FITNESS TRACKING INSIGHTS

PROJECT SYNOPSIS

OF MAJOR PROJECT

BACHELOR OF TECHNOLOGY

COMPUTER SCIENCE AND ENGINEERING

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INTRODUCTION

Background

We are very excited to announce that The "FITNESS TRACKING INSIGHTS" is our well researched approach to health monitoring system, by utilising a combination of hardware and software technologies. This initiative aims to provide users with personalised insights into their health metrics, To Empower their Fitness Journey.

Overview

This project involves the development of a screenless wearable tracking hand band, leveraging the capabilities of the ESP32 microcontroller and an assortment of sensors. These sensors are designed to capture essential health metrics, including heart rate, SpO2, step count, and sleep patterns. The acquired data is subsequently processed through a proprietary algorithm to derive optimised health insights.

Technology Utilised

The hardware prototype is powered by the ESP32 microcontroller, renowned for its efficiency in Internet of Things (IoT) applications. Complementing this, the dedicated Flutter app, named "WellWisher," serves as the user interface, providing a secure and intuitive platform for users to interact with their health data.

Specialization and Field

The project intersects the field of IoT, health technology, and analytics. It caters to the specialised field of personal health monitoring, where insights play a crucial role in fostering a healthier lifestyle.

Technical Terms

- ESP32: A microcontroller recognized for its versatility in IoT applications.
- Firebase Realtime Database: A cloud-hosted NoSQL database provided by Google, utilised for data synchronisation.

This project amalgamates well posed technology to empower individuals with a comprehensive and personalised approach to health tracking.

RATIONALE

Recognizing the significance of Health data, the project ensures that users receive immediate feedback on their health metrics, enhancing not only convenience but also potentially serving as a life-saving feature in critical situations. Moreover, the project distinguishes itself by tailoring health solutions to the unique needs and goals of each individual, elevating it beyond a mere gadget to an indispensable health companion.

To avoid distractions and enhance user engagement, the prototype of FITNESS TRACKING INSIGHTS will be intentionally screenless, a thoughtful design choice that reflects the project's commitment to providing a seamless and focused health monitoring experience

OBJECTIVES

- To Develop a functional prototype of a wearable band, integrating essential sensors to ensure accurate health data of the user.
- To develop a dedicated mobile application, With enhanced user experience with diverse profile views & improved dashboard.
- To obtain the reliability and precision of the hardware device with benchmarking.

LITERATURE REVIEW

The research conducted for the "Fitness Tracking Insights" project follows a mixed-method The primary research is close to Blaine Reeder PhD & Alexandria David BS's Article[1] unit comprises individuals who actively engage with fitness tracking devices. A diverse sample will be selected, considering factors such as age, gender, fitness levels, and technological familiarity to ensure a representative study population.

The article[1] is helpful for making fitness tracking bands, as it summarises the existing evidence and best practices for using smart watches to measure and improve physical activity, heart rate, and other health indicators. The article also highlights the potential of smart watches to enable personalised and contextualised interventions, such as reminders, nudges, and motivational messages, based on the user's activity level, goals, and preferences.

The App Perspective

For Individual App [4] In critical condition, if the pulse rate drastically increases/decreases above or below the threshold value, then a notification will be sent to the doctor. This project intends to decrease the death rates which occur due to heart attack or heart related issues.

In the Context of our Project, Thingspeak is a cloud platform for IoT devices that allows you to collect, analyse, and act on data from sensors or devices. Here we can replace our WellWisher Flutter App by providing a more robust and scalable platform for data collection and analysis. As for sensors, there are many options available depending on our specific needs in future. Some popular sensors for our projects include as per compatibility Testing.

The research paper titled "Smart Medicine Box"[3], presents a smart medicine box that reminds users to take their medication on time. It can provide insights into the development of a smart device that can be used for health monitoring. The paper discusses the use of sensors and a GSM module to provide notifications to users. Here we can use this information to develop a prototype of a wearable band that integrates essential sensors to ensure accurate health data of the user. Additionally, the paper discusses the importance of regular medicine administration and the issues related to forgetting to take pills at the right time. You can use this information to develop a reliable and precise device that provides personalised insights into fitness metrics.

FEASIBILITY STUDY

The feasibility study evaluates the viability of the "Fitness Tracking Insights" project, focusing on technical, operational, and economic considerations.

Technical Feasibility

- Hardware Compatibility: Utilising widely available components such as the ESP32 microcontroller and reliable sensors ensures extensive hardware compatibility.
- Software Compatibility: The project leverages popular development frameworks like Flutter and Dart, ensuring broad software compatibility.

    A. **Technical Expertise**

    Requisite technical skills for hardware and software development are either already present or can be acquired within the project timeline.

Operational Feasibility

The mobile app aims to be designed with a user-friendly interface, minimising the need for extensive user training.

1. Feedback Mechanism: An iterative development approach is to be followed, guided by user feedback, guarantees continuous improvement, enhancing user acceptance.
2. Reliability Measures: Robust testing protocols will be implemented to ensure the reliability of both the wearable device and the WellWisher app.

Economic Feasibility

Projected Cost: The expected and estimated project cost of 9000 INR aligns with the allocated by our group budget, ensuring economic feasibility and financial viability.

SIGNIFICANCE OF THE PROJECT

The project is designed to empower individuals by providing real-time insights into crucial health metrics like heart rate, SpO2, step count, and sleep patterns. This proactive approach supports preventive healthcare, enabling users to take early measures for a healthier lifestyle.

Technological Advancement

Innovating in wearable technology, the project integrates advanced sensors and a user-centric mobile app. This fosters innovation in health monitoring devices and showcases seamless integration between hardware and software components.

User Experience

User engagement is enhanced through personalised recommendations and a visually intuitive dashboard, making health data easily understandable. The screenless wearable design minimises distraction, allowing users to focus on activities while still receiving valuable health insights.

Overall Impact

The project contributes significantly to promoting healthy lifestyles by offering a holistic approach to health monitoring. It encourages users to actively manage their well-being, and its innovative approach influences the broader landscape of healthcare technology.

Conclusion

The "Fitness Tracking Insights" project holds substantial value in promoting individual health, advancing wearable technology, enhancing user experiences, and making a positive impact on the overall landscape of healthcare technology. These aspects collectively emphasise the project's relevance and importance in addressing contemporary health and technological needs.

METHODOLOGY

The methodology or planning for the Fitness Tracking Insights involves several stages,including:

- Research and Design: This stage involves researching the technical specifications and capabilities of the sensors and components to be used in the fitness tracker. A detailed design of the product is then created, including the hardware and software components, as well as the mobile app.
- Prototype Development: Once the design is finalised, a prototype of the fitness tracker is built. The prototype is tested extensively to ensure that it meets the required technical specifications and performance criteria.
- App Development: Concurrently with the prototype development, the mobile app is designed and developed. The app should be user-friendly, and intuitive, and display the data in real-time.

Data Collection Methods

1. Quantitative Methods: Structured surveys[5] will be employed to gather quantitative data on user preferences, satisfaction levels, and the perceived impact of the fitness tracking device.
2. Sensor Data Logging:The hardware prototype[4] will collect quantitative health metrics (heart rate, SpO2, step count) through integrated sensors, providing real-time data for analysis.

Data Analysis Tools: Quantitative Data Analysis[2]

A. Statistical Software: Data obtained from research articles and Tools and various sensor readings will be analysed using statistical software to derive quantitative patterns, correlations, and trends.

Planning of work

Phase 1: Hardware Prototype Development

Select components, collaborate on prototype design, and integrate sensors with the microcontroller.

Phase 2: App Development

Engage UX/UI designers, implement authentication, and create a health dashboard.

Phase 3: Logic Design

Creating data processing algorithms, and connectivity with hardware.

Phase 4: Database Integration

Integrate Firestore for data storage and Firebase for real-time updates.

Phase 5: Testing and Validation; Rigorous testing of the wearable device and app functionalities. Continuous collection and integration of user feedback for iterative development.

Testing and Validation involve rigorous testing of both the wearable device and app functionalities, coupled with continuous user feedback collection for iterative development. This comprehensive project plan provides a systematic approach to achieving the outlined objectives within the specified timeframe.

FACILITIES REQUIRED

Essentials Tools & Specific Requirements

This chapter succinctly outlines the critical hardware and software components, facility setup, and workspace requirements. It ensures a streamlined development process for the fitness tracking device and associated app.

Hardware:
- Microcontroller: Utilising the ESP32-WROOM series.
- Prototyping Board: Employing a versatile solderless breadboard.
- Power Source: Utilising a 500mAh 3.7V LiPo battery with a boost converter.
- Health Sensors: Incorporating the MAX Series for heart rate and Pre-build sensors for motion data.

Software:

- IDE: Using ThonnyIDE for ESP32 programming.
- Code Editor: Utilising Visual Studio Code for an integrated development experience.
- PCB Design: Relying on an online PCB manufacturing service.
- Mobile App Framework: Utilising Flutter for cross-platform development.
- Android App Development: Utilising Android Studio.

Facility Setup

1. Workstations: Configured with necessary hardware and software tools.
2. Testing Equipment: Equipped with multimeters, oscilloscopes, and other relevant instruments.
3. Internet Connectivity: High-speed internet for collaboration and data retrieval.
4. Collaboration Tools: Leveraging communication tools for remote collaboration.
5. Workspace:

   - Development Room: A dedicated and quiet space for focused development.
   - Testing Area: A designated space for prototype testing and validation.

EXPECTED OUTCOMES

It would be an advanced fitness tracking device seamlessly paired with an intuitive Flutter app. This includes the development of a functional hardware prototype using ESP32, precise health metric readings, and User readable data presentation on the dedicated "WellWisher" app. The project envisions delivering a smooth user experience, offering actionable insights for users.

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