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WEARABLE DEVICE BASED ON E-TEXTILE FOR SWIMMERS

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ABSTRACT

Wearable detectors play an important part in healthcare operations. Further, the Body Sensor Network is a monitoring system extended to a health care environment grounded on IoMT technologies, composed of connected or implantable detectors. Medical remedy and general fitness are important rudiments of public health services. Thus, this paper suggested that Wearable Electromagnetic dimension systems help the clinicians in physical remedy track and assess important recovery criteria and performance pointers. The swimming medium is fluently captured by the movement of truck and branch action. Stir prisoner grounded on wearable inertial detectors is a promising fashion for insensibility training. To apply stir prisoner ways duly, a swimming stir evaluation system grounded on inertial stir prisoner technology is proposed. Our proposed system uses a multi sensitive data emulsion algorithm for insensibility station estimation, and the swimming posture is reconstructed in combination with a mortal biomechanical model. The system can capture insensibility lumbar chine in four competitive swimming styles. A kinematic analysis of lumbar chine movement indicates that the patterns of insensibility lumbar chine movement can be used to estimate training performance and give quantitative data for insensibility. Hence this approach concentrates on Cloud Supported Intermittent Neural Network (CA-RNN) with multi-target optimization fashion is substantially used to control the swimming movement and to balance the synapse weight between motor neuron.RNN is used for balancing the swimming stir and to control the weight transmission between the detector and motor neurons.

KEYWORDS: Human biomechanical model, Motion capture, Inertial sensor, Sport training, IoMT technologies.

I.INTRODUCTION

Motion capture systems square measure effective tools for human sport observance. Optical following, mechanical following, and Inertial-sensor-based following systems square measure 3 common varieties of human motion capture systems. Mechanical phenomenon sensors have noticeable benefits, like their ultra-small size, low cost, and hardiness to completely different environments. With the speedy development of the Microelectromechanical system (MEMS) technology, wearable sensors became easier to use in several investigations and applications.Swimming motion analysis by victimization wearable mechanical phenomenon sensors may be a well-liked analysis topic. However, there square measure several difficulties and unresolved problems in swimming motion analysis compared with alternative human motions. First, swimming motion phase square measure additional complicated, and body postures in several swimming designs vary wide.Different types of devices square measure utilized in this projected system like unhearable sensor, MPU6050, HB sensor, MAX30100.unhearable device senses object detector. MPU6050 sense location of swimmer's position and additionally senses the guts beat rate and heart rate, that in very important for any athletes.Due to quality of the human and animals, sensible wearable devices have become necessary since they'll receive collect and send the info on the serial convertor. The advancements in low power mobile network, decrease within the size of electronic devices and sensors, similarly because the benefits that the sensible wearable will offer have enabled the event of wearable technology in a very quick pace.

II.LITERATURE SURVEY

1.Lee et al.

Compared the ROM of the spine during stair climbing between alow-back pain group and a healthy control group. Actually, many researchershave used other marker less tracking technologies to monitor human postureanddeveloped potential applicationssuchas gaitanalysis.

2.G.-Z. Yang and M. Yacoub,

Inertial sensors have notice able advantages, such as theirultra small size, low cost, androbustness todifferentenvironments.With the rapid development of the microelectromechanical system (MEMS)technology,wearable sensors have become easier to apply in many investigations and applications.

3.S.Daukantas,V.Marozas,andA.Lukosevicius

However,because a swimmer's body is unceasingly getting the water, there's no relative stationary state in swimming. Therefore, inertial guidance algorithms cannotbe applied as accurately as those for land movement; additionally, it's tough to calculate a swimmer's rate and mechanical phenomenon within the water.

4.F. A. de Magalhaes, G. Vannozzi, G. Gatta, and S. Fantozzi,

Swimming motion analysis by using wearable inertial sensors is a popular research topic. However, there are many difficulties and unresolved issues in swimming motion analysis compared with other human motions. First, swimming motion phases are more complex, and body postures in different swimming styles vary widely.

5.DeMagalhaes.

Verified the reliability of wearable motion capture based on a stereophotogrammetric system. Compared with above-mentioned studies, we adopt a human biomechanical model to represent the posture of body parts by using wearable sensors and simplify the orientation estimation algorithm calibration procedure, which can make the estimation algorithm flexible enough to be adjusted to vary with the laboratory or swimming pool environment. In addition, different from Magalhaes' studies on validating the wearable motion capture method, the impact of the measurement nodes positions is considered in this study because it is inconvenient and unrealistic to keep a measurement node in the same position on a swimmer's body during different swimming training.

6.Pasika and Gandla,

Proposed a monitoring system which consists of a number of sensors used to measure several quality parameters like turbidity, pH value, water level in the tank, dampness of the adjoining environment and temperature of the water. The sensors are interfaced with the Microcontroller Unit (MCU) and additional processing is executed by the Personal Computer (PC). The acquired data will be directed to the cloud by means of Internet of Things(IoT) based ThingSpeak application for monitoring the quality of the water under test. As a future directive, work should be extended for analyzing some other parameters such as nitrates, electrical conductivity, dissolved oxygen in the water and free residual chlorine.

III.EXISTING SYSTEM

Visualization involves using graphical representation to prop in the understanding complex relations and generalities and has been applied to the medical fields to prop in the understanding of complex electrophysiology where traditional styles which are delicate to diagnose particular abnormality, visual system have been applied to the sporting sphere as an aid to understanding and presenting complex dynamics. Visualization ways are a important system for displaying these data in a meaningful way to help in understanding the complex non-intercourses of the data and biomechanics. In particular, repetitious conduct similar as seen in numerous sports, including swimming can profit from similar analysis where overlay and visual comparison of multiple strokes can be advantages. Numerous other disciplines, similar as drug fantasize repetitious data and are translational openings for the disquisition of biomechanical data, similar as swimming.

IV.PROPOSED SYSTEM

The proposed system swimming monitoring based IoMT technology used to monitoring and analyze a swimming person of health care condition. The data can be view by personal computer. In this swimming person monitoring system, a brief description ofthemotion capture system, which contains the system hardware and software, is provided. Furthermore, the software component can be subdivided into coordinate definition, orientation estimation algorithm, and human motionreconstruction.To describe the orientation estimation algorithm and lumbar spine posture representation, three coordinate frames are defined as follows.

4.1.1 Earth coordinate frame (e-frame):

It is a local geographic frame, in which the axes are aligned with the North, East, and the local vertical (down), Here, the X-axis points to the North of the Earth's magnetic field.

4.1.2 Body segment coordinate frame (b-frame):

This frame exists in each body segment; the origin of the body segment frame joints two adjacent segments.

4.1.3 Sensor coordinate frame (s-frame):

This frame is parallel to the sensor's axis.

In this proposed system we have used different type of sensors like ultrasonic sensor, MPU6050, HB sensor, and Spo2 sensor.In ultrasonic sensor sense objectsdetector.MPU6050 senses 6-axis location, 3-axis accelerometer and 3-axis gyroscopes.Heart beat sensor monitoring continuously heart rate of swimming person.Spo2 sensor monitoring pulse value. All the parameters, data's and informations are stored in thinspeak cloud through the GPRS technology. The swimming person condition can be monitored and analyzed by personal computer.

Block diagram

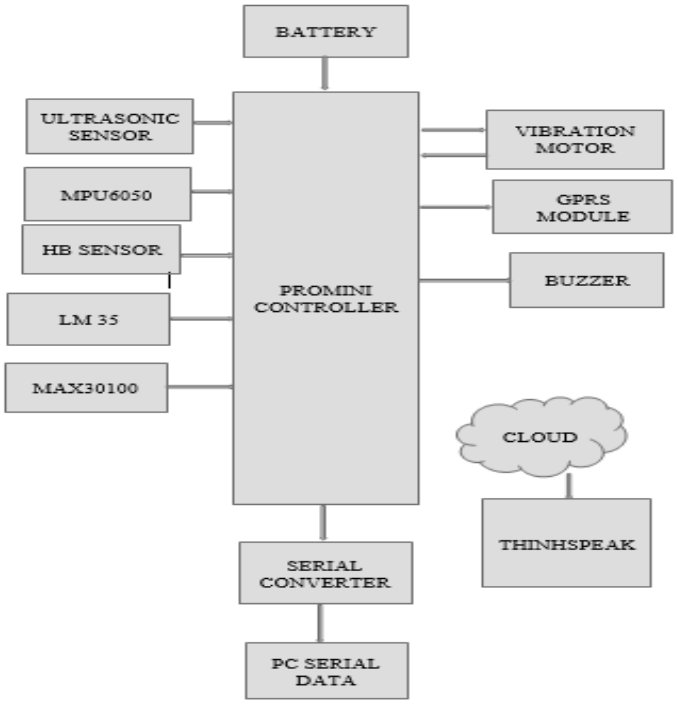


Figure:1 Block diagram

V.HARDWARE REQUIREMENTS

5.1 Ultrasonic sensor

The ultrasonic detector (or transducer) works on the same principle as a radar system. An ultrasonic detector can convert electrical energy into aural swells and vice versa. The aural surge signal is an ultrasonic surge traveling at a frequence above 18 kHz. The notorious HC SR04 ultrasonic detector generates ultrasonic swells at 40 kHzfrequency.

Figure:2 Ultrasonic sensor

5.2 MPU6050 SENSOR

The MPU-6050 is the world's first and only 6- axis stir shadowing bias designed for the low power, low cost, and high-performance conditions of smartphones, tablets and wearable detectors.

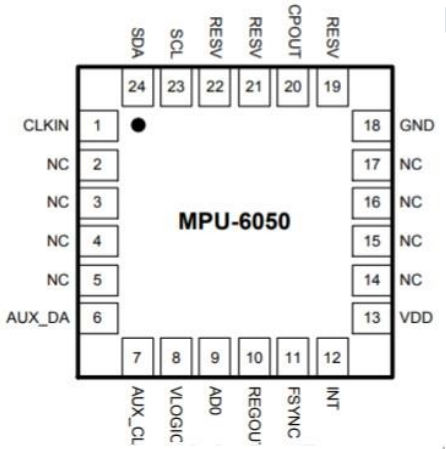


Figure:3 Pin diagram of MPU6050

POWER SUPPLY

A rechargeable battery, storage battery, or secondary cell, (or archaically accumulator) is a type of electrical battery which can be charged, discharged into a load, and recharged many times, as opposed to a disposable or primary battery, which is supplied fully charged and discarded afteruse.

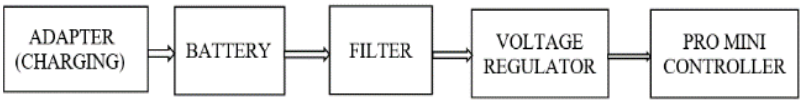


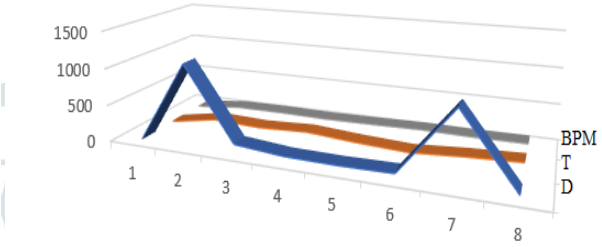
Figure:4 Power supply

V.RESULT

This paper has proposed IoMT based swimming person monitoring system was most beneficial and used in real time applications. A motion capture method for capturing movements of the lumbar spine during swimming. An orientation estimation algorithm and a human biomechanical model are used to obtain the posture of the human lumbar spine.

The method of capturing the posture of a swimmer's lumbar spine in four competitive swimming styles was demonstrated, along with the types of kinematic analysis that can be achieved using this sensor-based motion capture method.The motivation for this study is to develop a method using sensor-based motion capture techniques to supplement and possibly replace visual and video-based methods of competitive swimming stoke styles.

```
02:32:16.261 -> Distance: 28
02:32:16.261 -> Temperature: 132.94
02:32:17.246 -> BPM: 55
02:32:17.246 -> Acceleration X: 1.33, Y: -0.32, Z: 0.96 m/s^2
02:32:17.293 -> Rotation X: 0.03, Y: -0.03, Z: 0.01 rad/s
02:32:17.340 ->
02:32:22.356 -> Distance: 1109
02:32:22.356 -> Temperature: 115.35
02:32:22.402 -> BPM: 66
02:32:22.402 -> Acceleration X: 10.32, Y: -0.31, Z: 0.95 m/s^2
02:32:22.449 -> Rotation X: 0.03, Y: -0.03, Z: 0.01 rad/s
02:32:22.496 ->
```



	1	2	3	4	5	6	7	8
D	0	1109	120	60	50	60	950	30
T	0	115	90	120	70	35	82	115
BPM	0	66	69	59	68	82	72	78

Figure 5: Output images

VI.CONCLUSION

The results of the kinematic analysis can support and verify the qualitative analysis of a swimming expert, which shows that a wearable motion capture system has promising potential in swimming traininganalysis. In addition, optical and wearable motion capture systems have been widely accepted by coaches in sport training. The system in this study can accelerate the research and development of economical practical swimming motion capture systems.

In the future, whole-body motion capture will be used to capture the posture of swimmers' other body parts. Furthermore, novice swimmers should also be considered as experimental subjects. In addition, estimation of instantaneous velocity using inertial sensors extend our method to swimming velocity estimation. Another improvement of our motion capture system is its integration with machine learning algorithms.

VII.REFERENCES

1.Lee et al, "Design and Implementation of an integrated performance monitoring tool for swimming to extract stroke information at real time",2013.

2.G.-Z. Yang and M. Yacoub, Body Sensor Networks, G.-Z. Yang, Ed. London, U.K.: Springer, 2014.

3.Demagalhaes," Using wearable sensors to capture posture of the human lumbar spine in competitive swimming",2019.

4.H. Ghasemzadeh, P. Panuccio, S. Trovato, G. Fortino, and R. Jafari, "Power-aware activity monitoring using distributed wearable sensors," IEEE Trans. Human-Mach. Syst., vol. 44, no. 4, pp. 537–544, Aug. 2014.

5.C. Chen, R. Jafari, and N. Kehtarnavaz, "Improving human action recognition using fusion of depth camera and inertial sensors," IEEE Trans. Human-Mach. Syst., vol. 45, no. 1,
pp. 51–61, Feb. 2015.

6. Z. Wang, M. Guo, and C. Zhao, "Badminton stroke recognition based onbody sensor networks," IEEE Trans. Human-Mach. Syst., vol. 46, no. 5, pp. 769–775, Oct. 2016.

7. S. Qiu, Z. Wang, H. Zhao, and H. Hu, "Using distributed wearable sensors to measure and evaluate human lower limb motions," IEEE Trans. Instrum. Meas., vol. 65, no. 4, pp. 939–950, Apr. 2016.

8. J. M. Lambrecht and R. F. Kirsch, "Miniature low-power inertial sensors:Promising technology for implantable motion capture systems," IEEE Trans. Neural Syst. Rehabil. Eng., vol. 22, no. 6, pp. 1138–1147, Nov.2014.

9. F. A. de Magalhaes, G. Vannozzi, G. Gatta, and S. Fantozzi, "Wearable inertial sensors in swimming motion analysis: A systematic review," J.Sports Sci., vol. 33, no. 7, pp. 732–745, 2015.

10. R. Mooney, G. Corley, A. Godfrey, L. Quinlan, and G. OLaighin, "Inertial ´sensor technology for elite swimming performance analysis: A systematic review," Sensors (Basel), vol. 16, no. 1, Dec. 2015, Art. no. 18.

11. N. Chakravorti, T. Le Sage, S. E. Slawson, P. P. Conway, and A. A. West, "Design and implementation of an integrated performance monitoring tool for swimming to extract stroke information at real time," IEEE Trans.Human-Mach. Syst., vol. 43, no. 2, pp. 199–213, Mar. 2013

12.Pasika andGandla, "Water Quality monitoring system implemented with IOT",2021