IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 2, May 2022
Impact Factor: 6.252

The IoT Based Exercise Cycle

Kamlesh Kahar[1], Ritanshu Khatke[2], Pranav Bhople[2], Jayesh Tayde[2], Hariom Modokar[2]
Assistant Professor, Department of Electronics and Telecommunication Engineering[1]
B.E. Students, Department of Electronics and Telecommunication Engineering[2]
Shri Sant Gajanan Maharaj College of Engineering, Shegaon, Maharashtra, India
ritanshukhatke619@gmail.com

Abstract: *The "IOT Based Exercise Cycle" project combines a variety of technologies, including computer hardware and software, to provide bikers with a new modern home exercise solution that immerses them in their surroundings. As a result, a cyclist can monitor some of the most significant training data online via a web page, including speed, distance covered by the rider, heart rate, and oxygen level during exercise. Additionally, depending on the amount of peddling, a cyclist can view flashing pictures on a web page. This cycle is linked to the cyclist's heart rate and temperature, allowing him or her to keep track of their BPM (Heart Beats Per Minute) and body temperature. The system consists of both hardware and software components. Hardware is in charge of gathering, measuring, processing, and transmitting data from sensors. A server contains a Front-End Web page that displays and controls data for cyclists on the software side. Finally, there is a web page that displays all of the parameters that the rider can use to track his or her route.*

Keywords: IoT, Virtual Reality, Exercise

I. INTRODUCTION

As time passes, technology advances, and people transition from fieldwork to deskwork, a new fitness hazard emerges the sedentary lifestyle. To address this tendency, exercise appears to be a viable option, particularly in the form of an IoT-based smart cycle that can disclose the hobby and support us in working throughout our education. As far as I can see, the IoT-based entire workout cycle is today's answer. However, most cyclists, whether novices or specialists, no longer have this option, making it more difficult to improve and achieve specific goals. This seminar report suggests a technical solution to solve this problem by utilizing sensors and microcontrollers to collect, transmit, store, and display data on the internet. As a result, any bike owner can view relevant cycling data generated by the sensor in real-time. Nowadays, recording series from sensors are widely used. All of the records, however, are focused on the creation of sharing devices, sensor network implementation, security, intelligent town development, or smart manipulation implementation. The positioning strategy of the sensor device, structural fitness tracking, and smart car have all yielded some fantastic outcomes. There have been no research published on IoT (internet of things) and intelligent motorcycling IOT-based training cycles [1]. The sheet is the most used training strategy in cycling currently. This document, which may be customized by an instructor for one or more riders, contains a training schedule in days, weeks, and even seasons. However, this traditional and rigid strategy has a higher risk of failing to achieve its goal. The design of an IoT-based totally workout cycle retrieves and transmits the rate, and distance, and also flashes photographs continuously in accordance with pedaling speed output both to a server-hosted database and to a web web page, so we can compare and notify possible mistakes made by the bicycle owner at some point during the journey [2]. Furthermore, the biker can save statistics to a server and can look back on previous rides by maintaining a record of them. With the use of a webserver, the rider can also control the system by starting, halting, or ending the experience[3]. The technology in the described IOT-based workout cycle-assignment serves the following purposes:

- Data collection from the sensor.
- Using accumulated statistics, calculate the bicycle owner's velocity, pedaling charge (rpm), and distance traveled.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 2, May 2022
Impact Factor: 6.252

- Measure the Heartrate, Oxygen level, and Temperature of cyclists.
- Compiling and transmitting data to a web page for online tracking.

Providing access to the monitoring system via a web page.

II. Literature Survey

With the global economic increase, health membership is developing unexpectedly within the international. in themeantime, the fitness industry is booming particularly for the city's white-collar populace. inside the situation of Covid-19, everybody must have better immunization strength to build their fitness. on this challenge, we layout an internet of factors(IoT) based exercising cycle to offer the feel of actual globalcycling with the use of digital reality which encourages humansto do cycling or exercise. When biking the workout cycle,the facts are amassed via a sensor. eventually, this record isprocessed to discover specific parameters like the pace of the cycle, distance covered by using the bike owner, and pedaling charge [4].these parameters can be despatched to the website by the use of protocols wherein these parameters are displayed [5]. The pics which might be saved in the database are tagged with every distance and displayed continuously on a webpage. And, that offers the texture of virtual truth to the bicycle owner. on this mission[6], we will describe the info of the device and similarly reach out to the implementation technologies. The design of this form of the gadget is a trend for destiny virtual fact programs[7].

III. Objectives

To offer biking fans a modern opportunity solution for training by way of developing virtual reality and permitting them to get pleasure from the outer environment by way of sitting at home. Also tracking their performance during the training by measuring the parameters like speed, total distance traveled during the workout and pedaling rate i.e rpm of the wheel. Using a heart rate sensor module to monitor the heartbeat, and also calories burned by the cyclist during the workout. Also using a temperature sensor measure the temperature of the cyclist's body. To flash the images of the locations from where the cyclist will be traveling during his/her journey.

IV. Methodology

The cyclist's riding monitoring feature should have more mobility and be simple to access and engage with. A web page has been constructed to suit these requirements. This can be done by anyone, even cyclists, who have pages and functionalities specifically built for them[8]. A cyclist can access a list of parameters such as speed, distance, position, and heartbeat on a web page, as well as observe blinking visuals based on speed. Finally, the user has access to a page where he can view his personal information. A biker can watch his boarding statistics and see his performance in real-time. The project is divided into three hardware modules: 1. The first is in charge of receiving data from the IR sensor, measuring rpm, and inserting a formula to compute speed and distance using data from the cycle wheel delivered to the second module through a wireless channel and displayed on the Website. Bicyclists' BPM and temperature are also measured by the various sensors presented on the website. 2. The second module is in charge of reading and processing data from sensors, as well as the first module and the laptop that receives the data, converts it to a standard message format, and delivers it to a web page through the Internet. 3. The third module, last but not least, is a little open computer that handles the webserver and HTTP server's end. The first two modules are powered by dual sources, whereas the hybrid module requires internet connectivity via a mobile hotspot or Internet Stick. The entire system is constructed on three levels: hardware, application, and network.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 2, May 2022
Impact Factor: 6.252

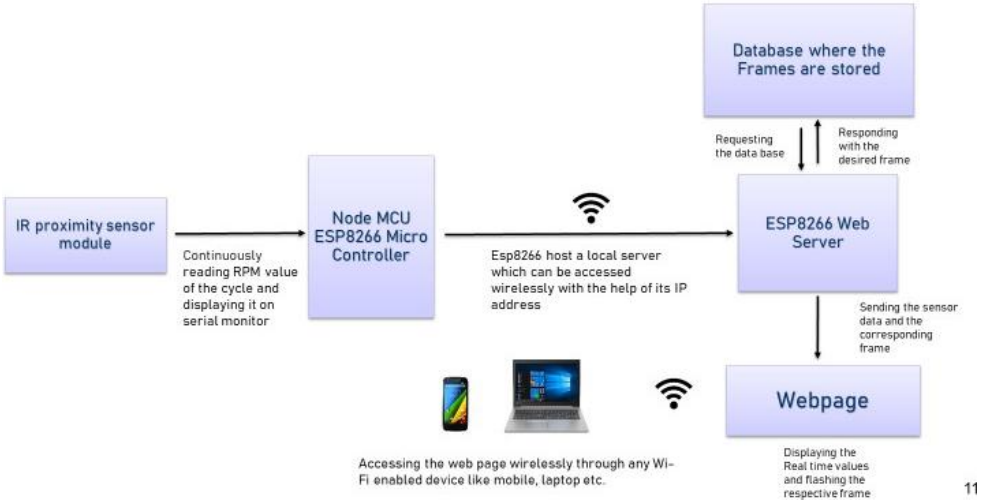

Figure 1: Block Diagram

V. ALGORITHM

The tachometer is been used to determine the speed of the cycle and also calculate the distance traveled by the cyclist.IR proximity sensor is interfaced with Node MCU ESP8266 microcontroller. In Tachometer, a black screen will be attached to the rotating wheel which will be detected by the IR beam of the IR proximity sensor. The reflection and absorption of the IR beam from the white and black surfaces respectively will determine the speed of the cycle. Further, this speed can be analyzed to determine the distance traveled by the cyclist. The data collected by the sensor is then displayed on the serial monitor of the Arduino IDE. The time difference between two successive pulses is takento calculate angular velocity. (angular velocity=width of black screen/time difference). Then time is found by using a simple formula, Time = 2*pi*radius/angular velocity m/s.Later rpm is calculated by dividing 60,000 by time. (time converted from millisecond to minute and then rpmconversion)To find speed we use the formula, Speed = 2*pi*radius*RPM/60 m/sec Distance is found by, Distance = speed*time/1000 meter heart rate sensor Max30100 is been used to determine the BPM and Oxygen level of cyclist. Temperature sensor DS18B20 is been used to the temperature of the body of the cyclist.

VI. HARDWARE AND SOFTWARE REQUIREMENTS

6.1 ESP8266(Wi-Fi Module)

A serial connection connects the Wi-Fi module (ESP8266) to a tiny controller. It can also access the Internet if it is connected to the Internet service provider's login area [9]. This module retrieves data from a web page and displays it. that data is transferred to the subdirectory It also loads the data sent to the selected URL from the subdirectory.

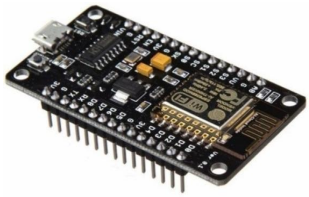

Figure 2: ESP8266(Wi-Fi Module)

6.2. IR Sensor

In a nutshell, the IR sensor module comprises an IR transmitter and receiver, a variable resistor (trimmer pot), and an output LED. Working Mechanism: In this circuit, the IR sensor module is interfaced with Node MCU to measure

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 2, May 2022
Impact Factor: 6.252

the speed of cycle, and distance covered using RPM. The calculation is done on this basis. After 1-second Node MCU calculates RPM using the given formula. rpm = (60000)/(total time)*10 (time in ms to minutes and then to rpm conversion step).

Figure 3: IR Sensor

6.3. Heart rate and Temperature Sensor

The MAX30100 — a contemporary, integrated pulse oximeter and cardiac charge sensor IC from Analog devices – is used in the module. It detects pulse oximetry (SpO2) and heart rate (HR) signals using LEDs, a photodetector, customized optics, and coffee-noise analog signal processing. The MAX30100 has two LEDs on the proper – a red and an IR LED. A completely sensitive photodetector is on the left. The idea is that you illuminate a single LED at a time, detecting the amount of light shining back on the detector, and then measuring blood oxygen level and coronary heart rate based on the signature. Maxim integrated's DS18B20 is a 1-cord programmable Temperature sensor. It's widely used to detect the temperature in challenging situations such as chemical solutions, mines, and soil. The sensor's construction is tough, and it may also be ordered with a water-resistant variant to make installation easier. It was capable of measuring temperatures ranging from -55°C to +125°C with a 5°C precision[10]. Every sensor has a unique code It has a one-of-a-kind deal and only uses one pin of the MCU to transport data, making it an excellent choice temperature at more than one factor without compromising much of your digital pins on the microcontroller.

Figure 4: MAX30100

Figure 5: DS18B20

6.4 Web Page

From each net-enabled a tool that may get entry to the professional website's tracking net web page can carry out Web Server the duties of tracking the sub-station device's present-day popularity and control the gadget.

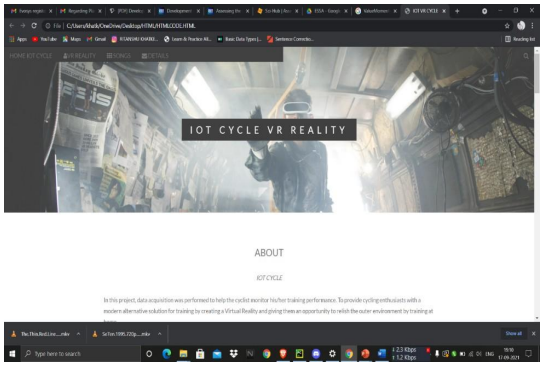

Figure 6: Web Page

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 2, May 2022
Impact Factor: 6.252

6.5 Web Server

A web server is an online storage and delivery system for files. Clients can request such a file or other piece of data, and the server will respond with the appropriate data/files. Different protocols, such as HTTP, MQTT, and others, are used to make requests HTTP, or Hyper Text Transfer Protocol, is useful for downloading online pages and uploading photos, although it is slow. The HTTP protocol is chosen for IoT[11]. It's a fantastic lightweight publishing and subscription tool that allows anyone to send and receive messages. For this project, we used an HTTP server.

Figure 7: Web Server

VII. APPLICATIONS

The most well-known application of IoT based exercise cycle is in gyms and the fitness business. In our project, we have created a virtual reality for the cycle but with more advancements, we can use this VR for Car Simulation, Airplane simulation, etc. VR also has wide applications in the field of Gaming. VR can simulate actual workspaces for a place of business occupational safety and health functions, educational purposes, and education functions. VR can be used to provide beginners with a virtual environment in which they are able to increase their capabilities without the actual-world outcomes of failing. VR has been used and studied in number one schooling, anatomy teaching, army, astronaut training, flight simulators, miner education, architectural layout, driving force education, and bridge inspection.

VIII. CONCLUSION

The IoT-based exercise Cycle was created in response to a difficulty that both new and experienced bikers faced. The limitations in modern training methodologies are the source of this issue. A wide range of approaches can be employed on this project, starting with electronics and hardware and progressing to the internet and mobile applications. setting all those collectively, a prototype of a complete solution might be constructed to assist riders and trainers while also monitoring their performance. during the training with the aid of measuring the parameters like speed, overall distance traveled during the workout, pedaling rate i.e. rpm of the wheel, To flash the pictures of the places from in which the bike owner could be touring all through his/her journey. Also monitoring heartbeat and temperature of cyclist.

IX. FUTURE WORK

Read the latitude and longitude from the GPS module or GPS string to track the cyclist's position in real-time. Installing an internet service that allows the rider to build a new experience, start or stop the current one, and get information on the state of the bike's body module. To make an app and proportion it on a worldwide server. Implant virtual reality on an advanced basis. Similarly upgrades to show facial expressions, sweat, and panicking conditions may be carried out via studying the facial trends, body developments the use of esp32-cam, and the system getting to know.

REFERENCES

[1]. G. Catargiu, E. H. Dulf, and L. C. Miclea, "Connected bike-smart IoT-based cycling training solution," Sensors (Switzerland), vol. 20, no. 5, 2020, doi: 10.3390/s20051473.

[2]. Y. Zguira, H. Rivano, and A. Meddeb, "Internet of bikes: A DTN protocol with data aggregation for urban data collection," Sensors (Switzerland), vol. 18, no. 9, pp. 1–39, 2018, doi: 10.3390/s18092819.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 2, May 2022
Impact Factor: 6.252

[3]. T. C. Kang, C. H. Wen, S. W. Guo, W. Y. Chang, and C. L. Chang, "The implementation of an IoT-based exercise improvement system," J. Supercomput., vol. 76, no. 8, pp. 6361–6375, 2020, doi: 10.1007/s11227-019-02889-4.

[4]. T. Kikuchi, K. Kobayashi, and M. Sugiyama, "Development of virtual reality bike with cylindrical MR fluid brake," 2012 IEEE Int. Conf. Robot. Biomimetics, ROBIO 2012 - Conf. Dig., pp. 1753–1758, 2012, doi: 10.1109/ROBIO.2012.6491221.

[5]. F. Corno, T. Montanaro, C. Migliore, and P. Castrogiovanni, "SmartBike: An IoT crowd sensing platform for monitoring city air pollution," Int. J. Electr. Comput. Eng., vol. 7, no. 6, pp. 3602–3612, 2017, doi: 10.11591/ijece.v7i6.pp3602-3612.

[6]. S. Mandal, "Brief Introduction of Virtual Reality & its Challenges," Int. J. Sci. Eng. Res., vol. 4, no. 4, pp. 304–309, 2013, [Online]. Available: http://scholar.google.com/scholar?hl=en&btnG=Search&q=intitle:Brief+Introduction+of+Virtual+Reality+&+its+Challenges#0.

[7]. S. R. Jacob, B. Varghese, and R. Varghese, "Cycling Management Using IoT – Keeping Track of Fitness Regime And Fall Detection," pp. 1495–1499, 2017.

[8]. L.-W. Chen, C.-C. Tsao, C.-C. Li, Y.-C. Lo, W.-H. Huang, and H. Chen, "Demo: All-You-Can-Bike -- A Street View and Virtual Reality Based Cyber-Physical System for Bikers Through IoT Technologies," 25th Annu. Int. Conf. Mob. Comput. Netw., pp. 60:1--60:3, 2019, [Online]. Available: http://doi.acm.org/10.1145/3300061.3343367.

[9]. J. Mesquita, D. Guimaraes, C. Pereira, F. Santos, and L. Almeida, "Assessing the ESP8266 WiFi module for the Internet of Things," IEEE Int. Conf. Emerg. Technol. Fact. Autom. ETFA, vol. 2018-Septe, pp. 784–791, 2018, doi: 10.1109/ETFA.2018.8502562.

[10]. Y. Bao, Z. Chen, S. Wei, Y. Xu, Z. Tang, and H. Li, "The State of the Art of Data Science and Engineering in Structural Health Monitoring," Engineering, vol. 5, no. 2, pp. 234–242, 2019, doi: 10.1016/j.eng.2018.11.027.

[11]. S. Shen, Z. Q. Wei, L. J. Sun, Y. Q. Su, R. C. Wang, and H. M. Jiang, "The shared bicycle and its network—internet of shared bicycle (IoSB): A review and survey," Sensors (Switzerland), vol. 18, no. 8, pp. 1–24, 2018, doi: 10.3390/s18082581.