Input to Virtual Personal Assistant by Gesture Using Machine Learning and Arduino

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***Abstract*— A hand gestures are used to give the input to the virtual assistant. By which the user can operate a system only with the gestures. This project can also be used to listen voice of the user to perform an action in the system. This project will help the user to do the simple input tasks by keyboard and mouse replaced by gestures. We done the simple gestures for the personal computer to perform a frequently used processes screenshot, opening application that is used more frequently with the gestures and using the applications for user requirements. These hand gesture using Arduino is used by many and all the projects were in the beginning stages only so we hope to have this project to reach more users and make this project as a huge success. We not only making the gestures but also an AI virtual assistant. Last but not the least, In this project we integrated two technology Arduino and Machine Learning to have high hopes and the success of this project lead to a greater leap of using the personal computer. In python speech recognition is used to listen to the audio input and the training set that we already prepared will be verified and desired output will be provided. In Arduino, Microchip ATmega328P microcontroller is used with 6 analog input pins. The ultrasonic sensor is attached to read the input from the user by the disturbance of the wave and the echo strength reaching back the sensor. We show how to operate simple operation in personal computer through gesture and voice command.**

***Index Terms*— Microcontroller, Hand Gestures, Personal computer, Virtual Assistant, Ultrasonic Sensor, Speech, Python.**

I. INTRODUCTION

The domain of the project are machine learning and Arduino. Machine learning (ML) is the study of computer algorithms that improve automatically through experience. It is seen as a subset of artificial intelligence. Machine learning algorithms build a model based on sample data, known as "training data", in order to make predictions or decisions without being explicitly programmed to do so. Machine learning algorithms are used in a wide variety of applications, such as email filtering and computer vision, where it is difficult or unfeasible to develop conventional algorithms to perform the needed tasks.

A subset of machine learning is closely related to computational statistics, which focuses on making predictions using computers; but not all machine learning is statistical learning. The study of mathematical optimization delivers methods, theory and application domains to the field of machine learning. In its application across business problems, machine learning is also referred to as predictive analytics. Arduino is a

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microcontroller platform, it is fully open source method. Microcontroller its like a small IC & its just like a mini motherboard and it is the heart of the Arduino just like human being Example for our regular use product; Tv remote controls, air conditioner, washing machine, there are lots of device used by this ICs. It has 6 PWM(pulse width modulation). PWM is a method of reducing the average power delivered by an electrical signals, It turning the switch between supply & load, Its turn on & off, Simply the pulse while keeping the frequency constant. A hand gestures are used to give the input to the virtual assistant. By which the user can operate a system only with the gestures. This project can also be used to listen voice of the user to perform an action in the system. This project will help the user to do the simple input tasks by keyboard and mouse replaced by gestures. We done the simple gestures for the personal computer to perform a frequently used processes screenshot, opening application that is used more frequently with the gestures and using the applications for user requirements. These hand gesture using Arduino is used by many and all the projects were in the beginning stages only so we hope to have this project to reach more users and make this project as a huge success. We not only making the gestures but also an AI virtual assistant. Last but not the least, In this project we integrated two technology Arduino and Machine Learning to have high hopes and the success of this project lead to a greater leap of using the personal computer. In python speech recognition is used to listen to the audio input and the training set that we already prepared will be verified and desired output will be provided. In Arduino, Microchip ATmega328P microcontroller is used with 6 analog input pins. The ultrasonic sensor is attached to read the input from the user by the disturbance of the wave and the echo strength reaching back the sensor. We show how to operate simple operation in personal computer through gesture and voice command.

II. LITERNATURE REVIEW

From this project the gifted child is focused for converting the hand signs into speech by using Arduino and it can also be able to type the words from gestures [1] K.Manikandan Ayush Patidar Pallav Walia Aneek Barman. (i)This project can be used by common users. (ii)This app can be integrated with mobile and IoT device to improve user interaction. (iii)Mainly focused on person who cannot able to speak and deaf. This project is a web-based virtual personal assistant, The project crew named it as Percy [2] Sampad mondal Subham paul Somjeet Ganguly Ratul Dey. (i)Web based application is platform independent.(ii)By this app we get weather updates, News, Jokes, Search, Movie Trailers, To-Do lists. This project is used to play a car race games where two hands are used to steer, gas and break [3] Gopi Manoj Vuyyuru. (i)Ultrasonic sound is used to capture the hand gesture using Arduino kit. It is replacement for human arm/hand and its used for dangerous places for exam bomb diffuse [4] Dheeban SS Harish DV Hari VigneshPrasanna M. (i)The Zig-Bee protocol is used with accelerometer based gesture for accuracy.(ii)It is cost effective method.(iii)It can be used in dangerous places like bomb diffusing and fireworks. The system is being designed in such a way that all the services provided by the mobile devices are accessible by the end user on the user's voice command [5] M.R.Abhijith J.Patankar. (i)It is capable to work with and without Internet connection.(ii)It is used specially for blind person.
Author mainly used Multi-dialog model which uses voice and hand gesture as input. This will increase the communication and interaction between users and computers [6] G.Srinath D.Sreejith K.Nimal M.R.Sruthy. (i)It integrated with both hand gesture and voice recognition. (ii)This dialog system can be used in many files. This project is based on the Microsoft's sound wave and acoustic doppler sonar(ADS) to identify the hand gestures [7] Nidhi Gupta Ramandeep Singh Sidharth Bhatia.(i)It is very useful for automation.(ii)It provide an intuitive and effortless interface for communication with computers. A combination of the sensor values will be used to estimate the path taken by the hand while making the gesture. The sensor values will be used to form a data-set [8] S.Saravanan S.Govindrajan Ardit Sigh Himashu Bansal. i)This will be used to predict the character from the gesture made in thin air. The principle behind this project is actually very simple. All you have to do is use two ultrasonic sensors with Arduino. Place your hand in front of the ultrasonic sensor and calculate the distance between the hands and the sensor [9] Gaurav Sawardekar Parthil Thaker Rishiraj Singh Vaishali Gaikwad. (i)The design of the circuit is very simple. (ii)It is easy to handle. In this project, The motion of hands is detected to calculate its movement and convert that motion into English alphabet character [10] Pravin Kshirsagar. (i)It provides natural and intuitive communication modality for human computer interaction.

III. EXPERIMENTAL SETUP AND EXPERIMENTAL PROCEDURE

The integration of previously developed project with some enhancement that will provide best result for the users. The Arduino and Machine Learning both are integrated. As mentioned in the previous statement there are more options that users can choose their own way to use the service of personal assistant. The way we planned

is to have a longer range of sensing from the sensor but the actual usage can't have such comfort. Financially, First we planned to order the kit in e-commerce sites but the price ranges with delivery costs were abundant. So, we decided to buy it offline and the reason is not only the price but also to verify the kits. The personal assistant is a normal program in python using the pre-built library and the new problem arises by choosing the editor or IDE or notebook.

The previous projects were developed with single motive and single technology implemented and the other process needs another technology to do the required work (i.e) If a user requires to give a voice command to the system, there is a speech recognition library used and if the same user need to open some application without voice or I/O devices the user needs to have another application with Arduino support that may be a gesture input as our assumption. The user cannot have the both options on the single project itself which is considered as a flaw and need to be rectified. It is a common idea that everyone thinks of integrated things like pencil with eraser in the back(combo) etc… Some of the existing systems do not have a GUI which is essential for any user to work with the application while considering a application or project everyone can able to use it otherwise it won't said to be a good project unless it is developed only for the skilled persons like programmers etc…

In our project we integrated both gesture using Arduino and virtual personal assistant using machine learning to perform the process required for users. So, our application will have a superior look that is integrated with two technology(combo) it is easy for the users to work on it. The personal assistant performs similarly better with the gesture and provide a precise output as the user required to perform. The GUI will be prepared based on the time we have complete the main structure of the project and then the GUI will be developed with an ease. Our main motto is to have this technology in our surrounding and have to analyze the pros and cons of the project that we are initiating.

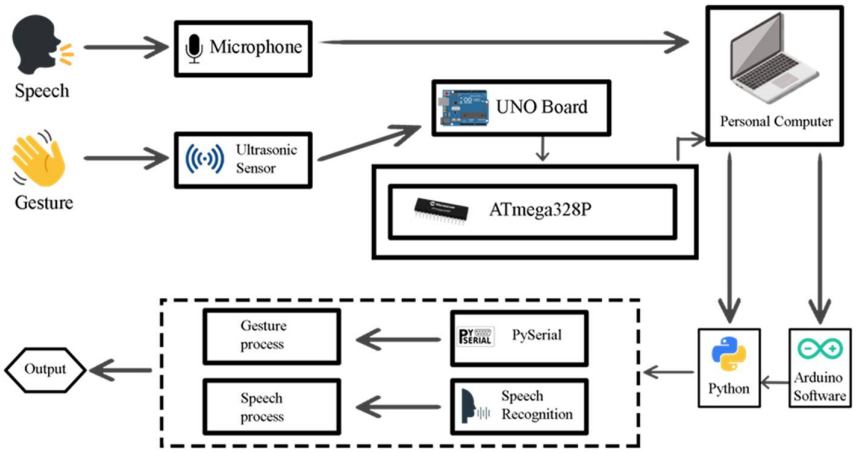

Figure 1. System architecture

IV. CONCLUSIONS

Thus the desired output using the speech and gestures were successfully implemented and the process of development is still going on by adding new features required to update.

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