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ARTICLE

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DESIGN AND DEVELOPMENT OF AN INTELLIGENT FITNESS TRACKING AND RECOMMENDATION SYSTEM

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The rapid advancement of technology has shifted app development from hardware-based to software-driven systems, transforming operations for industries and individuals worldwide. Modern companies increasingly invest in technology-focused, personalized products powered by Artificial Intelligence (AI), Machine Learning (ML), big data, analytics, and cloud computing. Among the most impactful innovations is the intelligent ecosystem of wearable devices, which significantly enhances global health and well-being. AI and ML form the core of decision-making in these systems, extending their use beyond simple activity tracking. This research paper presents the concept of a socially engaging fitness tracking and advising mobile application that integrates both physical and mental health features. The study identifies essential components of an effective health-centered web application and emphasizes the unification of multiple health functions into a single platform. The proposed system, including a mental wellness module, was designed and tested for usability, with the study focusing on its applicability to the Taiwan market.

Introduction

The COVID-19 pandemic caused the implementation of lockdown regulations and distancing orders throughout the country, which in turn created the necessity of a movement from movement towards a more digital-based setup for the fitness services, a shift previously only considered for gym-based operations[1]. Along with this, the figures of fitness apps' downloads and their utilization got substantially increased[1,2]. The report titled "Future of health and healthcare" by the World Economic Forum dated September 2020 lists a 46% global increase in fitness and healthy living apps downloading[3]. The fast pace of the obtained data suggests that fitness app use will keep rising very fast as soon as virtually trained is widely accepted. The trend of health and wellness awareness has positively affected the market as well. The Fortune Business Insights report on the global fitness tracker market says that the market size was US 30.41 billion dollars in 2019, and it is expected to rise to US 91.98 billion dollars by 2027, reflecting a CAGR of 15.2%. The Pew Research Center data also indicates that one in five Americans was using a fitness monitoring device in 2019.

Many interactive web applications are available across age groups, yet not all of them offer a good user experience, and they concentrate content, neglecting interaction[3]. Only a revolution in user interaction by the innovation, interactivity, and becoming user behavior adaptable can ultimately result in true personalized product[4]. The related hardware such as fitness bands and smartwatches are designed to work with the firm ware and software which are responsible for the health monitoring operations. The sensors technology has gone so far to facilitate the remote health assessment and early detection which is very much needed in the case of patients with chronic conditions, and simultaneously providing the less need for the visits to the hospitals[5-7].

Literature Review

In the past, various factors that drive people towards the use of fitness trackers have been discussed extensively[8]. Some researchers suggest that while people

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may have an intrinsic desire to be fit, they still tend to use the services of personal trainers or follow a fitness program that is run by a fitness center or community[9]. The power of exercise to prolong good health is a strong motivating force for an active and healthy life.Aims to overcome the aforementioned difficulties; this online platform is visualized as a virtual mentor, providing a fitness setting at home[10]. At the time of COVID-19 lockdowns in India and elsewhere, there was a considerable increase in the number of people incorporating fitness into their daily routine at home[10], thus underlining the importance to consider the crucial elements of an effective fitness system. This study addresses both the younger and the older customers, and those with mobility problems associated with aging, who can still use the services provided at their homes without going to the gym[11]. The research will take into account training of two types: at home and not at home, check on the nature of the workout, the measurement tools, data analysis, and the feedback which is to be customized. The suggested app FIT + TRACKER seeks to be an inhibition buster in the human distance people oriented era, by giving the most intimate and bonding with one throughout the fitness adventure among both new and already experienced users.

Methodology

The information was obtained via stringent methods from acknowledged scientific journals and trustworthy online sources. The results were supported by a comprehensive user study, the important features were recognized and grouped. This paper based on evidence cites extensively scholarly sources. The SEARCH process included many keywords like “Fitness Trackers”, “Health Tracker”, “Smartwatch Applications”, and “Evolution of Health Tracker Applications.” More than 70 research papers were scanned, and a word-cloud technique was used. The researchers adopted a triangulation method, thus conducted open-ended interviews with people from different age categories [12]. The group then unified and sorted all the ideas, backing them up with reliable market data and connecting the features to the statistical data.

Modeling and Analysis

The analytical approach was influenced significantly by the data that was amassed from the scientific literature, press articles, and user interviews. Real-time analysis is done through the FIT+ TRACKER web application which receives physiological data collected by the sensors in smartwatches or fitness bands. The reason for this is that raw sensor inputs need to be changed into meaningful metrics, therefore, devices show basic readings while mobile or web apps show detailed insights. Even though all devices have the same sensors, still different and sometimes unknown algorithms are used by manufacturers which, in turn, have an impact on the accuracy and user experience. On the other hand, the FIT+ TRACKER, apart from the health and calorie tracking functions, also provides the users with the ability to monitor and compare specific data as well as get daily and weekly performance summaries that are clear and thus, they can keep their motivation up.

Diet: The program for web use acts as a historical diet coach, by giving personalized food plans, aiding users in their struggle to reach fitness targets. It reviews the consumers’ meal patterns—varieties and volumes of food—to evaluate the supply of nutrients and energy, thus allowing the users to know the diet—exercise ratio and to modify their food habits in line with the new understanding.

Mental Exercises: The web app also has a key emphasis on mental fitness which is indeed a very vital aspect in the post-COVID times. It’s giving its users a way out to always be at peace, keep their minds strong and their emotions in balance by letting them listen to the 432Hz meditation music besides a number of other wellness activities such as yoga and guided meditation, hence contributing to mental health improvement overall.

A Comparison of Fitness Web-Applications: The number of fitness apps increased from 2.8 to more than 5 million by 2021. Contemporary health technology provides online consultations, basic services for free, and gives in-depth feedback based on device data automatically synced, not just manually input like weight and height.

Designing the User Interaction: Designing the interaction interface will be a real challenge because the software needs to cater to all age groups, starting from the elderly who are not so used to technology, and ending with the young who are used to good-looking software. Consequently, the UI should be simple, intuitive, and attractive. The design of the interactive training might be grouped into the following three aspects:

Direction: The style of interaction specifies the way that data is organized on the application and consists of two kinds. One-way interaction gives out only readable, pre-canned content while prohibiting user input. On the other hand, two-way interaction gives users the opportunity to express their opinions, which makes the system more active, more involved, and brings about higher engagement and a larger amount of information being shared.

Input Type: Input types are the ways by which users interact with an app and consist of three kinds. Indirect input uses intermediate devices like keyboards or mice. Direct input requires immediate interaction such as touchscreens. Natural input is based on AI-driven methods and allows gesture recognition and automated sensing without any explicit physical actions.

Training Output and Problem Formulation: Training output means the means through which materials are delivered, such as text, images, audio, video, or immersive environments. The design of the Training output influencing user interaction is vital to accessibility in all age groups. As there are multiple goals for the application, problems, notably the integration of multiple models and conflicting features, have to be dealt with in advance.

Connection and Compatibility: Compatibility issues may be encountered by the users if the fitness devices do not support the same Bluetooth version or are incompatible in terms of their models. Moreover, the app will have to create the server and internet connections at the same time. It must be lightweight for both the mobile and web versions because they will be large, hence it will be able to run smoothly on devices that have limited processing power.

Integration and Data Management: Creating a UI that can be used by all age groups is demandingless complex and not the functionality. The software is expected to save the information on your device in a secure manner and allow for sync via TCP/IP, which might lead to the loss of data if the connection fails.

Sensing and Monitoring: The data for training is collected either via self-reporting or with the help of wearable/fixed sensors that were worn by the subjects. The aspects of the subjects like their activity, physiology, and movement are monitored with the help of technology leading the progress. The use of self-reporting, which is applied in 47% of all apps, is the easiest but the slowest method in doing the research. Wearable devices such as a Fitbit can monitor sleep, heart rate, and respiratory rate at the same time, however only 20% of the apps and 90% of the physical trackers have integrated sensors. The answer to the question of whether the new sensor technology based on power-efficient long-term sensing is easily acceptable, if a low enough error level is reached with a highly-integrated cut-through implementation should be addressed not only from a technical perspective but also from an economical one.

Results and Discussions

The web-based application's coding has been completed entirely and hence, is now ready for hosting. The design is deliberately plain with brightly colored elements for the sake of visual appeal, and the appendix contains screenshots. The mobile version and the website version have the same name: the mobile app has all the features and system functions, while the website version only lets users do one-way actions, i.e., they can only view the content such as yoga guides, and meditation music through a minimalist and aesthetically pleasing design.

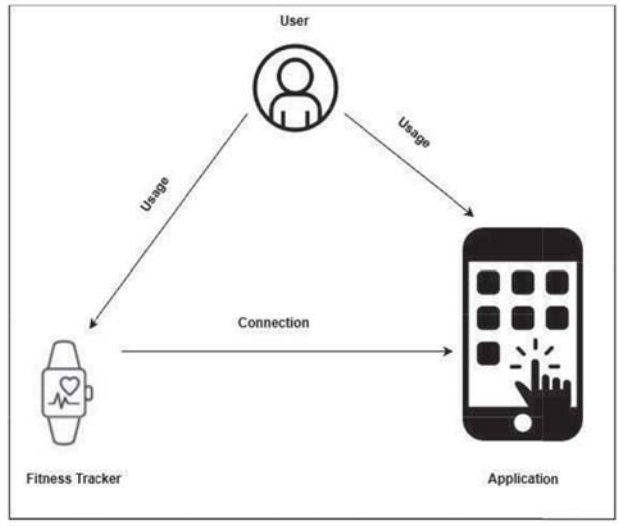

Fig. 1: web-application's training app.

Usage as a Training App: Upon successful login and the inputting of fundamental personal data, the users will be able to reach an extensive section of training. They do so by naming their focus, which can be the body, mind or spirit wellness, among others, and the platform then runs the appropriate module (Figure 1) . For instance, different workouts for individual body parts will be shown by the body exercises, and there will be a range of easily-performed asanas in the case of yoga.

Usage as a Tracking App: In order to receive full tracking advantages, the web-app is required to pair up with a fitness gadget, otherwise, it can just track steps via the phone sensors. As soon as it is connected, it will not only automatically gather, analyze and display all the device data interactively but also include such things as sleep patterns and daily comparisons, thus making users able to keep track of their metrics and evaluate their overall wellness.

Usage as Mental Health App: To keep the users informed about the daily reports, the web service has to connect with a fitness device even though the phone sensors can just track steps. The data from all sensors is gathered and, after the syncing is done, eventually being examined making the users able to check the general health metrics and get the daily comparison served through the system's interactive interface.

Conclusion

The fitness and healthcare mobile app industry has indeed seen a rapid growth due to the release of more advanced and secure technologies. However, the process of bringing in multiple features into a single application is not easy but still can be done. A lot of users are eager to improve their health but, sometimes, are reluctant to take action, consequently, looking for one app that would cater to all their health needs. Older adults are particularly in need of health information they can trust and apps with easy navigation. According to this research, the available mobile health solutions are group-specific and have some significant shortcomings. We have come up with FIT+ TRACKER, an all-in-one solution that will be available in the near future, by identifying and closing these gaps. ❐

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