

Password based Remote Access Control System through DTMF

B. Mounika¹, N Koteswaramma², A Navya³, T Rajeshwari⁴

*Department of ECE, Vignan Institute of Technology and Science
Deshmukhi, Telangana, India.*

ABSTRACT:

Security is prime concern in our day-to-day life. Everyone wants to be as much as secure as to be possible. An access control systems forms a vital link in a security chain. The micro controller based digital lock presented here is an access control system that allows only authorized persons to access a restricted area. The project PASSWORD BASED REMOTE ACCESS CONTROL SYSTEM THROUGH DTMF is a project which allows the user to control the door just by entering security code after calling to this system. Dual-tone multi-frequency signaling (DTMF) is used for telecommunication signaling over analog telephone lines in the voice frequency band between telephone handsets and other communications devices and the switching center. The version of DTMF used in push button telephones for tone dialing is known as Touch-Tone. DTMF decoder is needed to convert DTMF tones into 4 bit binary data. Each key has one unique 4 bit data which is read by micro controller. In this work micro controller plays an important role to control the door based on the inputs given from DTMF decoder. Stepper motor as door and L293d IC is used to drive the stepper motor.

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I. INTRODUCTION

The work is aimed to design a DTMF based to access control system that can be done remotely. User is able to control the door using a password by using mobile phone. In this modern days security became a bigger concern for an individual or an industry as they want to protect their important things which should not be accessed by others. So, Recognizing the need of security we developed a password based remote access control system through DTMF. In this project we make use of DTMF technology to enter the password which makes very secure for controlling the door from a distance from the place. In this way unauthorized people are not able to access the door and enter inside it. The owner has to be present at that place to enter the password if someone has to enter inside on the work of owner. The owner can say password to that person to enter but there is a chance of getting known password to others by him. So, there may be a chance of accessing without the permission of owner. In this proposed system, there is no need of owner to be present at that place to access the door. He can call the system and enter the password at a distance from that place system. The system can be called by the owner only as he only knows the number of the mobile phone which is attached to that system.

This work has the advancement from the existing system which improves the security and eliminates the limitations faced by conventional system. This project can be used at offices, personal rooms, etc. An embedded system can be defined as a computing device that does a specific focused job. Appliances such as the air-conditioner, VCD player, DVD player, printer, fax machine, mobile phone etc. are examples of embedded systems. Each of these appliances will have a processor and special hardware to meet the specific requirement of the application along with the embedded software that is executed by the processor for meeting that specific requirement. The embedded software is also called "firm ware". The desktop/laptop computer is a general purpose computer. You can use it for a variety of applications such as playing games, word processing, accounting, software development and so on. In contrast, the software in the embedded systems is always fixed listed below: Embedded systems do a very specific task, they cannot be programmed to do different things. Embedded systems have very limited resources, particularly the memory. Generally, they do not have secondary storage devices such as the CDROM or the floppy disk. Embedded systems have to work against some deadlines. A specific job has to be completed within a specific time. In some embedded systems, called real-time systems, the deadlines are stringent. Missing a deadline may cause a catastrophe-loss of life or damage to property. Embedded systems are constrained for power. As many embedded systems operate through a battery, the power consumption has to be very low. Some embedded systems have to operate in extreme environmental

conditions such as very high temperatures and humidity. Every embedded system consists of custom-built hardware built around a Central Processing Unit (CPU). This hardware also contains memory chips onto which the software is loaded. The software residing on the memory chip is also called the 'firmware'. The embedded system architecture can be represented as a layered architecture as shown in Fig. The operating system runs above the hardware, and the application software runs above the operating system. The same architecture is applicable to any computer including a desktop computer. However, there are significant differences. It is not compulsory to have an operating system in every embedded system. For small appliances such as remote control units, air conditioners, toys etc., there is no need for an operating system and you can write only the software specific to that application. For applications involving complex processing, it is advisable to have an operating system. In such a case, you need to integrate the application software with the operating system and then transfer the entire software on to the memory chip. Once the software is transferred to the memory chip, the software will continue to run for a long time you don't need to reload new software. Now, let us see the details of the various building blocks of the hardware of an embedded system. As shown in Fig.1, the building blocks are :

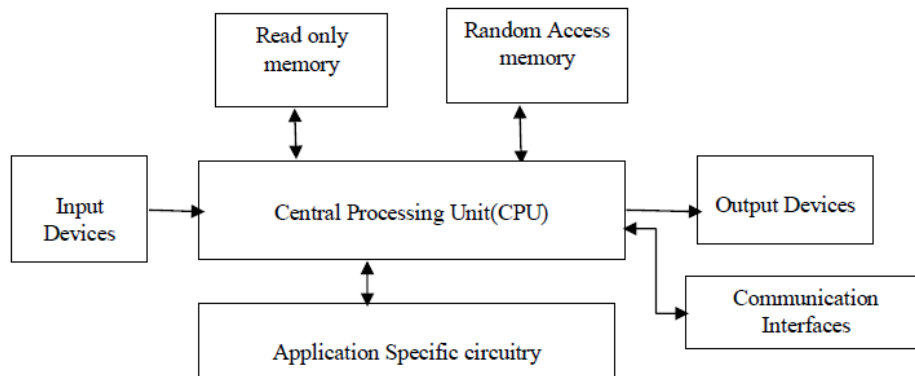


Fig.1 Hardware of an embedded system

The Central Processing Unit (processor, in short) can be any of the following: microcontroller, microprocessor or Digital Signal Processor (DSP). A micro-controller is a low-cost processor. Its main attraction is that on the chip itself, there will be many other components such as memory, serial communication interface, analog-to-digital converter etc. So, for small applications, a micro-controller is the best choice as the number of external components required will be very less. On the other hand, microprocessors are more powerful, but you need to use many external components with them. DSP is used mainly for applications in which signal processing is involved such as audio and video processing. The memory is categorized as Random Access Memory (RAM) and Read Only Memory (ROM). The contents of the RAM will be erased if power is switched off to the chip, whereas ROM retains the contents even if the power is switched off. So, the firmware is stored in the ROM. When power is switched on, the processor reads. Unlike the desktops, the input devices to an embedded system have very limited capability. There will be no keyboard or a mouse, and hence interacting with the embedded system is no easy task. Many embedded systems will have a small keypad-you press one key to give a specific command. A keypad may be used to input only the digits. Many embedded systems used in process control do not have any input device for user interaction; they take inputs from sensors or transducers and produce electrical signals that are in turn fed to other systems. The output devices of the embedded systems also have very limited capability. Some embedded systems will have a few Light Emitting Diodes (LEDs) to indicate the health status of the system modules, or for visual indication of alarms. A small Liquid Crystal Display (LCD) may also be used to display some important parameters. The embedded systems may need to, interact with other embedded systems as they may have to transmit data to a desktop. To facilitate this, the embedded systems are provided with one or a few communication interfaces such as RS232, RS422, RS485, Universal Serial Bus (USB), IEEE 1394, Ethernet etc. Sensors, transducers, special processing and control circuitry may be required for an embedded system, depending on its application. This circuitry interacts with the processor to carry out the necessary work. The entire hardware has to be given power supply either through the 230 volts main supply or through a battery. The hardware has to be designed in such a way that the power consumption is minimized.

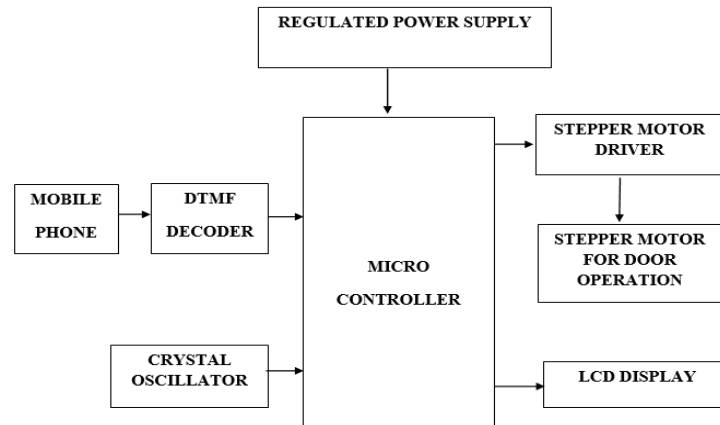


Fig.2 Block Diagram

The power supply section is the section which provide +5V for the components to work. IC LM7805 is used for providing a constant power of +5V. The ac voltage, typically 220V, is connected to a transformer, which steps down that voltage down to the level of the desired dc output. A diode rectifier then provides a full-wave rectified voltage that is initially filtered by a simple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variation. A regulator circuit removes the ripples and also retains the same dc value even if the input dc voltage varies, or the load connected to the output dc voltage changes. This voltage regulation is usually obtained using one of the popular voltage regulator IC units.

The Arduino Nano, as the name suggests is a compact, complete and bread-board friendly microcontroller board. The Nano board weighs around 7 grams with dimensions of 4.5 cms to 1.8 cms (L to B). This article discusses about the technical specs most importantly the pinout and functions of each and every pin in the Arduino Nano board. Arduino Nano has similar functionalities as Arduino Duemilanove but with a different package. The Nano is inbuilt with the ATmega328P microcontroller, same as the Arduino UNO. The main difference between them is that the UNO board is presented in PDIP (Plastic Dual-In-line Package) form with 30 pins and Nano is available in TQFP (plastic quad flat pack) with 32 pins. The extra 2 pins of Arduino Nano serve for the ADC functionalities, while UNO has 6 ADC ports but Nano has 8 ADC ports. The Nano board doesn't have a DC power jack as other Arduino boards, but instead has a mini-USB port. This port is used for both programming and serial monitoring. The fascinating feature in Nano is that it will choose the strongest power source with its potential difference, and the power source selecting jumper is invalid.

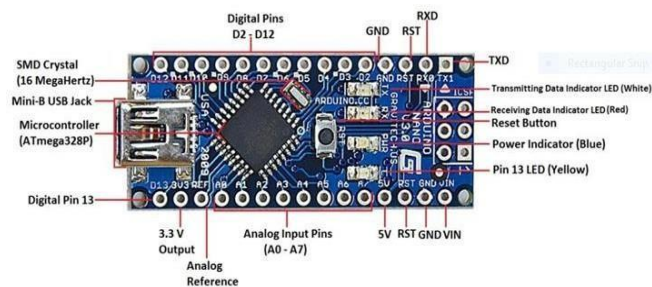


Fig.3 Arduino nano Board

A stepper motor is an electromechanical device which converts electrical pulses into discrete mechanical movements. The shaft or spindle of a stepper motor rotates in discrete step increments when electrical command pulses are applied to it in the proper sequence. The motors rotation has several direct relationships to these applied input pulses. The sequence of the applied pulses is directly related to the direction of motor shafts rotation. The speed of the motor shafts rotation is directly related to the frequency of the input pulses and the length of rotation is directly related to the number of input pulses applied.



Fig.4 stepper motor

DTMF is the most common telecommunications signaling method used in Australia. DTMF stands for Dual Tone Multiple Frequency; it is used to send information through phone lines to and from your local exchange. Dual Tone Multiple Frequency (DTMF) is also known as Touch-tone, Tone Dialing, VF Signaling and MF Dialing. DTMF Decoder is also used for receiving data transmissions over the air in amateur radio frequency bands. The following are the frequencies used for the DTMF (dual-tone, multi-frequency) system, which is also referred to as tone dialing. The signal is encoded as a pair of sinusoidal (sine wave) tones from the table below which are mixed with each other. DTMF is used by most PSTN (public switched telephone networks) systems for number dialing, and is also used for voice-response systems such as telephone banking and sometimes over private radio networks to provide signaling and transferring of small amounts of data. DTMF decoder connected to GSM module. It is not easy to detect and recognize DTMF with satisfactory precision. Often, dedicated integrated circuits are used. It is rather complicated, so it is used only marginally. Most often, a MT 8870 or compatible circuit would be used. The MT8870 is a complete DTMF receiver integrating both the band split filter and digital decoder functions. The filter section uses switched capacitor techniques for high and low group filters; the decoder uses digital counting techniques to detect and decode all 16 DTMF tone-pairs into a 4-bit code. External component count is minimized by on chip provision of a differential input amplifier, clock oscillator and latched three-state bus interface. Each DTMF tone consists of two simultaneous tones (one from the high group and one from the low group), which are used to indicate which number or symbol you press on your telephone's keypad. For example if you press number 5 on your telephone's keypad, the tone you will hear is 1336hz and 770hz played simultaneously. DTMF is an extremely reliable signaling method used by all Australian telecommunications companies to receive information from their customers. Whenever a number is dialed on a home phone, office phone, public or private payphone, DTMF is decoded and used by certain equipment inside that particular area's local exchange to call the number you have dialed. Dual Tone Multiple Frequency is the basis of voice communications control. Modern telephone circuits use DTMF to dial numbers, configure telephone exchanges (switchboards) from remote locations, and program certain equipment and so on. DTMF tones travel through the Red and Green wires (or Blue and White) wires on your standard home and office telephone line, as do voice signals. Almost any mobile phone is capable of generating DTMF, providing a connection has already been established. This is for the use of phone banking; voicemail services and other DTMF controlled applications. If your mobile phone can not generate DTMF (or your home or office telephone uses Decadic Dialing (Pulse Dialing) you can use a standalone Tone Dialer or White Box, which you may or may not be able to find on the market. DTMF is possible to use acoustic transfer. The DTMF tones can be sent from a standard speaker and be received using a standard microphone. DTMF tones were also used by cable television broad casters to indicate the start and stop times of local commercial insertion points during station breaks for the benefit of cable companies.

Until better out of band signaling equipment was developed in the 1990s, fast, unacknowledged, and loud DTMF tone sequences could be heard during the commercial breaks of cable channels in the United States and else where. In a telephone call a special - information tone is the three beep signal heard at the beginning of telephone company recorded announcements. There are eight variations of the SIT signal, all with different meanings. While all versions of the SIT signal indicate that a telephone call failed, the different variations of the SIT indicate WHY the call failed (e.g. disconnected number, busy circuits, dialing error, etc - see below for complete list).

A light-emitting diode (LED) is a semiconductor light source. LEDs are used as indicator lamps in many devices, and are increasingly used for lighting. Introduced as a practical electronic component in 1962, early LEDs emitted low-intensity red light, but modern versions are available across the visible, ultraviolet and infrared wavelengths, with very high brightness. The LED is based on the semiconductor diode. When a diode is forward biased (switched on), electrons are able to recombine with holes within the device, releasing energy in the form of photons. This effect is called electroluminescence and the color of the light (corresponding to the energy of the photon) is determined by the energy gap of the semiconductor. An LED is usually small in area (less than 1 mm²), and integrated optical components are used to shape its radiation pattern and assist in

reflection LEDs present many advantages over incandescent light sources including lower energy consumption, longer lifetime, improved robustness, smaller size, faster switching, and greater durability and reliability. However, they are relatively expensive and require more precise current and heat management than traditional light sources. Current LED products for general lighting are more expensive to buy than fluorescent lamp sources of comparable output. They also enjoy use in applications as diverse as replacements for traditional light sources in automotive lighting (particularly indicators) and in traffic signals. The compact size of LEDs has allowed new text and video displays and sensors to be developed, while their high switching rates are useful in advanced communications technology.

And the another module is LCD. This is I2C interface 16x2 LCD display module, a high-quality 2 line 16 character LCD module with on-board contrast control adjustment, backlight and I2C communication interface. For Arduino beginners, no more cumbersome and complex LCD driver circuit connection. The real significance advantages of this I2C Serial LCD module will simplify the circuit connection, save some I/O pins on Arduino board, simplified firmware development with widely available Arduino library.



Fig. 5 I 2 C L C D

And the software Description is The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328P. It offers the same connectivity and specs of the UNO board in a smaller form factor. The Arduino Nano is programmed using the Arduino Software (IDE), our Integrated Development Environment common to all our boards Use your Arduino Nano on the Arduino Desktop IDE If you want to program your Arduino Nano while offline you need to install the Arduino Desktop IDE To connect the Arduino Nano to your computer, you'll need a Mini-B USB cable. This also provides power to the board, as indicated by the blue LED (which is on the bottom of the Arduino Nano 2.x and the top of the Arduino Nano 3.0).

Select your board type and port Select Tools > Board > Arduino AVR Boards > Arduino Nano. Upload and run your first sketch :

To upload the sketch to the Arduino Nano, click the Upload button in the upper left to load and run the sketch on your board: Wait a few seconds - you should see the RX and TX LEDs on the board flashing. If the upload is successful, the message "Done uploading." will appear in the status bar



Fig.6 A r d u i n o D e s k t o p I D E

II. RESULTS AND DISCUSSION

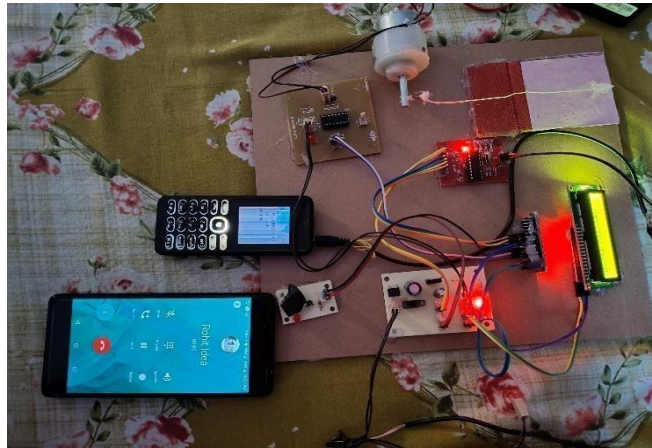


Fig .7 The owner has called the mobile phone connected to the system

The owner has to call to the mobile phone connected to the access control system connected to the door. He/ She has to enter the password (desired number from 0 to 9). Here we used DTMF (Dual-tone multi frequency) technology. It consists of a decoder HT9170 which is direct DTMF detector. Its output is a 4-bit BCD code. Each 4 bit code corresponding to a DTMF tone pair. The 4- bit code is represented by LED's

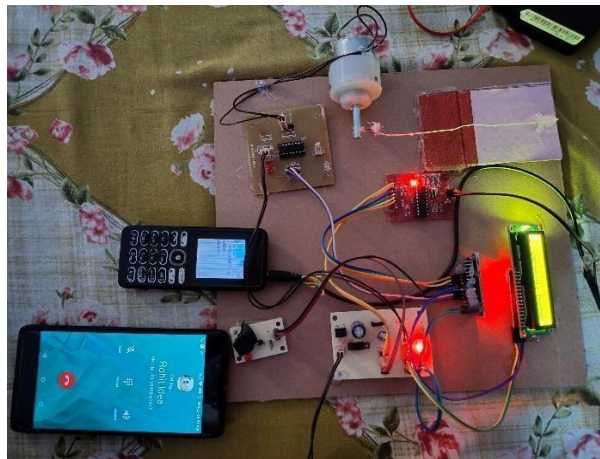


Fig .8 The Person present at the door has to accept the call

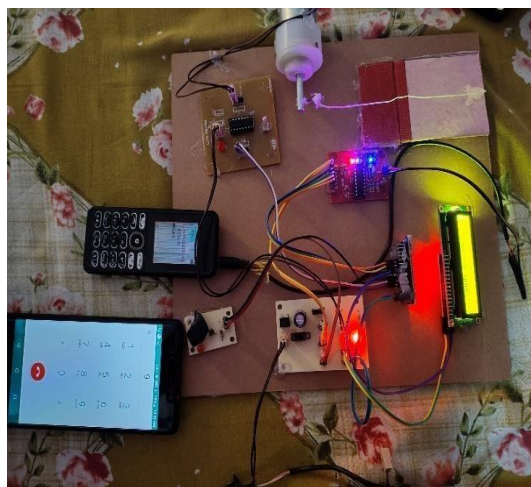


Fig .9 There will be a default Buzzer sound,9 has to be pressed to stop that Buzzer sound

If the light on, it represents 1 otherwise it is 0. The Arduino pins of 5,6,7,8 of D2, D3, D4, D5 names respectively are used as take input in 4-bit binary form. PIC16F72 accepts the 4-bit BCD code from HT9170 and checks if the DTMF tone pair stands for numbers between 0 to 9. The tone pair generated from the input by decoder is compared with predefined tone pair (password).

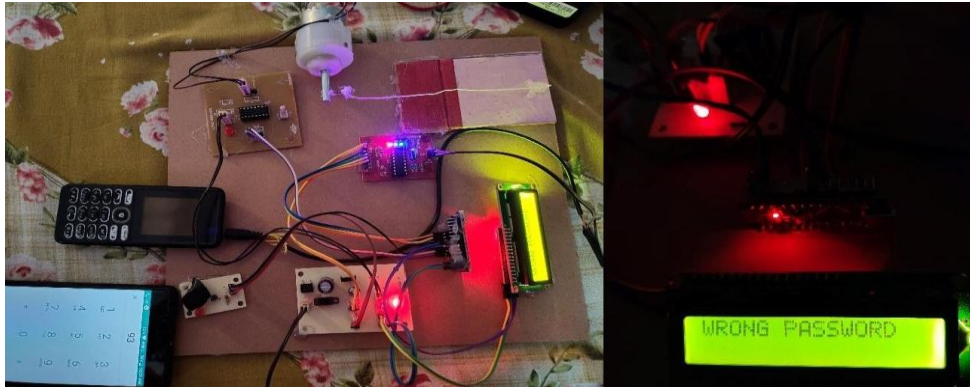


Fig .10 The password has entered by the owner from the phone .Suppose he enters incorrect password the door does not open and displays wrong password in the lcd module & there will be a buzzer alert

If the both of them matches then stepper motor rotates and door will be opens and the status of door is displayed on I2C display as "DOOR OPEN". If the password entered does not matches with actual password, then buzzer will "ON" which is alert as unauthorized people trying to access it. The buzzer sound continuous until the owner enters the predefined number. In this way our project is more secure than conventional system.

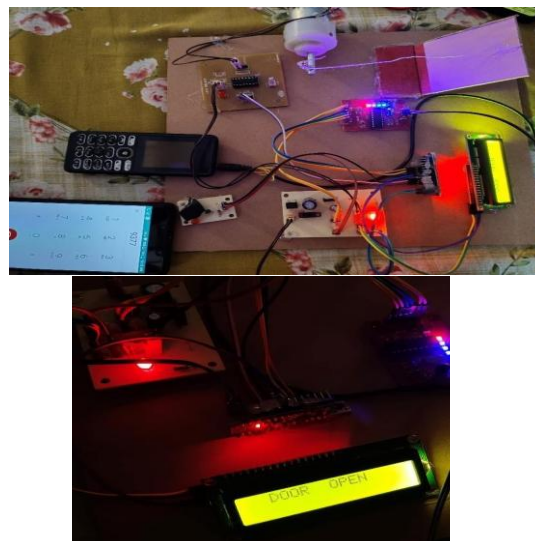


Fig .11 If the owner enter the correct password the door gets opened and the status of the door is displayed (door open) in the LCD module

III. CONCLUSION

Security is the main concern for an individual in these modern days. There will be difficulty if there is no privacy . For that purpose , our project works efficiently rather than existing system. So the limitations are dominated as we accessing the door from distance also . The reliable, affordable, simple design are the characteristics of the system which makes user friendly.

REFERENCES

- [1]. A Sai Krishna, P. Alekya, M. Satya Anuradha, P. A. Harsha Vardhini and S.R Pankaj Kumar, "Design & Development of Embedded Application Software for Interface Processing Unit (IPU)", International Journal of Research in Engineering and Technology (IJRET), vol. 3, no. 9, pp. 212-216, Sept. 2014.

- [2]. Vardhini, P. H., Ravinder, M., Reddy, P. S., & Supraja, M. (2019). Power optimized Arduino baggage tracking system with finger print authentication. *Journal of Applied Science and Computations J-ASC*, 6(4), 3655-3660.
- [3]. K. M. C. Babu and P. A. Harsha Vardhini, "Design and Development of Cost Effective Arduino based Object Sorting System," 2020 International Conference on Smart Electronics and Communication (ICOSEC), 2020, pp. 913-918, doi: 10.1109/ICOSEC49089.2020.9215269.
- [4]. K. S. S. Javvaji, U. R. Nelakuditi and B. P. Dadi, "IoT Based Cost Effective Home Automation and Security System", 2020 11th International Conference on Computing Communication and Networking Technologies (ICCCNT), pp. 1-5, 2020.
- [5]. N. Ananthula, T. Rajeshwari, B. Mounika, P. A. Harsha Vardhini and B. Kalyani, "Arduino based Rescue device with GPS Alert for Women Safety Application," 2022 International Mobile and Embedded Technology Conference (MECON), 2022, pp. 343-347, doi: 10.1109/MECON53876.2022.9751817.
- [6]. P. Sandeep, J. V. Rao, P. A. H. Vardhini, Y. Shanmukha Lakshmi Sai, A. Raju Sagar and P. Phaneendhar, "Arduino based Economical Floor Cleaning Robot," 2022 International Mobile and Embedded Technology Conference (MECON), 2022, pp. 263-267, doi: 10.1109/MECON53876.2022.9752317.
- [7]. Prakasam, V., Vikas Kumar Tiwari, and KR Anudeep Laxmi Kanth. "LabVIEW Based Temperature Controller using Arduino."
- [8]. K. K. Srinivas, A. Peddi, B. G. S. Srinivas, P. A. H. Vardhini, H. L. P. Prasad and S. K. Choudhary, "Artificial Intelligence Techniques for Chatbot Applications," 2022 International Mobile and Embedded Technology Conference (MECON), 2022, pp. 292-296, doi: 10.1109/MECON53876.2022.9751887.
- [9]. P. Upender and P. A. Harsha Vardhini, "A Hand Gesture Based Wheelchair for Physically Handicapped Person with Emergency Alert System," 2020 International Conference on Recent Trends on Electronics, Information, Communication & Technology (RTEICT), 2020, pp. 232-236, doi: 10.1109/RTEICT49044.2020.9315575.
- [10]. N. Koteswaramma and P. A. Harsha Vardhini, "Implementation of Arduino based Object Detection System", *International Journal of Modern Electronics and Communication Engineering (IJMECE)*, vol. 7, no. 3, pp. 2018-211, May 2019.
- [11]. K. Murali Chandra Babu, P. A. Harsha Vardhini and N. Koteswaramma, "Design and Implementation of Arduino based Riders Safe Guard 2.0", *International Journal of Innovative Technology and Exploring Engineering (IJITEE)*, vol. 9, no. 1, pp. 3078-3083, November 2019.
- [12]. P. Upender, G. N. Reddy and G. Santoshini, "Arduino based Accident Prevention System with Eye Twitch and Alcohol sensor," 2020 12th International Conference on Computational Intelligence and Communication Networks (CICN), 2020, pp. 130-134, doi: 10.1109/CICN49253.2020.9242577.
- [13]. P. A. Harsha Vardhini, M. H. Vishnu Sai and B. Matta, "Human Footstep Power Harvesting Systems using Piezoelectric Sensor Technology," 2022 International Mobile and Embedded Technology Conference (MECON), 2022, pp. 450-454, doi: 10.1109/MECON53876.2022.9752131.
- [14]. K. M. Chandra Babu and P. A. Harsha Vardhini, "Brain Computer Interface based Arduino Home Automation System for Physically Challenged," 2020 3rd International Conference on Intelligent Sustainable Systems (ICISS), 2020, pp. 125-130, doi: 10.1109/ICISS49785.2020.9315999.