

A Real Time Monitoring System for Yoga Practitioners and their Effective Programs

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ABSTRACT

In today's world, the vast majority of individuals are dealing with some kind of health or emotional stress. Both can be caused by a variety of things, including poor eating habits, a lack of physical activity, and the stress of one's social and professional environments. These variables can have a negative impact on a person's emotional and physical well-being. Although it rejuvenates the body and mind, yoga may be regarded one of the best options in this circumstance. In yoga, a person's mental, bodily, and spiritual components are all in the perfect balance. Yoga is a great way to incorporate the latest technology trends into your lifestyle. To integrate and track yoga activities, this study recommends using the Internet of Things (IoT) and a smart app. Data from the sensors attached to the user's body is analysed by a central processor (Smart phone or smart gadgets) to offer the user with pertinent ideas and feedbacks. Yoga practitioners will be able to keep track of and analyse their own practise with the help of this project. Practicing yoga has been shown to improve many health indicators, including blood pressure, temperature, and heart rate. Yoga practitioners who use our IoT-based system found it to be quite beneficial in their yoga practise, as seen by our survey findings.

Keywords: Real time monitoring, Yoga, Meditation, IoT

1. INTRODUCTION

Ancient yoga is a form of exercise for the mind, body, and soul. Yoga has been shown to minimise health risks and aid in the healing process in several clinical trials. In the United States, chronic disorders including heart disease, diabetes type 2, obesity, and cancer account for around 75% of all healthcare expenditures. These problems have an easy fix, but putting it into action will need some willpower and motivation on your part. The human body may fight and even acquire immunity to certain lifestyle-related disease disorders with minimal consistent effort over the course of several months. In the battle against several disorders, including metabolic syndrome, diabetes, and cardiovascular disease, yoga has provided encouraging benefits. Yoga is a very different experience than working out in a gym or participating in athletics. It is necessary to push oneself to the maximum and tolerate more and more stress in order to participate in activities such as the gym. Young adults may cope with this stress, but the more settled lifestyle of adults and those in the middle of life need a greater concentration on one's job.

This results in their neglecting their health, which has long-term consequences. Yoga focuses on finding harmony within one's body, mind, and soul. For those between the ages of 25 and 45, the positions aren't that difficult. In addition, Yoga offers a wide variety of other exercises. Yoga, rather than light sports (running, jogging) or light gym workouts, can help you become in shape at home. Yoga is a gentler approach to keep your body in control and stave against a variety of ailments. Yoga has been studied as a possible treatment for cancer, schizophrenia, asthma, and heart disease. According to Sovova's research findings, yoga practises are superior to other aerobic exercises suggested by current guidelines for preventing cardiovascular disease, despite their modest energy expenditure. Yoga has been shown to have a favourable influence on people's weight, BMI, and diet if they do it on a regular basis. By practising yoga you improve your mental and physical state of health and well-being as well as your ability to cope with stress and maintain a positive outlook. Anxiety, strepidation, depression, hyperthyroidism, weight gain, blood pressure and arthritis are all alleviated. To help yoga practitioners monitor their blood pressure, heart rate, and body temperature, we've developed an Android app that connects to a hardware kit. Our Android app can produce weekly and monthly reports from the data we've collected in the repository. As a result of our Android App,

yogis may keep a close eye on their health. Yoga asanas might be adapted under the direction of a yoga master to restore normal blood pressure, heart rate, and body temperature, according to the paper. Yoga asana instructions for beginners and professionals are also available in the Android App. The remainder of the work is divided into sections like Literature review, proposed system design, system analysis and findings, and conclusions. In the Literature review section, we describe the numerous previous studies that have been conducted in this subject. Section 3 focuses on system architecture and design process. Section 4 contains a system analysis and observations, and the final section, our deduced conclusions, concludes the paper.

2. PROPOSED SYSTEM ARCHITECTURE

2.1 System hardware

This system primarily relies on four different types of sensors. DHT-22 (Humidity and Temperature sensor), ADXL-345 (Accelerometer) and a heart rate sensor are included in the sensors (HRM-2511E) The board used to link the sensors and transmission module was an Arduino Nano with an ATmega 328 microcontroller. Android phones with Bluetooth modules can connect to the kit through a Bluetooth module (HC-05). In Fig 2, you can see our prototype embedded kit. This kit's figure is a prototype; the creators want to replace it with an Arduino Nano model, which will be even smaller and less expensive. Its simplicity, versatility, and cost-effectiveness make it a better option for embedded systems than more complex and expensive systems. The ability to run source code more quickly on the hardware is another benefit of utilising Arduino. There are no third-party applications or code conversions to worry about when developing Arduino code on the Arduino's native IDE, which was built only for Arduino boards.



Figure.1 Sample yoga postures



Figure.2 Prototype embedded kit

In order to receive and handle the data from the constructed system, an android application (Fig

3) was created. The data may be sent and received wirelessly via the Bluetooth module. You don't have to worry about tangled phone cords when practising yoga. For convenience, a primary screen of the application shows you the choice to start the preset asanas. After five seconds of each asana, a sequence of images and words are shown. In addition, the audio clip for text that appears on screen is played again at the same time. The user may customise the time interval in this programme. To open a side drawer box, swipe right from the left-hand panel. Video and written tutorials, as well as history settings and data uploading are all included in one box. To see a graph of your usage history, select the History option. There are a variety of yoga videos that may be viewed by clicking on the videos option. Choosing to upload data will bring you to a screen where you may manually enter the data you've received into the application's database. Finally, the option "Written directions" should be selected by the user if they choose to read the posture instruction. Sockets are automatically created and hardware is connected by the programme.

2.2 System intelligence

Sample findings were obtained by building a system prototype. Embedded kit's block diagram may be shown in Figure 4. For example, a cell phone or portable workstation phone or a TV, for example, can be used to help people get in shape by unlocking and unlocking the usefulness of their registering gadgets, which can then be used to help people get in shape (e.g. running) or engage in other legitimate exercises (e.g., playing a sport). Security and openness apps operating on a calculating gadget are secured and open by various aspects of this mechanism, which comprises systems, techniques, and mechanical assembly. A processing device can receive information about a client's movements directly from the client. In the case of a portable workstation or mobile phone, for example, a client can physically input client action information. The processor of a calculating device can be fed information about a client's mobility, which is self-governed and measured. By constantly delivering data to servers from a client device, an application may filter and support user contributions simultaneously. So the client may obtain information more easily from afar. A pedometer or other measuring device is one example of a checking gadget. There are accelerometers and gyroscopes that may be used in a portable registration device (such as a smartphone or an advanced cell) to monitor the movement of the client. Generally speaking, the screen client action operation 104 involves viewing physical movement or working out on the computer screen.. It is possible to measure the number of steps taken by a customer over a given period of time using pedometers. Consistent or intermittent observation is possible. A pedometer may be used to track a client's steps, and the results may be consistent. A comparison with at least one edge in contrast with the threshold(s) of choice is possible after information has been conveyed. It is determined whether or not sufficient movement has been refined to enable or open a device, feature or application by using the think about selection.

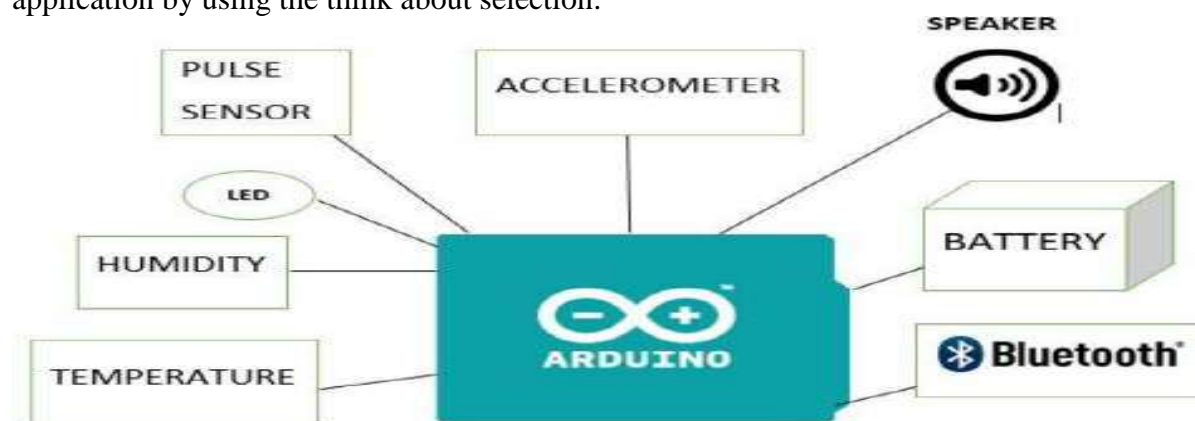


Figure.3 Block diagram of embedded kit

The contrast with threshold(s) option may, for example, think of a variety of well-executed

yoga movements. Another example is comparing the number of completed errands to a daily limit set by a different individual. Contrast with set objectives is the last test for whether or not an individual customer has achieved their goal. Furthermore, the client may read movement data from the observing gadget and transmit the movement data to the client devices. It is possible that the movement data is encoded to prevent the user from controlling the action data. The checking device can be attached to the client in a variety of ways, such as with a belt or waistband or a band around the client's wrist, arm, or thigh. A wristwatch, heart-rate monitor, GPS locator, mobile phone, or music player are all examples of devices in which the monitoring device can be included. In numerical sequence, these are the names of the 12 postures that make up the sun salutation: Dandasana, Bhujangasana, Parvatasana, Ashwa Sanchalasanasana, Hasta Padsana, Hastauttanasana, and Pranama asana. Sun salutation steps have been demonstrated to be highly beneficial in managing the heart rates, temperature, and humidity and the real time data is given in Table 1 and example Android app screenshots are supplied in Fig 4. Table 1 depicts the characteristics of the individuals for whom this information was gathered.

Table 1. Sample data collected of Age group 20-25

No .	Age	Weight	Height	Sex	Round	HB B	HB A	T B	T A	H B	H A
1	20	52	150	M	10	75	69	29	33	86	88
2	22	61	165	M	7	74	72	28	35	82	89
3	19	47	163	F	9	79	80	33	34	91	88
4	24	58	160	M	10	81	78	28	35	88	89
5	22	56	157	M	10	87	71	33	32	87	85
6	25	62	153	M	8	83	79	28	33	87	86
7	21	70	165	M	6	81	76	29	34	85	86
8	20	55	155	F	4	78	79	29	33	86	88
9	23	45	148	M	6	80	70	28	32	91	88
10	25	63	170	M	6	73	71	29	32	83	86
11	24	62	154	M	9	74	74	31	30	82	85
12	20	53	155	M	6	86	74	30	31	91	87
13	22	54	165	F	6	82	75	30	29	89	86
14	23	75	170	M	9	80	72	31	28	84	86
15	25	70	160	M	11	82	70	28	35	84	90
16	24	66	165	M	11	81	78	28	34	91	88
17	21	55	160	M	10	76	69	34	33	82	85



Figure.4 Block diagram of embedded kit

3. SYSTEM ANALYSIS & RESULTS

Our approach is tested by a diverse group of yoga practitioners of all ages. We used Eq. to calculate each person's BMI (Body Mass Index) to aid in our investigation (1).

$$\text{BMI} = \text{Weight (in kg)} / (\text{Height in meter})^2 \quad (1)$$

Listed in Table 3 are the BMI ranges and their corresponding health issues. We divided each group into healthy and unhealthy individuals based on the obtained BMI value. BMI values between 18.5 and 24.9 are considered healthy. People who fall inside or outside of this range are regarded to be unhealthy. Data from various age groups and clusters was evaluated.

Table 2: Sample data collected of Age group 26-40

No .	Age	Weight	Height	Sex	Round	HB	HB	T	T	H	H
1	27	70	160	M	5	81	76	31	34	87	85
2	29	54	162	F	11	85	80	33	30	85	88
3	30	69	172	M	7	87	71	33	34	87	85
4	35	62	155	M	10	85	70	33	34	87	85
5	27	64	169	F	7	81	80	32	35	87	85
6	37	68	172	M	11	78	77	34	28	85	88
7	33	50	150	F	4	77	75	33	34	84	87
8	34	58	162	F	4	81	72	31	29	83	91
9	37	70	170	M	5	80	79	29	30	89	88
10	39	53	175	M	10	83	72	29	35	85	86
11	40	78	165	M	12	74	72	29	29	88	91
12	35	65	163	F	8	75	74	33	34	83	86
13	33	72	180	M	10	85	75	30	33	88	88
14	37	64	160	F	6	78	80	29	33	89	91
15	38	71	163	M	12	85	77	31	29	86	88
16	40	74	180	M	10	75	74	34	35	87	89
17	32	61	160	M	7	75	78	34	35	86	89
18	33	75	183	M	9	76	74	33	35	85	87
19	35	67	172	M	8	85	73	30	29	87	90
20	38	60	165	F	6	84	77	30	28	83	89
21	29	72	165	M	5	80	70	28	35	86	87
22	30	70	160	M	11	83	77	33	32	85	89
23	38	55	155	F	8	76	71	33	28	89	88

Table 3. BMI Status

BMI range	Health condition
BMI<18.5	Under weight
18.6 – 24.9	Healthy
25 – 29.9	Over weight
BMI > 29.9	Obesity

Our blog contains a wealth of information, including data tables and graphs. Tables 1 and 2 provide the data for Figure 7. The results of the analysis demonstrate that the heart rate, body temperature, and humidity levels have improved as a result of implementing our system's recommendations. Women who do yoga often have to improvise with their heartbeat counts, and people in the 25-40 age bracket have to do a great deal of work to keep their bodies from overheating. People over the age of 50 have their blood pressure monitored and managed. The graphs below show the comparison of numerous metrics for various age groups. According to the results of our graph analysis, our proposed approach is more effective in supporting yoga practitioners. Our solution is compared to other current systems in Table 4 based on a number

of different characteristics.

Table 4. Comparison of various parameters

Parameters	Hardware Kit Developed	Existing Hardware Available
Features	Reliable, Durable, Robust, Tangible, Accurate.	Stable but requires more power and amateurish.
Cost	Economical and Ergonomic in terms of usage.	Costly as expensive sensor are plugged to power the hardware
Weight	Weight of the hardware developed is very less as we are using Arduino nano.	Weight of the existing hardware is more as bigger
Connectivity	There were no connectivity issues encountered as the hardware used is recently introduced in the market.	There were connectivity issues encountered during testing and development as mentioned in various research papers before.
Power Consumption	Power consumption is low as it is newly developed and more enduring. It can also be powered by multiple power sources	Power consumption was more due to complex circuit as mentioned in various paper.
Size	Compact and portable.	Large and bulky.
Data Transfer	Data transfer is faster and smoother as the latest and fastest processor is used.	Data transfer is rather slow due to low order processor.
Speed	Speed is extensively increased to support multiple devices at the same time.	Speed was quite slow when used to support multiple devices.
Usability	Can be easily used to support multiple devices from different domains without compromising speed and reliability of the data transferred.	Data was compromised when used with multiple devices as support for multiple devices was not suited. Mainly build as single purpose.
Example:	Arduino powered kit, ATtiny powered kit.	Smart watch, smart band, raspberry pi powered kit etc.

4. CONCLUSIONS

An individual's mental, physical, and spiritual well-being can be greatly improved via yoga practise. Using an IoT-based application and yoga, we have developed a system that enables yoga practitioners keep an eye on their physical health and adjust their practise accordingly. The smart software analyses the sensor data and makes appropriate conclusions depending on the yoga practitioner's BMI (Body Mass Index). Yoga practitioners and yoga experts alike will benefit greatly from our method, as demonstrated by our findings. Future studies may concentrate on the remote monitoring of this felt information by a doctor or physical trainer and the provision of their comments or instructions to the yoga practitioner in real time. This is an excellent tool for gauging your physical stamina. It aids in the development of a person's

physical strength. There are no skin allergies or side effects as a result of its design, making it both cost-effective and safe. Discussion: As of the moment, there isn't a standard yoga helper kit on the market. As a result, the tool we're proposing can help yoga practitioners work more efficiently. Instead of attempting to enhance a yoga practitioner's health, we hope to provide them with a set of asanas that are appropriate for their current state of health. We conducted a clinical trial at the Amrutha Yoga centre and found that it is safe for both children and the elderly to take. Conclusion Thereby a useful aid in the form of our recommended Yoga Kit

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