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Patient monitoring smart robot for biomedical engineering applications

[1]Bhoomika S. (USN : 1DS21EC047), [1]Peram Varshitha (USN :1DS21EC139),
[1]Bhoomika M.S. (USN :1DS21EC046), [1]Michelle David (USN :1DS21EC118),
[2]Adithya T.G., [3]Dr. Pavithra G., [4]Dr. Sindhu Sree M.,
[5]Dr. T.C.Manjunath* Ph.D. (IIT Bombay), Sr. Member IEEE, Fellow IE, Chartered Engineer
[1]First year BE UG (ECE) Second Sem Students, Dept. of Electronics & Communication Engg., Dayananda Sagar College of Engineering, Bangalore, Karnataka
[2]UG B.Tech. (CSE) Student of Third Semester, Dept. of Computer Science & Engg., PES University, Bangalore
[3]Associate Professor & Mini-Project Guide, ECE Dept., DSCE, Bangalore, Karnataka
[4]Assistant Professor, ECE Dept., DSCE, Bangalore, Karnataka
[5]Professor & HOD, ECE Dept., DSCE, Bangalore, Karnataka

Abstract
In this paper, the patient monitoring smart robot for biomedical engineering applications is presented in brief. This paper gives a brief review of the detection of pulse rate, body temperature, room temperature etc considering the modern AI and ML tools. In recent years ,smart robots have proven to be quite beneficial in the investigation of patient monitoring system. A machine resembling a human being and able to replicate certain human movements and functions automatically is known as robot. A robot which uses AI system and can learn from its environment and its experience and build on its capabilities based on that knowledge is called as smart robot. Machine learning, deep learning algorithms, CNN algorithms have all been used foe patient monitoring in various study publications. When these algorithms are applied to pictures, they can predict all monitoring applications quickly and accurately, as well as classify them into different categories. The work presented here is the mini-project work of the second semester engineering students of electronics & communication engineering department of Dayananda Sagar College of Engg., Bangalore, Karnataka.
Keywords – Patient, Smart, AI, ML, CNN, ANN

1. INTRODUCTION TO THE WORK

In this section ,we present the introductory concepts to the work that is taken into consideration in this review/survey paper. “Patient monitoring smart robot for biomedical engineering application” comes under service robot category. It consists of an obstacle avoidance line follower robot with Arduino with inbuilt patient monitoring system works with simple Arduino board along with IR sensors and optical avoided with an ultrasonic sensor. Sensors are most important component in this robot [12][1]. These include:

- Temperature sensors
- IR sensors
- Humidity sensors
- Heart rate sensors

After sensors power supply most important need for a robot. Just like human beings consume food when they need energy, robots needs energy to function as well. Almost all receive their power from electricity. Power supply is mainly produced by using high-capacity batteries. The program within a robot provides the logic that drives these behaviours [10] [2]:

- Python
- C language
- Java [3].

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2. PROPOSED METHODOLOGIES ADOPTED

The methodology followed to develop "Patient monitoring smart robot for bio medical engineering application" is as follows [8]. An obstacle avoidance line follower robot with Arduino inbuilt and patient monitoring system works with simple Arduino board along with IR sensors an optical avoided with an ultrasonic sensor. [4].

3. Pin connections for obstacle avoidance and line follower:

- First attach a motor driver shield onto the Arduino.
- Now connect the bo motor's to the l293d motor driver shield.
- Motor 1 to motor driver M1
- Motor 2 to motor driver M2
- Motor 3 to motor driver M3
- Motor 4 to motor driver M4
- Connect the IR sensor to motor driver.
- IR sensor OUT pin is connected to motor driver A0 pin.
- IR sensor GND pin is connected to motor driver GND pin.
- IR sensor VCC pin is connected to motor driver 5v pin.Do the same for other IR sensor but make sure that OUT pin is connected to motor driver A1.
- Connect the servo motor to motor driver servo1 slot.
- Connect ultrasonic sensor to motor driver.
- Hc-sr04 TRIG pin to motor driver A2.

4. Explanation of the circuit diagram

The circuit diagram for interfacing MAX30100, BME280 & DS18B20 with ESP32 is given below [5]:

- Interfacing GY-MAX30100 with ESP32
- VIN –> Vin (5v)
- SDA –> D21
- SCL –> D22
- GND –> GND
- Interfacing DS18B20 with ESP32
- RED wire –> Vin (5v)
- Black Wire –> GND
- Yellow Wire –> D5 (GPIO 5)
- Interfacing BME280 with ESP32
- VIN –> Vin (3.3v)
- GND –> GND
- SCL –> D22
- SDA –> D21 [6].

5. Examination of the many papers

A number of researchers have worked on the similar topic presented in this paper. A brief review of it follows. In [1], "Line follower and obstacle avoidance robot using arduino" has been designed and developed by Aamir attar, Aadilansari, Abhishekdesai, Shahid khan, to create an autonomous robot which intelligently detects the obstacle in its path and navigates according to the actions that user set for it. So this system provides an alternate way to the existing system by replacing skilled labor with

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robotic machinery, which in turn can handle more patients in less time with better accuracy and a lower per capita cost. In [2], "Obstacle-avoiding robot with IR and PIR motion Sensors" has been designed and developed by Aniket D. Adhvaryu et.al. has proposed that developed robot platform was not designed for specific task but as a general wheeled autonomous platform. It can therefore be used for educational, research or industrial implementation. Students can use it to learn the microcontroller programming using C++, Arduino Uno 1.6.5 compiler, IR and PIR sensors characteristics, motor driving circuit and signal condition circuit design. In [3], Author by the name S.J. Jung and W.Y. Chung studied the Flexible and scalable patient's health monitoring system in 6LoWPAN. The main advantage of this enabling factor is the combination of some technologies and communications solution. The results of Internet of Things are synergetic activities gathered in various fields of knowledge like telecommunications, informatics and electronics. In [4], authors by the name K.S. Shin and M.J. Mao Kaiver studied a cell phone based on health monitoring system with self analysis which incorporates IoT. In [6], authors by the name Cristina Elena Turcua studied Health care applications a solution based on the Internet of Things. [7].

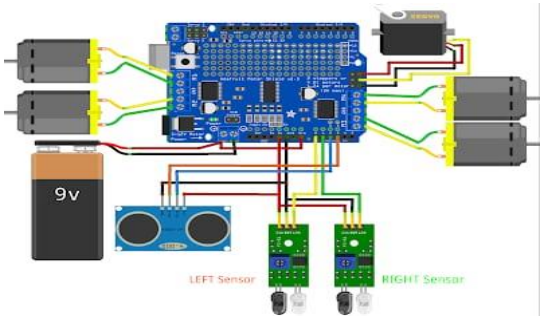

Fig. 1 : Arduino board pictorial layout.

6. Conclusions / conclusive remarks of the survey

In this research paper, the authors have presented a brief review of the works done by various researchers across the world in the field of patient monitoring smart robot. The future of home -based personal service robots is growing rapidly. Consulting firm Frost & sullivan estimates that It a million Service foots were being used in 2019, and that the personal robot market is set to become a 519 billion market opportunity in 2020. The international Federation of Robotics (FIR) forecasts that sales of services robots will grow between 20 and 25 percent by 2020 . Having alreadySignificantly impacted the agriculture, Surgery and logistics sectors, service robots are expected to offer greater assistive capability and value in future. We can develop this patient monitoring robot by adding more sensors , camera, high voltage battery etc which will make robot more effectively.

References

[1]. Conference paper, " "Arduino Architecture" https://www.engineersgarage.com/what-is-gsm-gprs-module
[2]. Conference paper, " "Systems design" https://en.wikipedia.org/wiki/Systems_design [Oct. 15, 2017] "UML – Standard Diagrams".
[3]. https://www.tutorialspoint.com/uml/uml_standard_diagrams.htm
[4]. Conference paper, "The Internet of Things in healthcare: an overview".
[5]. https://scholar.google.com/citations?user=Y4opLB8AAAAJ&hl=en
[6]. Conference Paper, "Envisioning inclusive futures: technology-based assistive sensory and action substitution".
[7]. X. Wang, J. T. Wang, X. Zhang and J. Song, "A multiple communication standards compatible IoT system for medical usage," 2013 IEEE Faible Tension Faible Consommation, pp. 1-4, 2013.

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[8]. T.C. Manjunath, Pavithra G., Ravi Rayappa, Rajasekhar Koyyeda, Satvik M. Kusagur, Praveen N., Gopalaiah Gopalaiah, Arun Kumar G., Spoorthi Jainar, "Safety Features Design During the Installation of Fixed Robots in Industrial Sectors Using Image Processing", MAT Journals, Journal of Analog and Digital Devices, Vol. 5, No. 3, pp. 13-15, 2020.
[9]. Adithya T. G., Pavithra G., T. C. Manjunath, Praveen N., "Stewart Platform Conceptualized Robotic Type of Designs for Aerospace Applications", Journal of Remote Sensing GIS & Technology, Vol. 8, No. 1, pp. 1-5, 2022.
[10]. T.C. Manjunath, Pavithra G., Ravi Rayappa, Rajasekhar Koyyeda, Satvik M. Kusagur, Praveen N., Gopalaiah Gopalaiah, Arun Kumar G., Spoorthi Jainar, "Safety Features Design During the Installation of Fixed Robots in Industrial Sectors Using Image Processing", MAT Journals, Journal of Analog and Digital Devices, Vol. 5, No. 3, pp. 13-15, 2020.
[11]. Spoorthi Jainer T.C Manjunath, Pavithra G, Ravi Rayappa, Rajasekar Koyyeda. Satvik M Kusagur, Praveen N, Gopalaiah, Arun Kumar G, "Transfer Function Based Controller Design for a Mobile Robot Using Image Processing and Computer Vision", Journal of control system and control instrumentation, Vol. 6, No. 3, pp. 10-12, 2020.
[12]. Praveen N., T.C. Manjunath, Pavithra G., Ravi Rayappa, Rajasekhar Koyyeda, Satvik M. Kusagur, "Medical Robots & its Applications in the Current Health Sector", Journal of Analog and Digital Devices, Vol. 5, No. 3, pp. 1-6, 2020.