Lecture Notes in Networks and Systems 803

Atulya K. Nagar
Dharm Singh Jat
Durgesh Mishra
Amit Joshi *Editors*

Intelligent Sustainable Systems

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Volume 803

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Preface

The Seventh Edition of the WorldS4 2023—World Conference on Smart Trends in Systems Security and Sustainability—will be held during August 21–24, 2023, in a hybrid mode and organized by Global Knowledge Research Foundation and Managed by G R Scholastic LLP. The associated partners were Springer, Springer Nature. The conference will provide a useful and wide platform both for display of the latest research and for exchange of research results and thoughts. The participants of the conference will be from almost every part of the world, with background of either academia or industry, allowing a real multinational multicultural exchange of experiences and ideas.

A great pool of more than 1250 papers was received for this conference from across 52 countries among which around 172 papers were accepted with this Springer Series and were presented through physical as well as digital platform Zoom during the four days. Due to overwhelming response, we had to drop many papers in hierarchy of the quality. Totally, 24 technical sessions were organized in parallel in 4 days along with few keynotes and panel discussions. The conference will be involved in deep discussion and issues which will be intended to solve at global levels. New technologies will be proposed, experiences will be shared, and future solutions for enhancement in systems and security will also be discussed. The final papers will be published in 2 volumes of proceedings by Springer LNNS Series.

Over the years, this conference has been organized and conceptualized with collective efforts of a large number of individuals. I would like to thank each of the committee members and the reviewers for their excellent work in reviewing the papers. Grateful acknowledgments are extended to the team of Global Knowledge Research Foundation for their valuable efforts and support.

I look forward to welcome you on the 8th Edition of this WorldS4 Conference in 2024.

Liverpool, UK — Atulya K. Nagar
Windhoek, Namibia — Dharm Singh Jat
Indore, India — Durgesh Mishra
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Design and Development of a Low-Cost Multi-functional Wheelchair with Patient Monitoring and Obstacle Detection

Jobyrul Hoque, Subhashis Sen, Muhammad Samiul Alam, Kazi Muhammad Asif Ashrafi, and Toufiq Ahmed

Abstract In general, a disable person needs assistance for self-movement. The objective of this project is to develop a low-cost prototype of a wheelchair with several characteristics that can be used by the ill and the disabled. In this paper, a low-cost multi-functional wheelchair with patient monitoring and obstacle detection is proposed. The multi-purpose wheelchair is built with all the characteristics required to guarantee safety and ease of use. A joystick is used to steer the wheelchair in any direction, and a push button is used to convert it from a chair to a bed. Using a temperature sensor, heart rate sensor, ECG, and blood pressure (B.P.) sensor, we can keep an eye on the patient, and a microcontroller is used to display this data on a screen. Every time the parameters exceed the threshold values, an alarm message is automatically delivered through GSM module to the phone of the person who has been informed. The patient's health state is checked via IoT. The wheelchair uses an ultrasonic sensor to identify obstacles. A medicine reminder system is also designed to remind patients to take their medications. With a Wi-Fi camera, the individual is being watched. To present all the facts and amuse the impaired person, a display is employed. The user-friendliness of the multi-features wheelchair is being improved to lessen the strain on patient attendants. Every individual who is ill or disabled will feel more confident as a result of being independent.

Keywords Disability · GSM · Heart beat sensor · ECG · Blood pressure · IoT · Microcontroller (ATmega) · Medicine reminder · Temperature sensor · Ultrasonic sensor · Display · Wheelchair

1 Introduction

One of the most common tools used to help the disabled with their own mobility is the wheelchair. Following to the report of World Health Organization (WHO) almost a wheelchair is required by 15% of the world's population, or over million individuals

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[1]. A wheeled chair that the user sits in is a mobility aid. Those who have trouble walking frequently use wheelchairs. Both manual and automated wheelchairs are readily accessible on the market; although automatic wheelchairs have more features overall due to the fact that an automated wheelchair does not require any kind of outside help or bodily ability to move. Different types of wheelchair model are now available in the market to meet its user's demand. But, producing a wheelchair that is beneficial and comfortable while also being more skillful and utilizing technology that is affordable is a substantial difficulty for designers and producers.

Many physically disabled persons can be satisfied with motorized wheelchairs to meet their needs. Some members of the handicapped population find using a typical motorized wheelchair difficult or impossible. So, to design such kind of multi-feature wheelchair which electrically energizes with realistic technology to control the movements without any kind of trouble to its user is the objective of this research. In this wheelchair, a joystick is used for the movement. And several types of sensors are to detect various types of health issues among consumers. This wheelchair will not only use as movement but also as bed. These kinds of wheelchairs will get more attraction as they will be simple to use and handle.

2 Literature Survey

Wheelchair is figured out as a medical device. The physician may advise those who are unable to move to utilize a wheelchair to help them move about independently. In this modern era, everyone wishes to involve themselves either in educational activities or jobs in spite of their disability and illness. Several studies have shown that independent mobility, which includes power wheelchairs, manual wheelchairs, and walkers, is advantageous for all kids, teens, and adults [2]. Independent mobility reduces dependence on guardians and enhances feeling of self-reliance. Moreover, it creates opportunities in the educational and vocational fields. Individuals who are unwell or disabled frequently run the risk of developing health issues. On mental, emotional, physical, and social activities, this could have a big impact. Children are taught the importance of autonomous movement from an early age [3]. Adults' ability to move alone represents a big opportunity for self-respect. Also, this is crucial for "aging in place." For instance, senior persons who find it exceedingly difficult to walk or wheel them to the bathroom may consume less fluid to lessen the frequency of urine. As a result, people search for a better wheelchair model that would increase their independence from caregivers.

So, we are going to take action to support the integration of the sick and disabled into society. Conventional wheelchairs are difficult for people to navigate in small areas because they must be manually operated to move. Because of this, electric wheelchairs have been available on the market since early 1970, making manual wheelchairs less physically taxing [4]. Since then, significant research and various initiatives have been undertaken to enhance this category of wheelchairs. Several systems for operating an electric wheelchair have been recorded. A few examples

are voice control, hand gestures controlled by vision, and joysticks. Because of their cutting-edge technology and accessibility, smartphones have become an integral element of modern life. Due to their high-quality displays and speedy internet connection, multi-functional mobile phones are becoming increasingly vital in our daily lives. We use a smartphone to get emergency messages and assistance with vital commodities, as well as a microcontroller (ATmega) to operate the sensors, motors, and actuators in the wheelchair. In this project, we developed a smart wheelchair which is self-movable, and monitoring the health of the patient by using IoT technology makes the multi-functional wheelchair much easier to use, cheaper, and with less complexity. Furthermore, when an ill or disabled person wishes to lie down, this wheelchair can be converted into a bed. It will give the person more comfortable and friendly feelings. The ill or disable person will feel self-reliance whenever he/she use this multi-features wheelchair.

3 Existing System

The number of persons with physical disabilities and illnesses is more than what is seen in statistics records of comprehensive health problems and diseases. They rely on others to transport them back and forth. The earliest form of wheelchair is known as manually operated wheelchair. It is manually operated. To move, this wheelchair does not require the use of an electrical system. Wheel-based, self-propelled, and attendant-propelled wheelchairs are the most common types. Electric wheelchairs are wheelchairs that are powered by electricity and have features such as tilt, recline, leg seat elevation, back seat elevation, and more [5–7]. Message-controlled wheelchairs were being created as well, which use an Android app to transmit the message to controller from the wheelchair with the help of Bluetooth system [8]. Later, voice-controlled wheelchair is also developed, which uses a microphone and HM2007P chip for recognition of voice and voice control-based applications [9, 10]. However, this system will require more programming and will be more expensive. A voice-activated wheelchair is currently available, although it is useless and inconvenient to use. Smart wheelchairs are now on the market, but they are out of the reach of the average person and ineffective in an emergency. The recommended technology for the recently suggested smart wheelchairs was voice-activated and head-controlled with a variety of unique features. They have a few drawbacks, including expense, technical challenges, and uncomfortable ecological consequences. The parts utilized in fabrication are quite cumbersome and difficult to use.

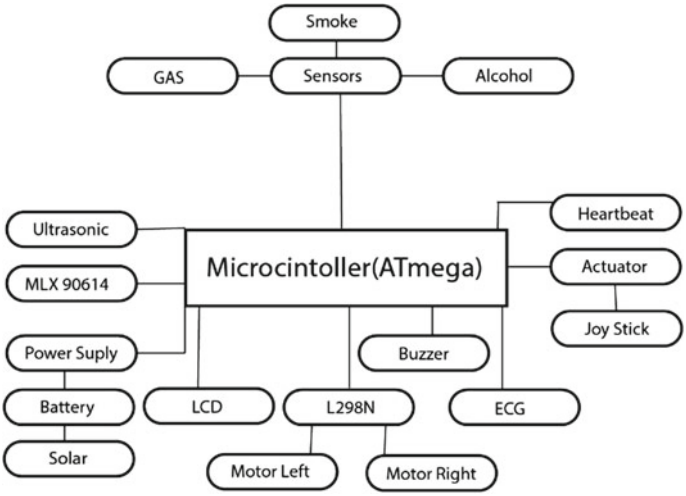

Fig. 1 Block diagram of the system

4 System Design

4.1 Block Diagram

See Fig. 1.

4.2 Block Diagram Details

The paper design and concept are explained via a block diagram. The necessary parts and working circumstances of the design are shown in the block diagram. The proposed plan to develop an electric power wheelchair is shown in Fig. 1's block-organized diagram. It is made up of an ATmega microcontroller, a GSM module, an LCD, an ECG, several DC motors, a joystick, an ultrasonic sensor, a temperature sensor, and a heart rate sensor. The suggested system performs three simultaneous tasks: obstacle detection, patient monitoring, and wheelchair movement using a joystick. DC motors that are interfaced to the microcontroller (ATmega) by the motor driver in response to the signal obtained by the ultrasonic sensor control the wheelchair's direction.

4.3 Working Principle

The main goal of this study is to assist impaired people in using wheelchairs with several functions. The aforementioned model is a multi-featured wheelchair design created using our system's microcontroller, the ATmega. All of the sensors, which are mounted on the multi-feature wheelchair, provide input. These sensors provide outputs that let the user choose and deduce the optimum options for the multi-feature wheelchair's safe mobility and control. They cover all directions. To control the movement of a joystick on the multi-features wheelchair arm-rest (according to the user's condition), there will also be an RF communication system used. Movements to the left and right as well as forward and backward will be made possible by these two methods. The joystick's input value will be continually pulled in by the microcontroller, and a corresponding output value will assist and operate the wheelchair's multi-featured motors for movement control. We use the ultrasonic sensor to detect obstacles in its path and notify the microcontroller processor if they are encountered while it is traveling. The multi-featured wheelchair will thereafter automatically stop thanks to the microcontroller.

Beside these, there are a few features of this wheelchair. We will use two actuators that will be able to convert the wheelchair to bad. It will be one of the major and effective features of our multi-feature's wheelchair. There is smoke and gas detector which can detect gas and smoke visibility around the wheelchair. It will also be able to detect alcohol. These two features will act like a protective environment for the users.

5 Implementation and Result

5.1 Hardware Design

We will discuss the interesting elements pertaining to the project's equipment utilization in this section. Before being integrated into the circuit, the parts were initially simulated to determine their behavior influencing the use of appropriate components to improve the circuit's activity.

5.2 Circuit Design

See Figs. 2, 3, 4 and 5.

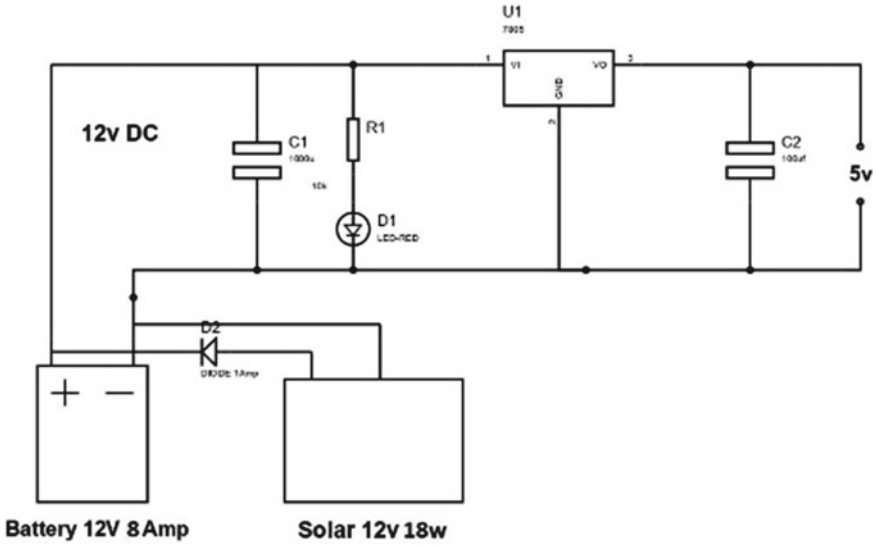

Fig. 2 Power circuit diagram

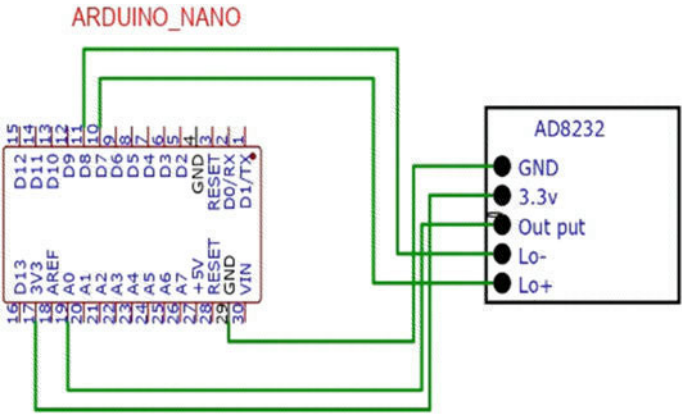

Fig. 3 Circuit diagram of ECG sensor

5.3 Description of Circuit Diagram

Here in Fig. 2, we are using a 12 V, 8 amp battery to drive the wheelchair and for changing the DC battery using a solar system of 12 V, 18 W. Then a voltage regulator IC is used for regulation of voltage. The IC will constantly supply 5 V, which will be used for all of the circuit that was used in the wheelchair as in Figs. 3, 4 and 5, and so on.

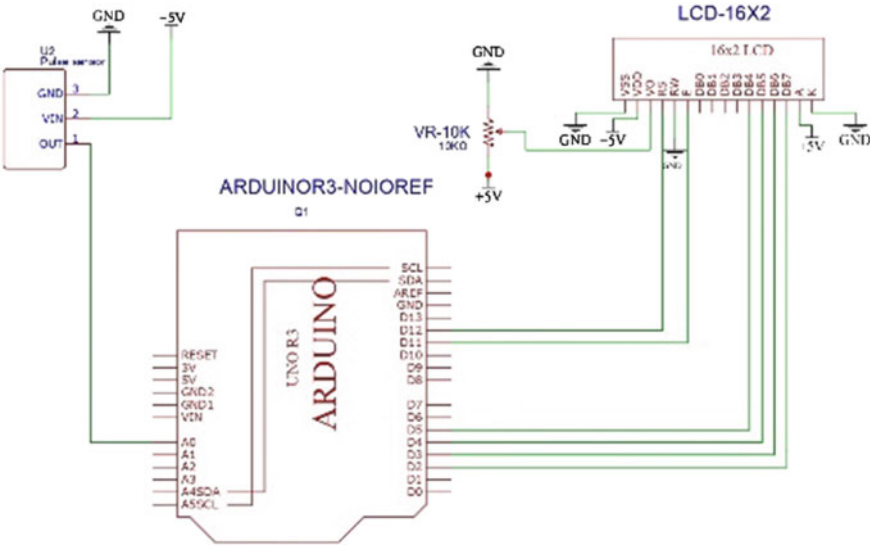

Fig. 4 Circuit diagram of pulse sensor

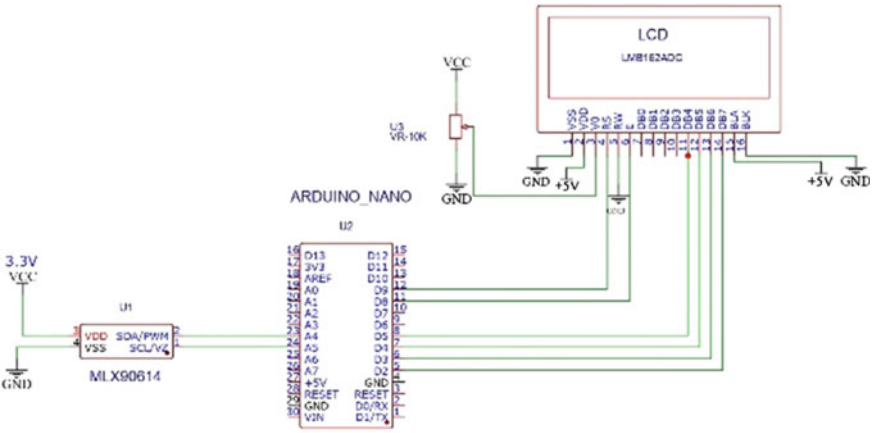

Fig. 5 Circuit diagram of temperature sensor

5.4 Results

Figure 6 indicates all the sensors, motors, actuators, and all the parts that are placed in the wheelchair. Below, we can see a clear vision of the project image as how the wheelchair responds (Figs. 7, 8, 9 and 10).

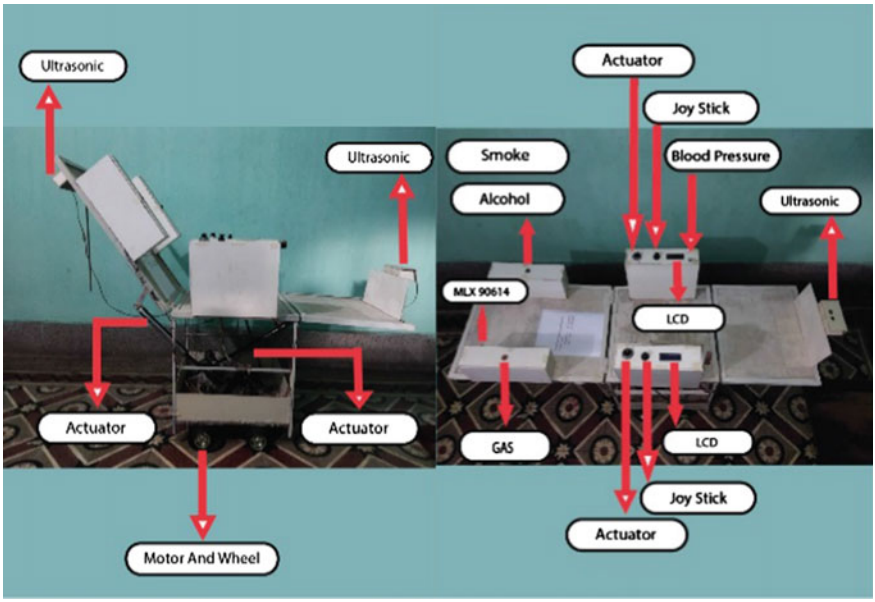

Fig. 6 Project overview

Fig. 7 Side view

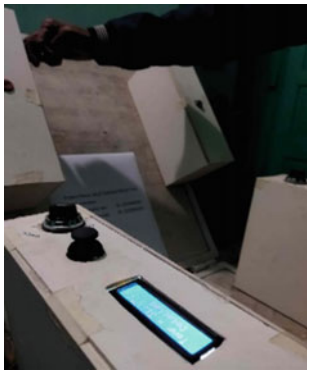

Fig. 8 Temperature sensor

Fig. 9 Heart beat sensor

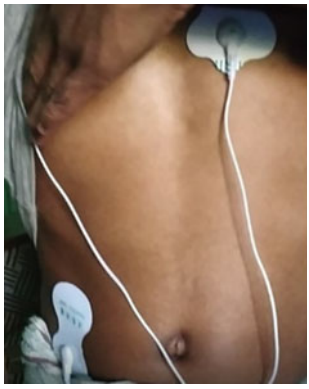

Fig. 10 ECG

6 Conclusion

A system for steering an electric multi-feature wheelchair that is both efficient and safe has been designed and tested. The multi-functional smart wheelchair's ingenious design allows it to travel left, right, forward, backward, or remain in place. However, by investigating new multi-features wheelchairs, the bulky and sophisticated designs have been addressed. When the user needs to inform someone (who will take care of the user) in an emergency, he or she can do so effortlessly with the help of a buzzer that is mounted on the multi-features wheelchair. The ease with which this wheelchair can be assembled is a huge benefit to the general population. This effort is entirely focused on achieving a social goal.

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OpenAI ChatGPT and the Accelerated Spread of Biased Information

Izzat Alsmadi, Michael J. O'Brien, and Milan Tuba

Abstract Motivated by the rise of new GPT language models and their impact on society, both realized and potential, we evaluated several potential impacts of those models, in particular bias and misinformation issues. Bias in machine learning models refers to their tendencies to make certain decisions more often than expected. Humans exhibit numerous biases that impact daily decisions, and although machine learning models can limit human decision-making biases, they can also create their own kinds of biases. However, when it comes to bias, not all kinds are negative, and some can be intentionally injected into the models to support equity. In the end, whether they occur in the real world or in the machine learning world, bias issues will always be open for debate. We view that debate becoming more and more important with respect to the explosion of OpenAI, in particular ChatGPT-3, and what it means for the future.

Keywords Bias · GPT-3 · Language models · Machine learning · OpenAI

1 Introduction

According to the OpenAI web page, OpenAI is a non-profit research company that focuses on artificial intelligence. The goal was defined as developing digital intelligence with the aim to help humanity welfare while not being restricted by an obligation of making a profit. The OpenAI web page also states that focus can be put on making a positive human impact specifically because no profit is expected.

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