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A Bot based on E-Motion and Research using Arduino and Artificial Intelligence

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***Abstract*: An Arduino-based bot is a computer programme that communicates with users via text or voice and uses the Arduino microcontroller board. Ultrasonic sensors and a microphone amplifier are linked to the Arduino board. The sensors can be applied to speech and hand gesture commands. Software such as Arduino IDE for writing code and local database for storing voice recorder data will be used. The development of bots using Arduino and AI has a number of unresolved research questions. These bots' primary goals are to provide useful and informative responses. Yet, there is an increasing demand for bots that can also comprehend and react to human emotional responses. Research on the social and ethical ramifications of bots created using Arduino and AI is required given the expanding use of bots in a variety of applications. The possible effects of bots on social interaction, employment displacement, and privacy can all be explored in this study. Using Arduino and AI, the user's inquiries will produce results that will be displayed as output.**

***Keywords*: Amplifier device, Arduino, Bot, Local database, Pyautogui, Python, Voice recognition.**

1. Introduction

Nowadays it's vital for any company to have the infrastructure to listen to social media streams whether it's Twitter, Facebook, Messenger, LinkedIn, email, or even the company's own application. Because most of the customers are using this stream to reach out to companies as they need help regarding a particular product or service. The company has to build a platform by which customer care representatives reach out to these people to ensure that they are happy. Till now the companies have set up huge customer care centers, where the users have to call and go through the IVR (Interactive Voice Response) process which will redirect them to the customer care representatives. This is usually very time-consuming and frustrating for the customer who has to wait until their chance comes to talk to the customer representatives. In today's world, no one has that much time to talk with customer care representatives. This has resulted in many unsatisfied customers over the years. Even though the company spends so much on customer cares service, there are not able to give an optimal outcome. The emerging trend of online chatting is gaining popularity, where the customer can chat with customer care representatives at any point in time from anywhere. This gives them the freedom for the customers to express their issues in a more elaborate way. As it turns out, Arduino is starting to truly become mainstream and 2017 looks like it's going to be full of new technologies and platforms. Bots are one of those technologies which are going to change the way we do conversations till now. A bot is a service that you communicate with through a chat interface that is driven by rules and occasionally artificial intelligence. The service might be in any significant conversation product and could be any number of things, from useful to entertaining. Gestures made with the hands are known as sign languages. By adhering to these norms or syntax, mute persons can communicate. These gestures and motions have their own syntax. The output aspect of this sign language is the subject of our study. We are studying a connection between bots and sign language to use the output we are getting from image processing, which will be sent to various platforms like bots. Hence, as a result of this, mute individuals can utilise sign language to communicate with bots. Overall, the integration of AI technology and Arduino technology offers a strong and adaptable foundation for the creation of bots with greater functionality. It is anticipated that as bot technology develops, chatbots created with Arduino and AI will advance in sophistication and become more prevalent in a range of applications.

2. Literature Review

Here, our research study outlines the specifications we need for the AI algorithm, Arduino wiring, and, ultimately, presenting the correct output.

In 2019, Jinan N. Shehab, et al. [1] suggested approach for controlling home application based on voice command. This system basically targets the elderly and disabled persons to enhance their life in the community. It can be concluded this work depending on Arduino microcontroller a successful system. It is user sociality and it is cost-effective, Low power consumption and it reduces risk.

In 2018, Arjun Pardasan, et al. [10] proposed a model which presents a way of human-interaction between abled people so; the primary goal of us project is to recognize the hand gestures of the differently abled person. An advantage of this is conventionally differently abled person used to type to give the machine an input but now they can use their sign language for

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communication and communicate in an efficient manner with machines.

In 2020, Alfiantin Noor, et al. [2] proposed to the study findings, which were obtained by examining journals, voice command implementation and design in the form of voice recognition and speech recognition can help people carry out daily activities.

In 2021, Gowri Shanmugam, et al. [3] proposed hand gestures as classification of the text provides the table with automation and simplification. It is academics, and engineers will all be able to make use of this technology.

In 2020, Pratibha P. Waghale, et al. [4] proposed that the objective of this was achieved, that is employed to style associate degree Arduino primarily based gesture system with associate degree measuring system.

In 2019, Nalini S. Jagtap, et al. [5] proposed that a chatbot is a rising in cloud-based trend and chatbot increases the effectiveness of business by providing a better experience with low cost. A simple chatbot with cloud based using Arduino is not a challenging task as compared to complex chatbot.

In 2019, Manoj Lal, et al. [6] proposed that using modular design for all its components a distributed environment facilitating transparent and high performance of the overall system has been created.

In 2017, Jakob Aberg, et al. [7] proposed that the result shows the social implications a chatbot interface can have on pro-environmental behavior and that these interfaces can be used as a mean to fight climate change.

In 2018, John Wood, et al. [9] proposed that the literature review has covered a number of selected papers that have focused specifically on chatbot design techniques in the last decade. A survey of nine selected studies that affect chatbot design has been presented, and the contribution of each study has been identified.

In 2018, Sagina Athikkal, et al. [8] proposed that the voice questions are parsed through an algorithm on a remote server that analyses the document for all possible relevant answer. The most relevant answer is sent back to the user, together with approximate confidence from the model. Reusable generic model which captures voice input and convert it into text and convert the text back to voice once the result received from the server.

In 2021, Tarun Lalwani, et al. [17] proposed that software applications, user interfaces that can be used includes command line, graphical user interface (GUI), menu driven, form-based, natural language, etc. The mainstream user interfaces include GUI and web-based, but occasionally the need for an alternative user interface arises.

In 2021, Niraj Wani, et al. [16] proposed that an artificially created virtual entity that interacts with users using interactive textual or speech skills. This CHATBOT directly chats with the people using artificial intelligence and Machine Learning concepts. This paper reviews the technique, terminology, and different platforms used to design and develop the CHATBOT. It also presents some actual practical life typical applications and examples of CHATBOT.

In 2020, Ahmed Kadem Hamed AlSaedi, et al. [11] proposed that for a long time, the problem of distinguishing gestures was important in computer vision because of the challenge of extraction the target object such as hand from a background that has been cluttered and all that in real-time. In fact, the human when looking to a certain image can easy detecting what is inside it but that very difficult for the computer if looks to the same image because it deals with the image as a matrix with three dimensions.

In 2020, Vaibhav Garg, et al. [12] proposed that a way of human-computer interaction between differently abled people so; the primary goal of our project is to recognize the hand gestures of the differently abled person.

In 2020, Yuhua Li, et al. [13] proposed that Arduino may be used to display a situation or environment's components, and that the algorithm can also be used to run the display of the output at a fast rate of speed.

In 2021, Faria Sorani, et al. [15] proposed that a hand gesture identification method for recognizing different hand acts using the PC Webcam. In the CNN program, hand movements are learned and classified. This research article proposes to use the PC webcam to identify different hand motions.

In 2019, Shreya bisen, et al. [17] proposed that, The purpose of a chatbot system is to simulate a human conversation. Its architecture integrates a language model and computational algorithm to emulate information online communication between a human and a computer using natural language.

Thus, we get the conclusion that our project should use artificial intelligence to implement the system appropriately and present the output accurately.

3. Proposed System

Now, the diagram below will demonstrate how voice and hand gesture recognition functions,

A. Voice Recognition

Here, we're using an Arduino-connected Voice Recognition V3 Module as our hardware for voice recognition.

According to our research, there are 80 voice commands available, and only seven of them can be active at once.

Below Fig. 1 shows that the voice sent by the user is sent to a voice recognition analyser, which then analyses the data in a database using an Arduino. The action will then be executed to provide the results to the user.

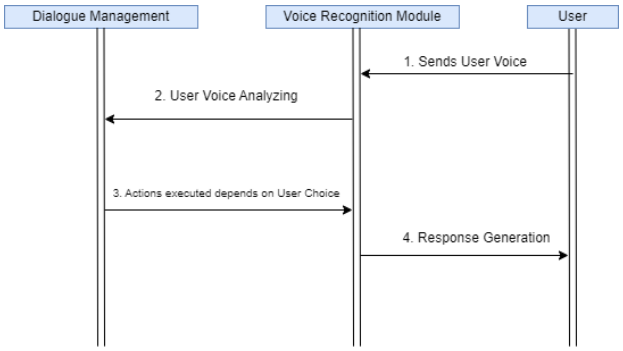


Fig. 1. Voice recognition detection

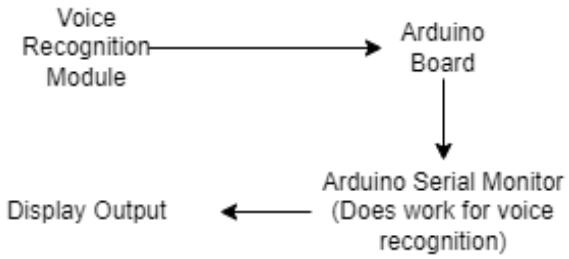


Fig. 2. Voice recognition algorithm

The algorithm for voice recognition from speaking into an Arduino is shown in Figure 2. It will analyze the voice in a serial system, which is essentially how voice from the module works, and display the output requested by the user.

Our goal for the voice in the future is to be as accurate as possible so that the user can receive an exact response.

B. Hand Gestures

Here, we'll use the camera sensor and ultrasonic technology to detect objects using hand motions (laptop camera).

Figure 3 shows that the object/hand detected by the user is sent to a sensor, which then analyses the data in a local database using an Arduino. The action will then be executed to provide the results to the user.

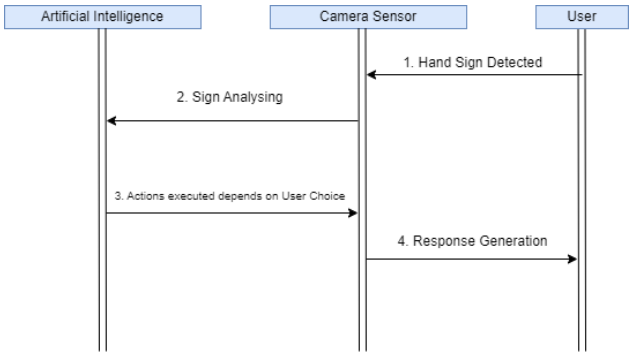


Fig. 3. Hand gestures detection

For our research, the bot in figure 3 accounts for the sensor used by blind and deaf users, giving them a simple fix in the form of a camera sensor for hand motion gestures.

In this system we also have used the artificial intelligence in order to match the gestures from the local database, we have used the k-mean algorithm, mediapipe for the live streaming media and cv2 uses for camera vision for better clarity.

There are a maximum of 9 gestures in this hand gesture function that the user can simply recognise and utilise to display the output in front of the camera.

We intend to increase the number of hand motions in order to improve physical functionality and accurate detection.

4. Implementation

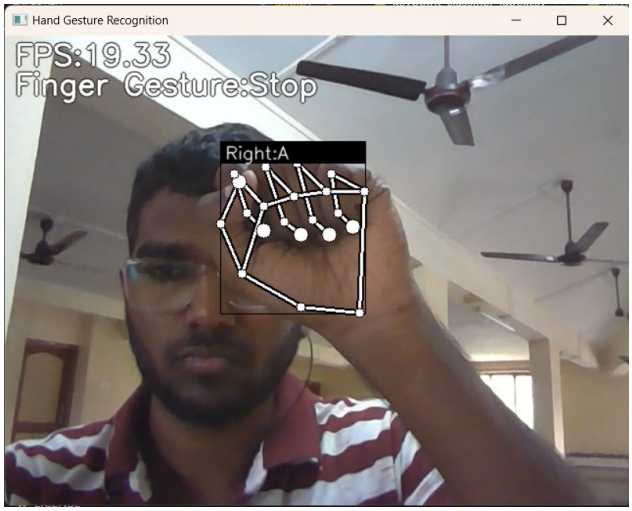


Fig. 4. Hand Gestures Detection-1

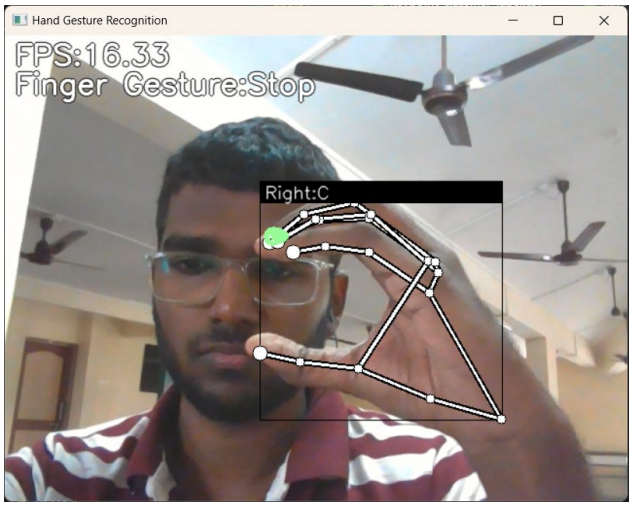


Fig. 5. Hand Gestures Detection-2

Figures 4 and 5 above demonstrate how an artificial intelligence (AI) programme can recognize hands used in sign language. It uses ultrasonic technology to identify hands at a distance and displays the results in the box in the figures 4 and 5.

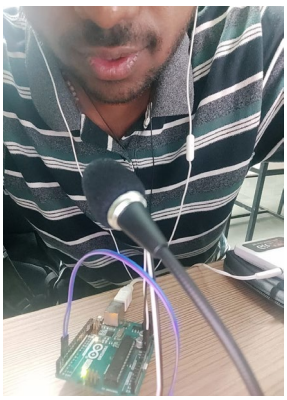


Fig. 6. Voice Recognition Detection-1

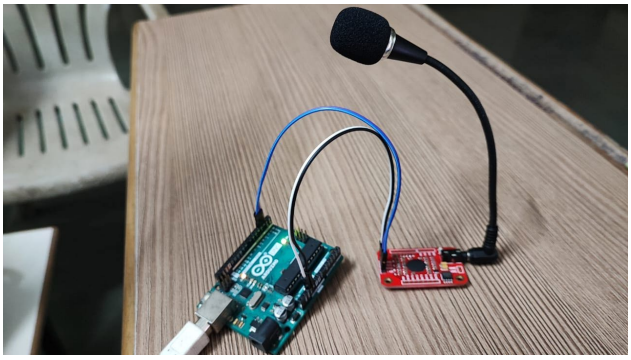
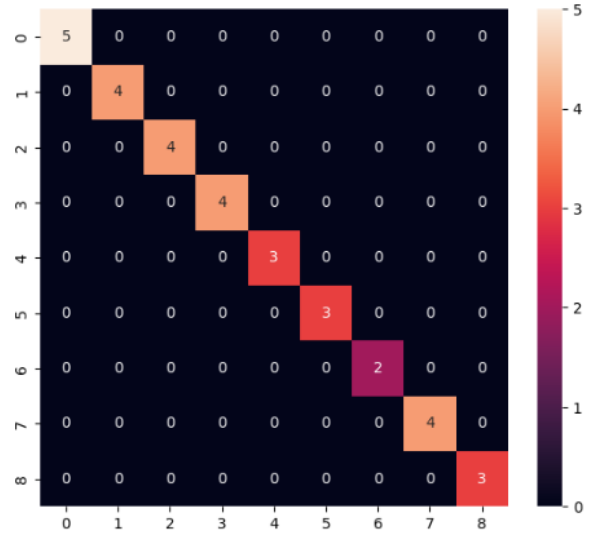


Fig. 7. Voice Recognition Detection-2

The figure 6 and 7, demonstrate how the system works during voice matching and speech detection so that it can display to the system, we have placed the Arduino system attached to the voice recognition 3 module.

5. Result and Discussion



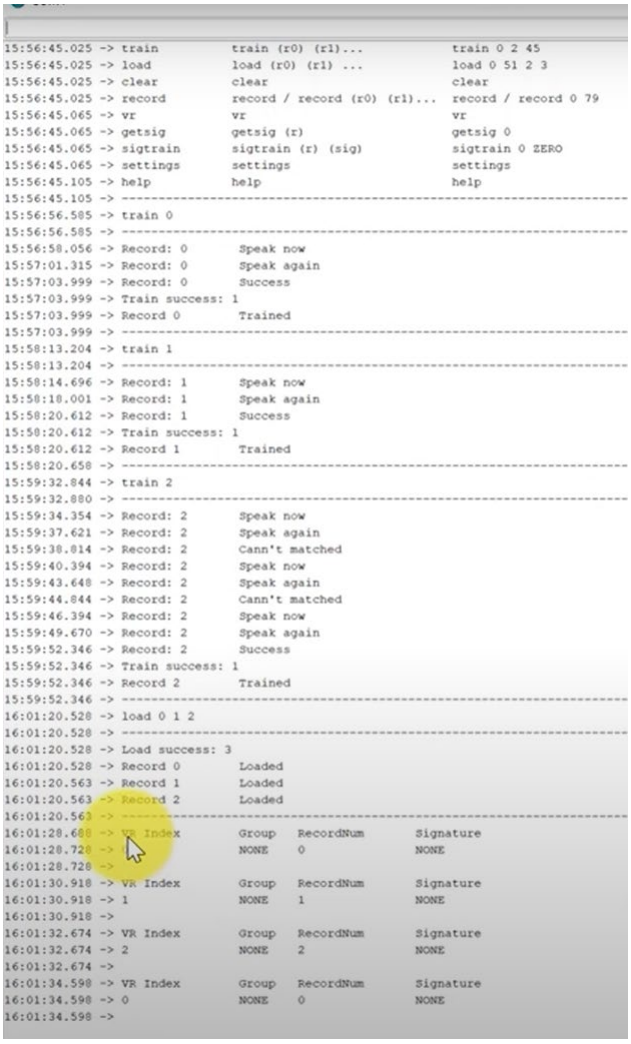
Classification Report

	precision	recall	f1-score	support
0	1.00	1.00	1.00	5
1	1.00	1.00	1.00	4
2	1.00	1.00	1.00	4
3	1.00	1.00	1.00	4
4	1.00	1.00	1.00	3
5	1.00	1.00	1.00	3
6	1.00	1.00	1.00	2
7	1.00	1.00	1.00	4
8	1.00	1.00	1.00	3
accuracy			1.00	32
macro avg	1.00	1.00	1.00	32
weighted avg	1.00	1.00	1.00	32

Fig. 8. Hand classification diagram

Figure 8, shows the accuracy of the hand detection during data logging into the database (which is .csv format) is shown in the above figures, which aids artificial intelligence (AI) in understanding the sign language provided by the user hand.

Figure 9, shows the training (transmitting the word from user to match those database) and loading (matching the word from database). The vr3 uses loading to begin speaking through the module to detect the word requested by the user.



```
15:56:45.025 -> train          train (r0) (r1)...          train 0 2 45
15:56:45.025 -> load           load (r0) (r1) ...          load 0 51 2 3
15:56:45.025 -> clear          clear                       clear
15:56:45.025 -> record         record / record (r0) (r1)...  record / record 0 79
15:56:45.065 -> vr             vr                          vr
15:56:45.065 -> getsig         getsig (r)                  getsig 0
15:56:45.065 -> sigtrain       sigtrain (r) (sig)          sigtrain 0 ZERO
15:56:45.065 -> settings       settings                    settings
15:56:45.105 -> help           help                        help
15:56:45.105 -> ------------------------------------------------------------------------
15:56:56.585 -> train 0
15:56:56.585 -> ------------------------------------------------------------------------
15:56:58.056 -> Record: 0      Speak now
15:57:01.315 -> Record: 0      Speak again
15:57:03.999 -> Record: 0      Success
15:57:03.999 -> Train success: 1
15:57:03.999 -> Record 0       Trained
15:57:03.999 -> ------------------------------------------------------------------------
15:58:13.204 -> train 1
15:58:13.204 -> ------------------------------------------------------------------------
15:58:14.696 -> Record: 1      Speak now
15:58:18.001 -> Record: 1      Speak again
15:58:20.612 -> Record: 1      Success
15:58:20.612 -> Train success: 1
15:58:20.612 -> Record 1       Trained
15:58:20.658 -> ------------------------------------------------------------------------
15:59:32.844 -> train 2
15:59:32.880 -> ------------------------------------------------------------------------
15:59:34.354 -> Record: 2      Speak now
15:59:37.621 -> Record: 2      Speak again
15:59:38.814 -> Record: 2      Cann't matched
15:59:40.394 -> Record: 2      Speak now
15:59:43.648 -> Record: 2      Speak again
15:59:44.844 -> Record: 2      Cann't matched
15:59:46.394 -> Record: 2      Speak now
15:59:49.670 -> Record: 2      Speak again
15:59:52.346 -> Record: 2      Success
15:59:52.346 -> Train success: 1
15:59:52.346 -> Record 2       Trained
15:59:52.346 -> ------------------------------------------------------------------------
16:01:20.528 -> load 0 1 2
16:01:20.528 -> ------------------------------------------------------------------------
16:01:20.528 -> Load success: 3
16:01:20.528 -> Record 0       Loaded
16:01:20.563 -> Record 1       Loaded
16:01:20.563 -> Record 2       Loaded
16:01:20.563 -> ------------------------------------------------------------------------
16:01:28.688 -> VR Index       Group   RecordNum       Signature
16:01:28.728 -> 0              NONE    0               NONE
16:01:28.728 ->
16:01:30.918 -> VR Index       Group   RecordNum       Signature
16:01:30.918 -> 1              NONE    1               NONE
16:01:30.918 ->
16:01:32.674 -> VR Index       Group   RecordNum       Signature
16:01:32.674 -> 2              NONE    2               NONE
16:01:32.674 ->
16:01:34.598 -> VR Index       Group   RecordNum       Signature
16:01:34.598 -> 0              NONE    0               NONE
16:01:34.598 ->
```

Fig. 9. voice recognition module implementation

6. Conclusion

However, the employment of AI with Arduino technology has made it possible to create bots that are more practical, adaptable, and affordable. AI algorithms allow bots to comprehend and react to input in normal language, and Arduino offers a cheap and simple platform for creating them. Yet, there are still a number of research gaps in the creation of chatbots utilising Arduino and AI, including the requirement for multilingual chatbots, chatbots with emotional intelligence, and studies on chatbot usability and social impact. This system basically targets the elderly and disabled persons to enhance their life in the community. Overall, it's fascinating to see how this technology develops over the next few years, and the combination of Arduino and AI technology offers a promising platform for the creation of chatbots with increasing functionality and variety.

7. Future Scope

In order to provide the user with the correct output and increase the number of gestures in the programming code, we have planned to add additional hand gesture movements in the future. Last but not least, in order for speech recognition to pick

up on the user's varied requests, we planned to add the appropriate voice for the user.

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