Arduino Uno Based Voice Conversion System for Dumb People

Md Abdullah Al Rakib, Moklesur Rahman, Md Shamsul Alam Anik, Fayez Ahmed Jahangir Masud, Md. Ashiqur Rahman, Sanjib Islam, Fysol Ibna Abbas

Abstract—Around nine million individuals are dumb at intervals of the planet's unit of measurement. Communication between a deaf and a hearing person has a significant disadvantage as compared to communication between blind and elderly visual individuals. A dumb communication translator is a gadget that translates hand motions to sensible speech. This job provides assistance to persons who are deaf and dumb. The main goal of this research is to connect them to the actual world via a sophisticated methodology. It is based on Human Computer Interaction, in which the patient is connected to the outside world by translating their sign language into conventional language. In this work, Arduino Uno, MP3, and speaker module has been used. Some button has been used for generating the voice signal at the output.

Keywords—Arduino Uno, Dumb People, Sensor, Microcontroller, Communication.

I. INTRODUCTION

Communication is the primary means through which individuals communicate with one another. There has been a fast increase in the number of dumb victims in recent years as a result of congenital abnormalities, accidents, and oral infections. Because stupid individuals cannot speak with regular people, they must rely on some form of visual communication. This initiative is designed to assist these specially challenged persons in achieving equality in society. Communication is the primary means through which individuals communicate with one another. There has been a fast increase in the number of dumb victims in recent years as a result of congenital abnormalities, accidents, and oral infections [1]. Because stupid individuals cannot speak with regular people, they must rely on some form of visual communication. These projects are designed to assist these specially challenged persons in achieving equality in society [2].

The gadget not only translates alphabets but can also sort words by using produced press. A training mode is available on the gadget, so it suits every user, and the accuracy is flattened. The device will even be able to translate large gestures that require a single hand movement of pressing implies a method by which knowledge is collected from parts of the physical body (typically the hand) and processed to workout at tributes such as hand form, direction, and speed of gesture being performed. Because the user signs, the cameras capture the ever-changing image and location of the hand, and the images are subsequently analyzed to obtain the hand shape, position, and orientation [3].

The installation costs are an important issue since they typically determine the feasibility and viability of a project. The installation must be easy enough for a layperson to complete. The goal of this experiment was to create dumb people. They are able to live normal lives. Because the goal is to save labor costs, minimum oversight and calibration are required. The system's consistency must be optimized. Power usage must also be tracked.

The total design of Xiaohuang Yu and his colleagues consists of a stm32 MCU, flex4.5 bending sensor, mpu6050 six axis sensor, Bluetooth transmission module, and mobile phone speech software. It captures information about the user's hand movements using the flex4.5 bending sensor and the mpu6050 six axis sensor [4]. When compared to the old method, the gloves devised by M. Priyadharshini and his colleagues are relatively simple yet effective. The finger gesture was recognized using flex sensors, and the accompanying instructions are shown in the Android app with audio output. Arduino Uno and Raspberry Pi were used to build the suggested system [5]. Senthil Kumar M and his colleagues presented a technology that would assist these folks (blind – dumb) in engaging with their surroundings. This suggested system consisted of three components (Eyeglass, Walking Shoe, and Braille – Voice Application) [6].

The signs that are preloaded in the gadget are given via a microcontroller-based speaking system for the deaf and dumb. It is a microcontroller-based device that emits alert sounds simply by pressing the control buttons, which are pre-programmed with pre-defined messages such as "ask for water," "use the restroom," and so on. Here, the person can simply press the control button that indicates the sign of water (for example), and the device will emit the same sound with a certain output volume. The device's heart is a microcontroller. It keeps track of a person's requirements. So that it may access the data saved on the device whenever the user does. This technology allows the deaf and hard of hearing to communicate their needs. The person who is close to them will be able to recognize their need and assist them as a result of this [7]-[9].
II. SYSTEM DESIGN

Language is also a non-verbal mode of communication used by deaf populations all over the world. Because the languages lack a common root, they are difficult to decipher. A Dumb communication translator is a gadget that translates hand motions into speech with sensitivity. A gesture is a specific movement of the hands with a certain sort generated out of them in associate degree very language. At the same time, all facial expressions contribute to the gesture. On the other hand, a posture is a static variation of the hand used to hold an emblem. Gesture recognition may be divided into two categories: vision-based and detector-based. The downside of vision-based total approaches is that they require specialized processing algorithms [10]-[14].

The microcontroller IC is used to construct the control module. Microchip ATmega32 is the core controller. The ATmega32 is a flash microcontroller with Nanotechnology and a 10-bit A/D converter. It has 40 I/O (bidirectional lines) with a current of 25 milliamps per pin. It also features a built-in A/D converter with 10 channels and 32 Kbytes of program memory. By regulating the Fan Unit, Filter Unit, and Air Conditioner, the Controller Unit monitors the whole environment of the BTS room and maintains the room temperature. A data logging area is also included [15]-[18].

Arduino is a prototype platform built on open-source hardware and software that is simple to use. Arduino boards may read inputs such as light on a sensor, a finger on a button, or a Twitter post and connect them to an output such as an active motor, an LED, or publishing anything online.
The 2N2222 is a widely used transistor that serves as an example of an NPN transistor. It’s commonly employed as a tiny-signal transistor, and it’s still a popular little general-purpose transistor. Motorola described the 2N2222 as part of a family of devices during an IRE meeting in 1962. Many semiconductor firms have produced it since then [19]-[23].

By employing sound or music as an output, this handy little MP3 player may kick your projects up a level. This MP3 module is very simple to use. You can use it to play audio in seconds even if you don’t know how to code. It’s a great way for manufacturers to include noises or music in their work. To hear the programmed sounds, we’ll need an external device with a 3.5 mm audio connector, such as a speaker or headphones.

The 7805 Voltage Regulator, which is part of the 78xx series of fixed linear voltage regulators used to regulate such fluctuations, was employed in this application. It is a widely used voltage regulator integrated circuit (IC).

Keypads are an excellent method to get consumers involved in your project. They may be used to traverse menus, input passwords, and operate games and robots, among other things. In this part, we’ll look at how to set up a keypad on an Arduino. It is first demonstrated how the Arduino senses key presses, and then how to locate the pinout of any keypad. It will also be demonstrated, as a basic example, how to print out key pushes on a serial monitor and an LCD. Finally, how to activate a 5V relay when a password is input successfully is demonstrated. In this tutorial, I’ll be utilizing a 4X4 matrix membrane keypad, but there’s also code and wiring schematics for 3X4 matrix keypads. Membrane keypads are my favorite since they’re thin and feature an adhesive backing that allows you to apply them to almost any flat surface [25].

Here, we can see about the internal connection of keypad. A keypad’s buttons are organized in rows and columns. A 3X4 keypad contains four rows and three columns, whereas a 4X4 keypad contains four rows and four columns: A membrane switch is located beneath each key. A copper line beneath the pad connects each switch in a row to the other switches in the row. Each switch in a column is linked in the same way: a conductive trace connects one side of the switch to all of the other switches in the column.

In this study, a 1N4007 diode was also employed. It’s a rectifier diode with a PN junction. These types of diodes only allow electrical current to travel in one way. As a result, it may be used to convert AC to DC power. The 1N 4007 is electrically compatible with other rectifier diodes and may be used in place of any 1N400X family diode [24].
The reasoning for the Controller's operating process is called an algorithm. In the algorithm, many criteria and loops are used. It is depicted in the flowchart below.

Proteus 8 is the greatest simulation software for diverse microcontroller designs. It is popular because practically all microcontrollers are available in it, and it is a useful tool for electronics hobbyists to test applications and embedded systems. In Proteus 8Simulation Software, you may mimic your microcontroller programming. After modeling your circuit with Proteus 8 Software, you may go straight to PCB design, making it a one-stop shop for students and hobbyists. So, we are assuming you have a basic understanding of what proteus software is [26].

![Flow chart of the Algorithm](image)

Proteus 7.0 is a Virtual System Modeling (VSM) program that integrates circuit simulation, animated components, and microprocessor models to co-simulate microcontroller-based systems. Engineers may use this application to test their microcontroller designs in real time before building a physical prototype. This application allows users to interact with the design via on-screen indications, LED and LCD displays, as well as switches and buttons if the PC is connected. The Circuit Simulation module in Proteus 7.0 is a product that combines a SPICE3f5 analogue simulator kernel with an event-driven digital simulator to allow customers to use any SPICE model from any vendor [27].

![User interface of proteus 8.1](image)

III. HARDWARE SETUP AND RESULTS

When We Press Button-1 Then We Listen the Voice “Assa-lamualaikum, how are you? it is the Output for Button 1.

When We Press Button-2 Then We Listen the Voice “Please give me water for drink? it is the Output for Button 2.

When We Press Button-3 Then We Listen the Voice “What are you doing now? it is the Output for Button 3.

When We Press Button-4 Then We Listen the Voice “how was the day? it is the Output for Button 4.

When We Press Button-5 Then We Listen the Voice “I am very hungry? it is the Output for Button 5.

When We Press Button-6 Then We Listen the Voice “I want to some money? it is the Output for Button 6.

![Hardware implementation of this work](image)

IV. CONCLUSION

The design and assembly of an automated irrigation system were completed successfully. It helps to cut down on water use, human monitoring time, and labor costs associated with traditional approaches. A timed feedback control is used in this system to assess soil moisture and switch on the valve on demand at regular intervals. Simple electronic elements may be used to create such a system at a reasonable cost. The costliest component is the soil moisture probe. It is simple to set up in a home context and requires few resources. The design is currently in the early stages of development. Before the efficiency, durability, and dependability of the system can be shown, more testing must be undertaken. Furthermore, other enhancements may be made to make the system more adaptable, flexible, and user-friendly. This project succeeded in presenting a dependable, secure, rapid, and efficient method to replace an annual and unreliable system. This approach may be deployed in a variety of organizations, particularly academic institutions, to improve attendance management. This method will save time, minimize the amount of work required of the administrator, and eliminate the need for stationery by replacing it with an electronic device. As a consequence, a system has been built that produces desired outcomes, although there is still potential for improvement.

REFERENCES

[1] Li Ze et al. Fault-tolerant predictive torque control design for induction motor drives based on discrete space vector modulation. IEEE Journal of Emerging and Selected Topics in Power Electronics, 2021.
Md Abdallah Al Rakib received Bachelor of Science (B.Sc.) in EE from American International University Bangladesh (AIUB). He is also currently pursuing a Master’s Degree from American International University Bangladesh (AIUB). He started his career in September 2018 at City University-Bangladesh (CUB) as Lecturer in the Dept. of EEE. His research interest is focused on Power, Embedded system, Communication.

Md. Moklesur Rahman received his M.Sc. in Physics from Dhaka University, Bangladesh in 2012 and B.Sc. in Physics from Dhaka University, Bangladesh in 2011. He is currently working as a Lecturer in the Department of Physics (34th BCS Education cadre), Shaltazpur Govt. College, Sirajganj. His research interests are in Material Physics, IoT and Condensed Matter Physics.

Md Shamsul Alam Anik received his M.Sc. and B.Sc. from the Department of Physics, University of Dhaka, Bangladesh. He also completed his MBA from IBA, University of Dhaka. Mr. Anik is a very dynamic, passionate, and very known face in the civil society in Bangladesh. Mr. Anik has a lot of inspirational speeches for the youth. After all of that, he also completed his software engineering from IIT, University of Dhaka. For the last 12 years, he has had a research collaboration with Assistant Professor Dr. Abbas.

Fayez Ahmed Jahangir Masud completed his graduation and post-graduation from the Department of Applied Physics, Electrical & Electronic Engineering, University of Dhaka. He is the Under General Secretary of the Bangladesh physics Olympiad, & team leader of the Bangladesh physics Olympiad national team. He is currently working as a chief consultant, University of Arizona micro campus Bangladesh & head of academic Oxford International school and college. In addition, he is also working as an education researcher of O/A LEVEL and Higher secondary education system in Bangladesh. For the last 12 years, he has had a research collaboration with Assistant Professor Dr. Abbas.

Md. Ashiqur Rahman has completed his undergraduate degree (B.Sc.) & graduation degree (M.Sc.) in Physics from Department of Physics, University of Dhaka. He is currently doing his Ph.D. research at Graduate School of Science, Tokyo Metropolitan University at Tokyo prefecture Japan. He served as a Lecturer in the Department of Physics, Comilla University (CoU), Bangladesh from 31st July, 2016 to 30th November, 2018. He promoted as an Assistant Professor in the same University from 1st December 2018. Still Now, he has worked as an Assistant Professor in the Department of Physics, Comilla University (CoU), Bangladesh. His research interests are inorganic nanotube, carbon nanotube, thermoelectric materials, Superconductivity, Nanotechnology and Optics.
Sanjib Islam received his Bachelor of Science (B.Sc.) in EEE from Independent University, Bangladesh (IUB). He started his career as a researcher in the Dept. of EEE. His research interest is focused on Material science and Telecommunication Engineering.

Dr. Fysol Ilna Abbas received his Ph.D. in Material Science from the Department of Theoretical Physics, University of Dhaka, Bangladesh. The worldwide well-known Professor Dr. Arghya Taraphder, (IIT-Indian Institute of Technology Kharagpur, India) & Professor Dr. David J. Gonzalez (The University of Valladolid, Valladolid province, Spain) were his doctoral thesis reviewer of him from 22 July 2018 to 25 February 2019. Both of them are specialists in Material Science research works.

Dr. Abbas completed his M.Sc from the Department of Theoretical Physics (Condensed Matter Research Group) at the University of Dhaka in 2012. From the same university, he completed his B.Sc in Physics (2010). In the Graduate school of science, Tokyo Metropolitan University at Tokyo, Japan, Dr. Abbas is currently working as an active researcher. In his service career, he served as an Assistant Professor in the Department of Electrical & Electronic Engineering, City University Bangladesh (CUB) from 2018 to 2021. He has also served as a contractual faculty member in the MNS Department at BRAC University from 2014 to 2018. Dr. Abbas has more than 15 years of experience in teaching and research. He has more than 20 international publications in Elsevier, Springer, Wiley, Applied Physics Express, Russian metallurgy Society, Japanese Physical Society, American Institute of Physics (AIP), etc. His research interests are Liquid binary alloys, Nuclear physics (Theory), High entropy alloys (HEA), Thermoelectric materials (TE), Functional materials application, Superconductivity (SC), Photonics, Nanotechnology, Optics, and Solar cell.