested independently and to ensure the app is working as expected. Integration tests to ensure the app is working as a complete system and that all components are interacting correctly.
4. At the end of the project, and user manual will be delivered to help users understand how to use the app and troubleshoot issues that may arise.
5. Source code and build scripts to allow the app to be built and deployed on different Android devices. Source code will be committed to a GitHub repository.

Reference

[1] M. -S. Pan and H. -W. Lin, "A Step Counting Algorithm for Smartphone Users: Design and Implementation," in IEEE Sensors Journal, vol. 15, no. 4, pp. 2296-2305, April 2015, doi: 10.1109/JSEN.2014.2377193.
[2] “How accurate is the iPhone's pedometer at counting steps?”, Accessed on 10.03.2023, Url : https://www.youtube.com/watch?v=Ljk7kAjvEd8
[3] S. I. Serengil and A. Ozpinar, “LightFace: A Hybrid Deep Face Recognition Framework,” in 2020 Innovations in Intelligent Systems and Applications Conference (ASYU), 2020, pp. 1–5. doi: 10.1109/ASYU50717.2020.9259802.