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Using machine learning, examine the influence of yoga on public health

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Abstract:

Yoga is a thousand-year-old practise that has been shown to promote public health in a variety of ways. Boosting our immune system and reducing inflammation in the body are becoming more important. We propose to use innovative technologies and the Internet of Things (IoT) to aid in public wellbeing to enhance the immune system with regular practise of Yoga and Meditation, due to developments in information technology and its great significance in healthcare research. We want to create a prototype model for a yoga self-monitoring system that uses machine learning approaches to track a person's health. With the aid of monitoring and identifying one's behaviours, one's health state may be assessed and forecasted. With the use of smart sensors and actuators, an automated human activity identification model gathers data on a person's yoga asanas positions on a regular basis. The acquired data will be used as training data by a machine learning algorithm to create a mathematical model. Using a Yoga positions self-observatory system to train the machine learning algorithm to predict labels from features. The mathematical model tracks yoga asanas and measures a person's overall health at regular intervals. The mathematical model's output is used to train a model that may be used to infer new data points and make predictions. This prototype model will be useful for self-practice yoga and will monitor public wellbeing after a certain number of days. With the real-time monitoring gadget, we will be able to promote Yoga education and raise awareness.

Keywords— IoT, Wearable Device, ML,

1. Introduction (Heading 1)

Emotions drive a big amount of our decisions, not only instinctual ones, thus they have a direct impact on our everyday lives. The majority of research on emotion recognition has thus far focused on the responses of participants elicited by technology advancements in a controlled environment. As a result, complicated emotion identifiable evidence in the real world, especially for inescapable registering, remains an important challenge for this relatively young yet promising area of research. It's difficult to establish a universally agreed-upon definition of emotion. Rather, we should analyse a number of features that distinguish emotion from non-emotion. Emotion is often seen as a neurophysiological expression that is purposefully open but not targeted at a specific material, and temperament is a constant and not exceptional feeling. Finally, a brief, remarkable, and well-coordinated tension is shown as emotion. Now, instead of referring to feelings, allude to effect. Furthermore, there are obviously two full of feelings processing points: stress and emotion recognition, which have recently become independent study lines. Emotions may be detected and evaluated from a variety of angles.

Stress is a mental and natural phrase that describes the inability to respond appropriately to distressing emotional and physical situations that might be real or imagined. Emotional pressure, ineffective physiological movement, and failing execution are all symptoms of stress. A state of high excitement, an increased pulse, excessive adrenaline production, disillusionment with stress management techniques, a feeling of strain and exhaustion, and inability to focus are all common stress side effects. Stress may be triggered by external circumstances (such as a difficult work at hand, clamour, vibration, or a lack of sleep, for example) or by internal reasons. Emotion encompasses a wide range of mental and physiological characteristics, including a person's worldview and how they interact with nature. Physiological stimulation, expressive activities, and aware experience are all examples of emotion. Emotion is inextricably linked to the state of mind known as mood. Unlike emotion, which is a psycho-physiological expression that occurs in the current instant (minutes to hours), mood is a long-term emotional state (hours-weeks). Moods, unlike fundamental emotions, are less apparent, less severe, and less likely to be triggered by a particular stimulation or event.

Automatic emotion recognition based on articulation level prosodic highlights may play an important role in speaker-autonomous emotion recognition. The recognition of emotions based on a person's speech has been discussed for a long time. The vast majority of work-related data is acquired in a regulated realm where the data is clean, free of noticeable turbulence, and legitimately segmented. Furthermore, the majority of such a framework is comprised of speech or voice recordings. In actuality, the method is even more complicated. There are several factors, such as background sounds and non-speech voices such as a giggle, a scream, a laugh, a groan, and so on, that greatly disrupt the results obtained in a controlled domain. These factors will render the true emotion recognition based on data from the controlled condition useless.

With the current advancements in machine learning, artificial intelligence, and natural language processing, driven by new revolutionary possibilities, it is now possible to automate the analysis of massive amounts of freely disseminated data. Language mining and social network analysis have become essential tools for analysing data and the relationships between it. The fundamental goal is to separate essential facts as effectively as possible given the conditions, and to discover connections between available data by using algorithmic, quantitative, and information-based executive tactics. The automation of concept discovery in these informal groups has gotten a lot of attention for a variety of reasons. Image sensors, electromyogram sensors, wearable receiving tags, inertial measurement units (IMUs), and common interface platforms are the most prevalent sensors.

The development of wearable technology has progressed at a steady pace. Wearable innovations are expected to become a commonplace part of our daily lives sooner rather than later. This inquiry serves two purposes. The first is the ranking of wearable innovations based on criteria and uses, such as wearable health breakthroughs, wearable material developments, and wearable buyer hardware. The second goal of the project is to determine how wearable innovations will benefit people's daily lives as well as how organisations will collaborate in the future. Wearable advancements will make the future safer, easier, more beneficial, snappier, and more interesting, as seen by the prospective uses.

2. Materials and Methods

We presented a full-body pose exhibiting and quantitative evaluation technique to perceive and analyse yoga stances in order to show diverse full-body stances with high precision and cover the gaps in the stance assessment. A wearable device with IMUs attached to the body was created to quantify human stance information using a quaternion position. A two-phase classifier was used in the presenting stage to demonstrate fundamental full-body yoga poses. Backpropagation fake neural system (BP-CNS) was used as the primary classifier to divide yoga poses into different categories, while Machine Learning Algorithm was utilised as the secondary classifier to organise the stances within each classification. To build the Bayesian system, the quaternion information calculated by IMU fixed on each body component was treated as a multivariate Gaussian variable. The standard level of distinct body parts was quantitatively assessed using the contingent likelihood of the Gaussian variable comparing to each body part compared to the Gaussian variable related to the linked body part as a rule. For example, we may compare the standard level of the lower arm to the higher arm, the shank to the thigh, the upper arm to the bosom, and the thigh to the midsection. After evaluation, the student was given instruction in an easily understood manner, which included altering the direction and degree. Following that, the kids' out-of-the-ordinary body parts might be exhibited and corrected.

3. Brief Description of The System

Both hardware and software are included in the yoga suite bundle. The suite's hardware is divided into three key components: 1. Optical vision, infrared sensor, and echolocation sensors are all included in one wireless image sensor. 2. Yoga IMU body coat, 3. Wireless Yoga pad/mat The counter is a The software comprises of a universal wearable band software programme that can access the sensors in wearable devices and is compatible with all kinds of wearable bands and smart watches. The yoga suite may be interfaced with a personalised software package that can combine all three pad, coat, and picture inputs, or any two inputs, or even just one input. The machine learning and neural algorithm can interact with the three inputs from the suite and recognise all of the users' actions, store them, and compare them to a preset set of yoga poses before providing feedback to the users. The universal software programme use cutting-edge technology to fuse all sensor data in precise timing and provide a long-term chart of the user's health report.

4. Detailed Description of The System

Hardware Components:

The suite's hardware consists of three key components: a wireless image sensor kit, a wireless yoga mat, and a yoga IMU coat.

The Image Sensor Kit includes a 64 Megapixel optical zoom lens, IR sensors, an Echolocation sensor, and a wireless Bluetooth 5.1 module to communicate with

additional modules. Even in low light, the optical sensors are configured with an effective algorithm that improves picture contrast and brightness. The IR sensors can detect hotspots in moving people while doing yoga asanas, as well as overheating areas on the body. By distinguishing the other persons in the background, the echolocation sensor delivers low frequency acoustic signals to forecast the number of users actually executing the yoga asanas. The image sensor kit's visual video output may be watched by directly inserting the device into a TV or through the internet via a LAN connection. The machine learning algorithm gathers data from the yoga pad and yoga coat, then notes the user's skeletal key points. Finally, the algorithm identifies the yoga posture that the user is currently performing and provides feedback on where the user is making mistakes and which key points are becoming overly stressed as a result of the incorrect posture, as well as keeping track of overall changes in the user's body over time. This will ensure that the user's health and body mass index are under control throughout time.

Wireless Yoga Pad: The yoga pad is equipped with 48 pressure sensors and piezo sensors arranged in a 124 matrix pattern that can compute the user's precise weight, as well as forecast the right movement of the user when executing yoga asanas and communicate the information to the imaging device. The mat/pad is composed of a soft leather material with high durability and strength, and it can sustain a weight of roughly 200 kg.

Yoga Coat with Wireless Technology:

The yoga coat has 18 inertial measurement units (IMUs) that precisely sense minute movement changes in the user's body and can transfer the movement information to the image sensor kit, which manipulates the details and marks the skeletal important spots. These IMUs are in charge of recording body motions and users' asanas gestures, and this feedback is analysed, the accuracy of the body movement is anticipated, and corrections are suggested.

Components of Software:

Mobile application for universal wearing bands:

A universal mobile wearable application for Android and Apple phones has been created, and it is compatible with all wearable devices and smart watches that employ sensors to monitor the user's various activities. The software includes 150 pre-programmed yoga asanas, and the app may be used individually or in conjunction with a yoga suite through mobile phones. The data collected from the wearable devices' different sensors is saved and monitored for future predictions and analyses. A machine learning technique that analyses data from wearable devices and a neural network that gathers all of the data to forecast the user's health. The programme records the users' blood flow, heart rate, and stress level on a regular basis and saves it to the cloud. While practising yoga asanas, the gadget predicts the asana technique and evaluates the user's entire respiration, attempting to determine the total volume of inhaling and exhalation done by the user throughout the method. Data may be analysed in users' registered mobile phones via IoT, and the health curve can be overlaid with prior data.

Customised Sensor Fusion Software Kit: The personalised sensor fusion software kit makes use of all of the sensors linked to this module. It can read data from the image sensor unit, the IMU unit, the pressure sensor on the pad, and all of the sensors in wearable devices. The aggregate data from all of the sensors is combined with powerful state-of-the-art technology and Machine learning algorithms, and the user's condition is assessed in all aspects and saved in the cloud. Users may also get the information through IoT on their own smartphone. The user may customise their own settings and understand the information they need. This programme also provides data on the length of the courses, muscle stretch levels, and the evolution of the user's health issues in the past.

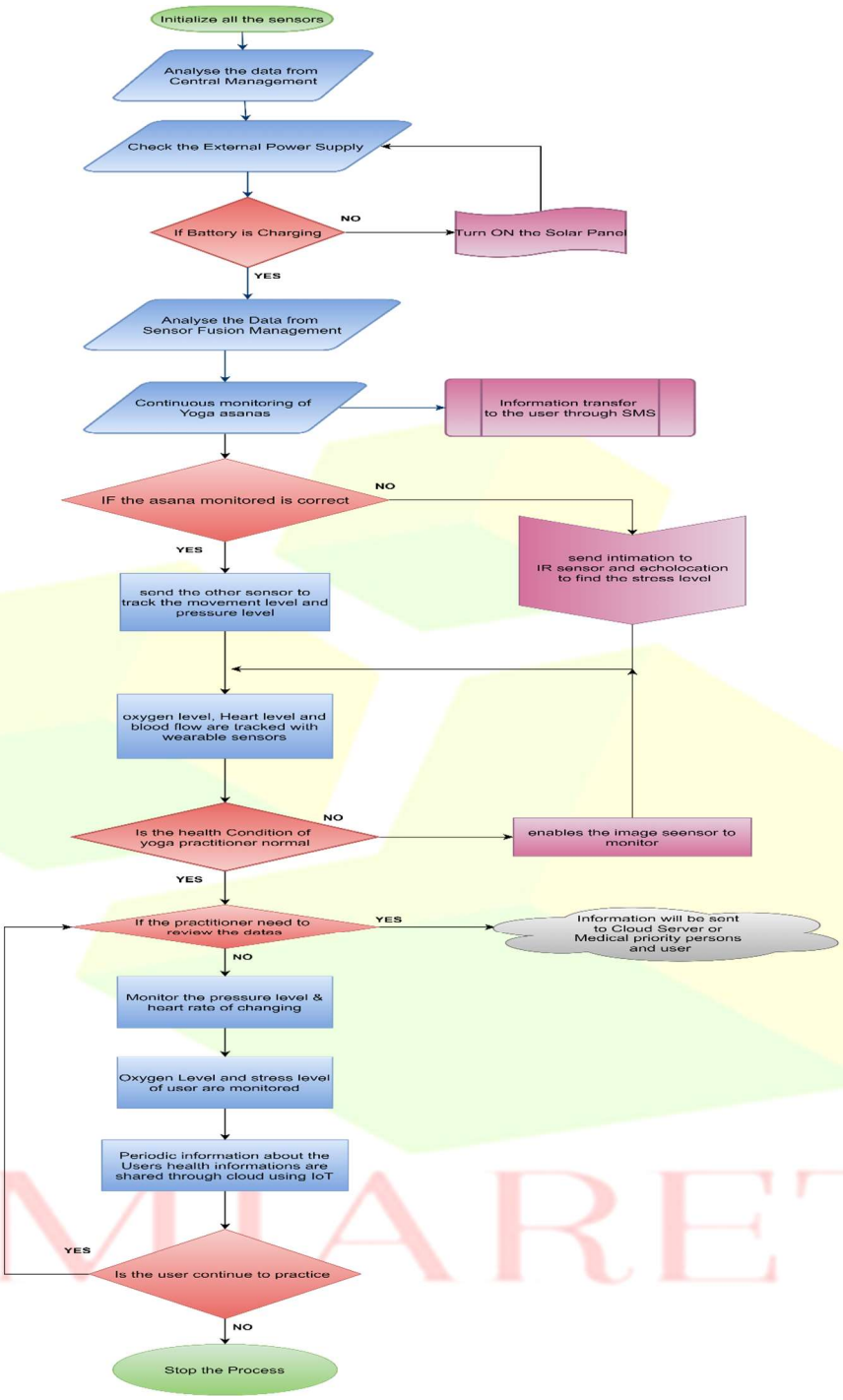

Figure-1 Flow diagram

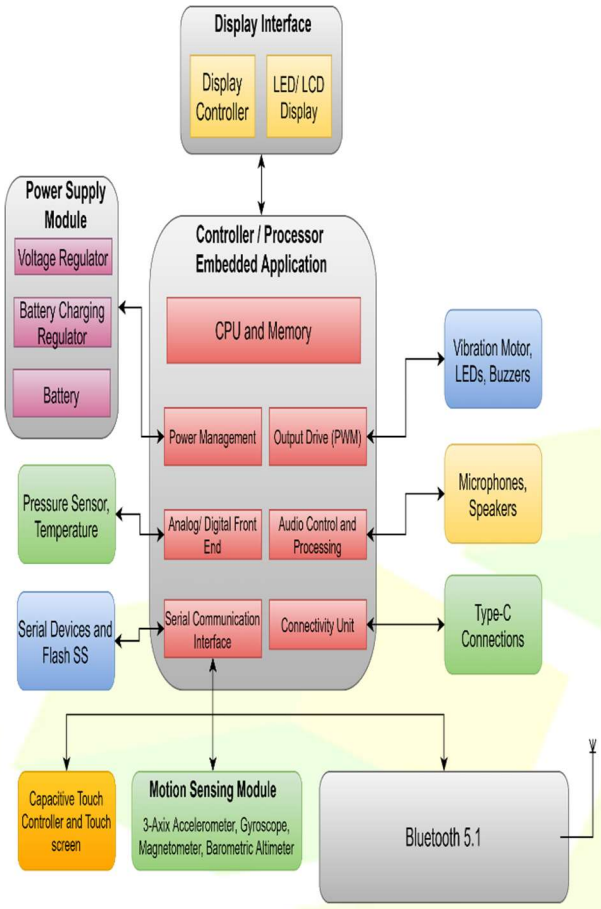

Figure-2 Block Diagram

5. Conclusion

The wireless image sensor kit, wireless yoga mat, and yoga IMU coat are the three key hardware components of the suite.

Wireless Image Sensor: The Image sensor kit includes a 64 Megapixel optical zoom lens, IR sensors, and an Echolocation sensor, as well as a wireless Bluetooth 5.1 module to connect to additional modules. Even in low light, the optical sensors are configured with an effective algorithm that can boost picture contrast and brightness. The infrared sensors can detect hotspots in moving people while doing yoga asanas, as well as overheating areas of the body. By distinguishing the other persons in the background, the echolocation sensor delivers low frequency acoustic signals to anticipate the number of users executing yoga asanas. The image sensor kit's visual video output may be seen on a TV or via the internet through a LAN connection. The machine learning algorithm gathers data from the yoga pad and yoga coat, then notes the user's skeletal key points. The algorithm then identifies the yoga posture that the user is currently performing and provides feedback on where the user is making mistakes and which key points are becoming overly stressed as a result of the incorrect posture, as well as keeping track of long-term changes in the user's body. This ensures that the user's health and BMI are maintained throughout time.

Wireless Yoga Pad: The yoga pad is equipped with 48 pressure sensors and piezo sensors arranged in a 124 matrices pattern to compute the user's precise weight and to forecast the right movement of the user when executing yoga asanas, as well as to transfer the information to the imaging device. The mat/pad is composed of a soft leather material with high durability and strength, and it can support up to 200 kg of weight.

Yoga Coat with No Wires

The yoga coat has 18 IMUs that correctly monitor minor movement changes in the user's body and communicate the movement information to the image sensor kit, which manipulates the details and marks the skeletal important spots. These IMUs are in charge of monitoring users' asanas gestures, and this input is analysed, and the accuracy of the body movement is anticipated, as well as recommendations for modifications.

Components of Software

A mobile application for universal wearing bands:

A universal mobile wearable application for Android and Apple phones has been created, and it is compatible with all wearable devices and smart watches that employ sensors to monitor the user's numerous activities. The software includes 150 pre-programmed yoga asanas, and the app may be used separately or in conjunction with a yoga suite. The data collected from the wearable devices' different sensors is saved and monitored for future forecasting and evaluations. A neural network and a machine learning algorithm analyse data from wearable devices to forecast the user's health. The algorithm monitors the users' blood flow, heart rate, and stress level on a regular basis and saves the data to the cloud. While executing yoga asanas, the gadget predicts the asana technique and evaluates the user's complete respiration, attempting to determine the total volume of inhaling and exhalation done by the user during the method. Data may be evaluated in users' registered mobile devices via IoT, and the health curve can be matched to past data.

The customised sensor fusion software package makes use of all of the sensors linked to this module. It can collect data from the image sensor unit, the IMU unit, the pressure sensor on the pad, and any other

sensors in wearable devices. The aggregate data from all of the sensors is combined with powerful state-of-the-art technology and Machine learning algorithms, and the user's condition is analysed in all areas and saved in the cloud. Users may also get the information using IoT on their own smartphones. The user may customise their settings and understand the information they need. This programme also provides data on the length of the courses, muscle strain levels, and the evolution of the user's health issues over time.

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