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Design and Implementation of IoT based Floor Cleaning Robot for Healthy Environment

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Abstract:- Ambient Assistive Living has been a focus for both studies and business due to a fast-growing elderly population and the issues in health and social care that come with it. Government agendas place a high priority on the need to control, if not lower, healthcare costs while enhancing service quality. Although technology has a significant impact on attaining these goals, any solution must be conceived, put into practice, and verified using the right domain expertise. To get around these difficulties, remote real-time monitoring of a person's health can be utilised to spot relapses in illnesses and allow for early intervention. Thus, the study discussed in this paper focuses on creating a smart healthcare monitoring system that can monitor elderly individuals remotely. The technology discussed in this article focuses on the capability to monitor a person's physiological data in order to identify illnesses that can help with early intervention practises. This is accomplished by properly processing and interpreting the sensory data that has been obtained while communicating the discovery of a condition to the proper professional. The conclusion shows that the suggested approach can enhance clinical decision assistance while promoting Early Intervention Practices. Our thorough simulation findings show that the suggested system performs better than expected, with minimal packet loss (2.2% of all packets are discarded) and low latency (96% of packets are received in less than 1 millisecond). As a result, the system operates well and is inexpensive to use for gathering and modifying data.

Keywords: Arduino Uno, Stepper Motor, Ultrasonic Sensor, Bluetooth Module.

1 INTRODUCTION

Technology has influenced how we all live and work in the contemporary world and has become a necessary and fundamental part of it. The majority of the time, technology is a good thing since it makes managing and controlling our everyday activities easier. Modern technology, however, is crucial for other fields, such as addressing the myriad problems in social and health care. The idea of creating new living spaces that integrate social settings with cutting-edge technology to provide goods and services that considerably improve the occupant's quality of life is known as ambient assistive living (AAL). Assistive solutions are influenced by several fields of study and technological advancements, and numerous experiments are conducted to determine their viability. The use of assistive technology in the home has been made possible and improved via the application of numerous disciplines. AAL, which refers to the gathering and integration of such technologies, strives to help individuals by making it possible for them to accomplish their daily goals. AML places particular emphasis on the inclusion and applicability of different technologies (such as sensors, computers, etc.) and allied fields (such as computer science, engineering, medicine, and social sciences). Any system's primary purpose is to recognise human activity from the sensory data it has collected. The use of assistive technology in the home has been made possible and improved via the application of numerous disciplines. AAL, which refers to the gathering and integration of such technologies, strives to help individuals by making it possible for them to accomplish their daily goals. AML places particular emphasis on the inclusion and applicability of different technologies (such as sensors, computers, etc.) and allied fields (such as computer science, engineering, medicine, and social sciences). Any system's primary purpose is to recognise human activity from the sensory data it has collected. Using a smart bracelet, for instance, which is frequently used to track fitness and health. Electrocardiogram-based smart phones can be used to evaluate and examine the state of the heart. The Brain Sensing Headband tracks brain activity and wirelessly sends data to a laptop, smartphone, or tablet. IoT and wearable sensor technologies have the potential to significantly enhance our way of life by, for example, delivering healthcare monitoring systems that are in charge of monitoring and controlling our fitness and health. The data may be shared and studied by healthcare professionals thanks to additional capabilities like real-time communication, which also gives people the ability to recognise and respond to concerning behaviours and symptoms. One of the most important objectives of contemporary society is to increase the efficacy and total cost-effectiveness of healthcare. The rise in global population is partly attributable to medical progress, which has also led to an increase in the number of old individuals who require greater care. The rise of an ageing population is quickly evolving into a growing public health problem for many nations. The expense of healthcare is steadily growing, and the standard of care does not satisfy the demands of contemporary society. One potential approach to resolving these issues is remote real-time health monitoring. Wearable technology and fitness trackers have shown to be effective ways to continuously monitor the health of older persons while promoting early intervention practises and lowering discharge rates. According to surveys conducted in Europe and the US, people prefer to get treatment and healthcare monitoring at home rather than in a hospital. There are several benefits to monitoring patients remotely, including EIP, lower recurrence rates, lower patient expenditures, and increased convenience. Every year, governments and healthcare organisations spend millions of pounds on high-quality services for the healthcare industries. One of the key components of today's healthcare services is the monitoring of patients' vital signs, such as their temperature, blood pressure, and heart rate. In the healthcare industry, bed blocking—where a patient is medically prepared for release but is postponed due to insufficient care, support, and rehabilitation resources outside hospitals—has become more prevalent. Up until recently, doctors and other clinicians had to manually monitor patients in clinics and/or hospitals for extended periods of time while maintaining correct reports and records. However, a patient's health may be precisely tracked remotely by integrating various technologies including smart-phone applications, wearables, and sensors. The improvement of living conditions in general and healthcare in particular is what drives our research. Because of the enormous population expansion that has increased demand on our already unchanging healthcare systems, healthcare services in modern countries are able to fulfil individual needs. . On the other hand, there is still a lack of healthcare investment in cutting-edge technologies to serve these populations. Additionally, we take our health seriously and are interested in continuously tracking our physical activity anywhere, anytime utilising different fitness and health tracker devices like smart watches. Additionally, we are concerned about the welfare of our elderly and disabled neighbours when we leave them at home alone for an extended amount of time while going about our daily business. Therefore, it is increasingly important to integrate technology like wearables and healthcare sensors with our healthcare systems to provide a more secure and convenient living environment for everyone.

. For many years to come, the health care system will be significantly impacted by the expanding older population and the rising frequency of chronic disorders linked to ageing. Therefore, we are recommending a system that allows ongoing, real-time monitoring of older patients' health in order to prevent chronic illnesses and avoid the need for hospitalization, which puts a strain on healthcare systems and raises expenditures. This research describes a system for monitoring elderly patients' healthcare using wearable sensors and a smartphone app (SW-SHMS). The system collects physiological data from patients in real-time using wearable sensors (such as pulse, oxygen, etc.) worn by old people. A data repository receives the data, stores it, and examines it for any anomalies. pressure As a result, any abnormality in a patient's vital signs will be immediately communicated to the patient's doctors and/or hospital so they may take appropriate action and avoid various issues, such an unexpected heart attack. Remote remediation is made possible by technologies that can transmit physiological data from patients' locations to clinicians everywhere in real-time. For instance, wearable technology may be used to monitor and send in real-time from the patient's location to their doctor information like blood oxygen saturation, heart rate, and blood pressure. This makes virtual communication between patients and physicians possible. It may be possible to identify illnesses and other issues early by offering a system that can successfully monitor an aged person's physiological activities at regular intervals. Particularly when it comes to senior individuals who are considerably more prone to have a malfunction in their physiological data. To improve health care for the senior population at a reasonable cost with simplicity of use while providing maximum comfort and independence, new techniques and technologies must be developed.

2 LITERATURE SURVEY

It is essential to create methods that make it possible to monitor health status independently at home and at work due to the rise in lifestyle-related diseases and the ageing population. One significant development is the exodus of physiological data processing from hospitals, enabling patients to remain at home or at work. For example, My-Heart [25], an EU FP6 project with Philips Research group that focuses on vital sign monitoring to save lives by providing earlier diagnoses, closer monitoring, and a way to help people manage any heart problems, has been started by a number of research groups and industry. Additionally, Philips-led HeartCycle project [11, 24] offers a closed-loop disease management solution that can assist both heart failure (HF) and coronary heart disease (CHD) patients, including those who may also have co-morbidities such hypertension, diabetes, and arrhythmias. This has been accomplished by multi-parametric monitoring and analysis of measures and vital signs. Over a dozen interoperable solutions have already been approved by the Continua Health Alliance [33, 44], a key force in the industry that was founded in 2006 to promote an interoperable personal telehealth ecosystem. In defining interoperability for the LAN and WAN interfaces, Continua has also made significant strides and is now able to provide end-to-end interoperability. Additionally, a number of projects have been carried out using the AAL framework, and we have classified them according to their primary purposes. We begin by listing a collection of initiatives that are geared towards enabling seniors to age in place, some of which are supported by the Assisted Living Joint Programme1 projects fund [3]. In order to monitor and assist senior citizens, the Aware Home project [3, 12] combines social robots with a broad range of sensors, from specially created smart flooring to more common video and ultrasonic sensors. The Ubiquitous house Project is also focused on a robot that monitors inhabitants and acts as a transitional platform between the smart house and the end users. The robot has a dialogue- based user interface. Additionally, some projects have concentrated on the monitoring of patients with chronic diseases, such as the CASAS project, which uses the environment of smart homes to monitor patients with dementia and is comparable to the ENABLE project [1]in that it aims to give them more autonomy in their lives. While the DOMUS [7] and IMMED [28] initiatives concentrate on behavioural recognition for Alzheimer disease patients [3]. [Grenoble Health Smart Home suggested a collection of instruments to assess patients' activity in hospitals using a number of indicators of their daily activities, mobility, and distribution of stays and displacements. A telehealth system based on lifestyle monitoring was created as part of the Gloucester Smart House project [5] with the intention of continually obtaining data about the patients' everyday activities. When collecting automated ECG measures for the Welfare Techno House project, several of these devices also sample biological constants. In the Aging in Place initiative, individuals are examined for urinary tract infections, and a sensor network is used to send alarms to the carer. The objective was to identify disease indicators earlier thanthrough standard health care assessment.

3 EXISTING SYSTEM

To gather the dust, an autonomous floor cleaner robot has brushes connected to its sides. This robot has a suction device that

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picks up dust as it moves about the room and utilises ultrasonicsensors to avoid obstructions and adjust its course.

4. METHODOLOGY

With the constant development of technology, we created a special system that makes it simple to track and monitor patents. When a robot encounters an impediment in front of it, anultrasonic sensor is utilised to detect it, causing the robot to halt and alter course. The floor iscleaned with the aid of a hoover cleaning system.

5 BLOCK DIAGRAM

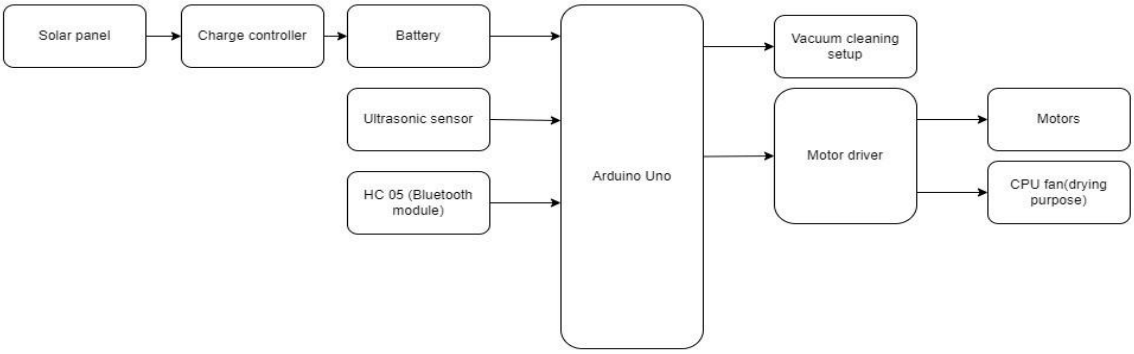
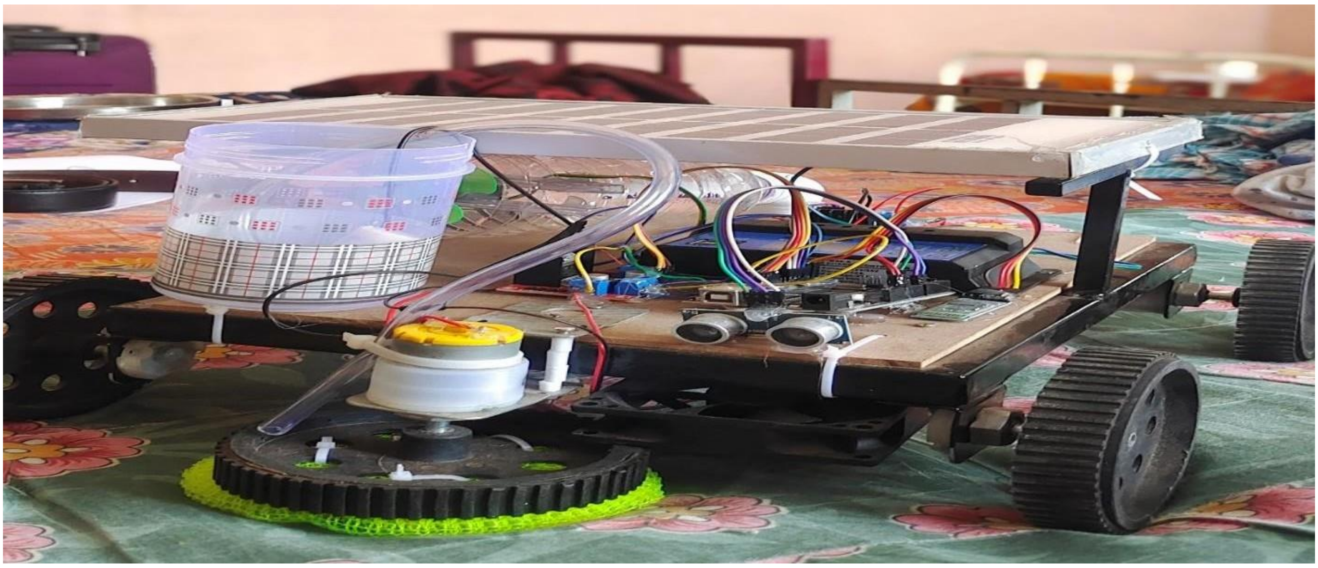


Fig 1 Block Diagram

Fig 1 Block Diagram

Results



The robot is designed to assist with and streamline daily cleaning activities.Using a vacuum cleaner and a wet cleaning brush, it combines dry and wet cleaning operations.The battery of the robot is used, and it is continuously recharged by a solar panel as it is depleted by motors.is exposed to sunlight, this extends the battery life.The system comprises of a hoover cleaner with an ultrasonic obstacle detection sensor attached.

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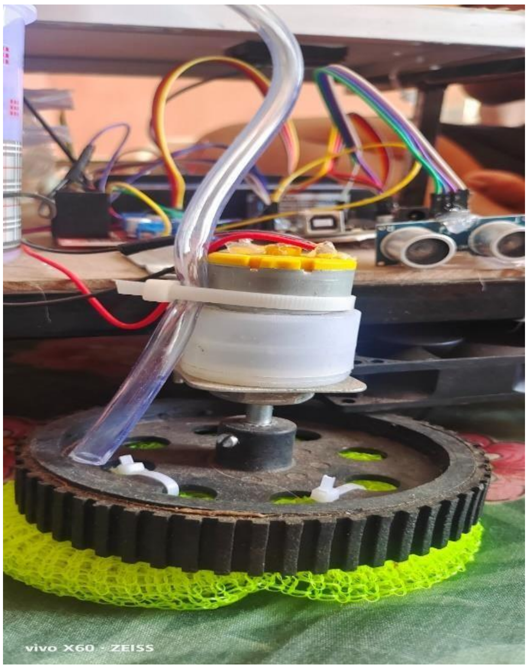
Figure 2 Solinoid actuator



water is sprayed in front of A water tank is built within the robot, and a brush is attached toclean the floor surface.

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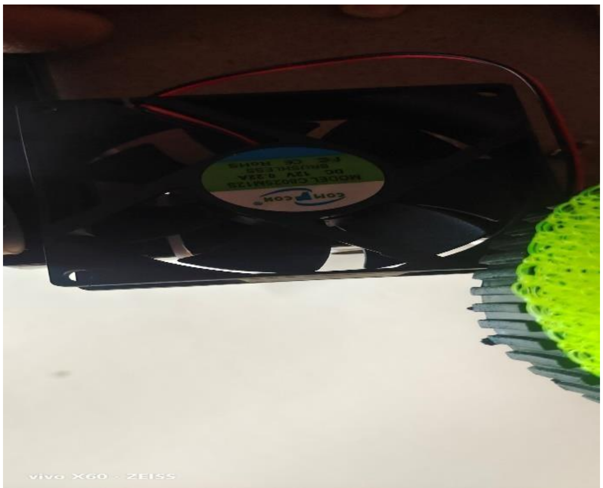

The robot is designed to assist with and streamline daily cleaning activities. Utilizing ahoover cleaner and a wet cleaning brush, it combines dry and wet cleaning processes.

CONCLUSION & FEATURE SCOPE

In this research, a smart healthcare monitoring system (i.e., SW-SHMS) is put forth as a solution to the problems associated with home-based healthcare monitoring and preventing hospitalisation. According to the literature, there is a significant need for creating a healthcare system that can monitor senior citizens in real-time and at home. By continuously monitoring their health, SW-SHMS may significantly contribute to the provision of a comfortable and safe environment for elderly and disabled persons, enabling them to live independently without the worry of any emergency or urgent healthcare condition. In a nutshell, SW-SHMS collect patient physiological data using wearable sensors and send it to the cloud for data processing and analysis. As a result, any abnormality found in the patient's data will be sent to their doctors via the hospital platform. SW-SHMS offers a dependable and affordable solution for remote patient monitoring because to its fixable design, which can scale and extend quickly. Additionally, the findings indicate that by utilising the advanced flawless SW-SHMS system, which is able to remotely and in real-time monitor patient symptoms, the system might effectively contribute to improving healthcare services.

The SW-SHMS will continue to evolve and be improved in the future. For example, the system can be expanded to use artificial intelligence and/or machine learning ideas to aid in early illness prediction. Additionally, the system has a sizable quantity of medical data that will be used to create a system of recommendations that may offer advice on diets and lifestyle choices for improved health. Additionally, the network topology can be expanded to include a fog computing node, which will process data closer to the network's edge rather than having to travel far to the cloud. Fog computing clouds also reduce data traffic on the cloud and aid in better healthcare decisions due to their placement within local area networks. Therefore, by updating the network architecture to allow for the distribution of several Fog nodes at the network's edge, fog computing will be used to decrease packet losses. This will enable the system to acquire data and manipulate it using the Fog-Cloud cooperation paradigm, acting more quickly on data packets before they are lost.

REFERENCES

[1] Adlam T, Faulkner R, Orpwood R, Jones K, Macijauskiene J, Budraitiene A (2004) The installation and support of internationally distributed equipment for people with dementia. IEEE Transactions on Information Technology in Biomedicine
[2] Ali A, Ming Y, Chakraborty S, Iram S (2017) A comprehensive survey on real-time applications of WSN. Fut Internet 9(4):77
[3] Alsina-Pages RM, Navarro J, Al ` ´ıas F, Hervas M (2017) homeSound: Real-Time Audio Event Detection ´ Based on High Performance Computing for Behaviour and Surveillance Remote Monitoring. Sensors
[4] Angelini L, Carrino S, Abou Khaled O, Riva-Mossman S, Mugellini E (2016) Senior living lab: an ecological approach to foster social innovation in an ageing society. Fut Internet 8(4):50
[5] Barnes NM, Edwards NH, Rose DA, Garner P (1998) Lifestyle monitoring-technology for supported independence. Computing & Control Engineering Journal
[6] Bonato P (2010) Wearable sensors and systems. IEEE Eng Med Biol Mag 29(3):25–36
[7] Bouchard B, Giroux S, Bouzouane A (2007) A keyhole plan recognition model forAlzheimer's patients: first results, vol 21
[8] Catarinucci L, De Donno D, Mainetti L, Palano L, Patrono L, Stefanizzi ML, Tarricone L (2015) An IoT-aware architecture for smart healthcare systems. IEEE Internet Things J2(6):515–26
[9] Chauhan J, Bojewar S (2016) Sensor networks based healthcare monitoring system. In: International conference on inventive computation technologies (ICICT). IEEE, Vol 2, pp 1–6
[10] Chen TL, King CH, Thomaz AL, Kemp CC (2011) Touched by a robot: an investigation of subjective responses to robot-initiated touch. In: 2011 6th ACM/IEEE international conference human-robot interaction (HRI)
[11] Chouvarda I, Antony R, Torabi A, Weston J, Caffarel J, van Gils M, Cleland J, Maglaveras N (2013) Temporal Variation in telemonitoring data: on the Effect of Medication and LifestyleCompliance. International Journal of Bioelectromagnetism
[12] Cook D, Das SK (2004) Smart environments: technology, protocols and applications. Wiley, New York
[13] Dall TM, Gallo PD, Chakrabarti R, West T, Semilla AP, Storm MV (2013) An aging population and growing disease burden will require alarge and specialized health care workforce by 2025. Health affairs
[14] Dohr A, Modre-Opsrian R, Drobics M, Hayn D, Schreier G (2010) The internet of things for ambient assisted living. In: 2010 seventh international conference on information technology: new generations (ITNG), pp 804–809
[15] Dudakiya S, Galani H, Shaikh A, Thanki D, Late RA, Pawar SE (2016) Monitoring mobile patients using predictive analysis by data from wearable sensors. In: International conference on electrical, electronics, and optimization techniques (ICEEOT). IEEE, pp 332–335)
[16] El-Darzi E, Vasilakis C, Chaussalet T, Millard PH (1998) A simulation modelling approach to evaluating length of stay, occupancy, emptiness and bed blocking in a hospital geriatric department. Health Care Manag Sci 1(2):143.
[17] Gupta MS, Patchava V, Menezes V (2015) Healthcare based on IoT using Raspberry Pi. In: 2015 international conference on green computing and internet of things (ICGCIoT). IEEE,pp 796–799)
[18] Hassanalieragh M, Page A, Soyata T, Sharma G, Aktas M, Mateos G, Kantarci B, Andreescu S (2015) Health monitoring and management using Internet-of-Things (IoT) sensing with cloud-based processing: opportunities and challenges. In: 2015 IEEE international conference on services computing (SCC). IEEE, pp 285–292)
[19] Islam SR, Kwak D, Kabir MH, Hossain M, Kwak KS (2015) The internet of things for health care: a comprehensive survey. IEEE Access 3:678–708
[20] Kumar R, Rajasekaran MP (2016) An IoT based patient monitoring system using raspberry Pi. In: International conference on computing technologies and intelligent data engineering (ICCTIDE). IEEE, pp 1–4
[21] LeBellego G, Noury N, Virone G, Mousseau M, Demongeot J (2006) A model for the measurement of patient activity in a hospital suite. IEEE Transactions on information technology in biomedicine
[22] Lee C, Kim T, Hyun SJ (2016) A data acquisition architecture for healthcare services in mobile sensor networks. In: 2016 International conference on big data and smart computing (BigComp). IEEE, pp 439–442
[23] Lin CT, Ko LW, Chang MH, Duann JR, Chen JY, Su TP, Jung TP (2010) Review of wireless and wearable electroencephalogram systems and brain-computer interfaces–a mini- review. Gerontology 56(1):112–9
[24] Luprano J, De Carvalho P, Eilebrecht B, Kortelainen J, Muehlsteff J, Sipila A, Sola J, Teichmann ` D, Ulbrich M (2013) HeartCycle: advanced sensors for telehealth applications. In: 2013 35th annual international conference of the IEEE engineering in medicine and biologysociety (EMBC)
[25] Luprano J, Sola J, Dasen S, Koller JM, Ch ` etelat O (2016) Combination of body sensor networks and ´ on-body signal processing algorithms: the practical case of MyHeart project. In: null. IEEE, pp 76–79
[26] Madden SR, Franklin MJ, Hellerstein JM, Hong W (2005) TinyDB: an acquisitional queryprocessing system for sensor networks. ACM Trans Database Syst (TODS) 30(1):122–73 27. Manzano-Santaella A (2010) From bed-blocking to delayed discharges: precursors and interpretations of a contested concept Health services management research
[27] Megret R, Dovgalecs V, Wannous H, Karaman S, Benois-Pineau J, El Khoury E, Pinquier J, Joly P, ´ Andre-Obrecht R, Ga ´ estel Y, Dartigues JF (2010) The IMMED project: wearable video monitoring of ¨ people with age dementia. In: Proceedings of the 18th ACM international conference on multimedia
[28] Mottola L, Picco GP (2011) Programming wireless sensor networks: fundamental conceptsand state of the art. ACM Comput Surv (CSUR) 43(3):19
[29] Navarro J, Vidana-Vila E, Alsina-Pag ˜ es RM, Herv ` as M (2018) Real-Time Distributed architecture for ´ remote acoustic elderly monitoring in Residential-Scale ambient assisted living scenarios. Sensors (Basel Switzerland) 18(8):1