# Voice Based Smart Robotic Arm

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***Abstract:*** ***A robotic arm is a type of mechanical arm, usually programmable, with similar functions to a human arm;the arm may be the sum total of the mechanism or may be part of a more complex robot.There are many places where humans are expected to interact with incendiary objects such as explosives and hazardous objects. Since ages such situation has caused casualties or life for many.In this project with the available technology we aim to build a voice controlled robotic arm capable of performing remote operation under above mentioned places,contributing a lot to human safety.Prime features of this arm will include it's ease to operate and low build cost without compromising on its functionality.With few amendments in hardware following project can be extended in arc welding,oxyacetylene welding,plasma welding.They find a great application in dangerous works like a nuclear experiment , greater precision and repeatability can be availed with robotic arm.Thus,these offer high productivity Advances in assistive technologies have begun to provide an increase in independence for these individuals, but there is great potential for further technological developments to significantly improve their abilities, independence, and overall quality of life.***

**Keywords**—Speech Recognition, Robotic arm.

## 1. Introduction

Robotics is a branch of engineering that involves the conception, design, manufacture, and operation of robots. This field overlaps with electronics, computer science, artificial intelligence, mechatronics, nanotechnology and bioengineering. A robotic arm is a machine that can execute different tasks repeatedly with high accuracy. Hence many functions like collecting information and studies about hazardous sites which is too risky for humans to venture is one of the most common applications of robotic arms. Robotics in general has revolved around the idea of replacing humans in order to improve the overall life style of mankind or do chores more efficiently.

## 2. Literature Survey

### *A.* Voice Controlled Personal Assistant Robot for Elderly People

Jishnu U K, Indu V and K J Ananthakrishnan [1] proposed a model which describes the design and development of a personal assistant robot, which is controlled by voice commands to pick long/short distance objects. Voice communication between the robot and android smartphone is done via Bluetooth which is achieved using HC05 module interfaced with android device or equivalent desktop application. The proposed four wheeled robot consists of a camera and robotic arm. The camera is used for object detection, distance measurement, and a robotic arm to perform pick and place actions which are achieved by producing calculated torque in servo motors. It can be widely used in many applications such as chemical industries, healthcare for the disabled and elderly population.

### *B.Voice Control Robotic arm as a physical assistant for paralyzed people:*

Adarsh Singh, Omkar Naik, Amit Ghadi [2] proposed a model which is used for persons who are paralyzed or the person may have lost their hand. This project presents a system whereby the human voice is used to command the robotic arm for specific needs. It is very similar to the human arm, and this robotic arm has a 6 D.O.F. The two main software used in this project is Matlab and Solid works. The main aim is to assist them in daily feeding activities. .It can be a real boon for handicapped people who are paralyze or lost their hands in some accident. This arm can be fixed on either wheelchair or on a bed as per individual needs.

***C. Robotic arm using voice and Gesture recognition:*** Dr. Nabeeh Kandalaft and Padma Sandeep Kalidindi [3] proposed a human machine interface for Explosive Ordnance Disposal is proposed based on gesture control. With the growing role of Remotely Operated Vehicles in bomb defusing scenarios aiding experts to locate, handle and destroy hazardous objects, new intuitive gesture based systems can be modeled on human hand movements to make the control of a complex gripper arm instinctive. Integration of such an arm for more precise control in accurately manipulating explosive devices would allow the ROV to actively assist in defusing the bombs as well. In this study, an adaptive manipulation scheme is proposed through a communication interface between an Arduino Uno Microcontroller, Leap Motion controller and OWI robotic arm. The results of the implementation demonstrate the ease of operation and effectiveness of gesture control as a technique. The user's hand movements are captured by the Leap Motion Controller and sent to the computer. The software algorithm performs all necessary computations, and information is received-from/sent-to the Arduino Uno via Bluetooth. Additional sensors, actuators, and display systems can also be attached via the micro-controller

board. The Arduino Board in turn drives the motors of the robotic arm.

***D.Speaker Dependent Voice Controlled Robotic Arm :***

Doğa Akçınar, Mustafa Kemal Arıtürk and Tülay Yıldırım [4] proposed to integrate the speech recognition system into the robotic arm and accordingly move the robot arm with the voice commands given instantaneously, hold the object and leave it the set of commands being {movements: Up, Down, Left, Right, Catch, Drop}. At the same time, the voice recognition system to be used in this work depends on the person and will only detect the voice of the desired person to make the system more reliable. Simpler models for signal processing are chosen over complex one. The hardware used is a basic computer in the form of raspberry pi 3, servo motors for producing torque and light and durable materials to create a base of arm. High torque motors are preferred to achieve low angles.

## 3. Proposed Work

Robotic applications are becoming ubiquitous. They are widely used in several areas (e.g., healthcare, disaster management, and manufacturing). However, their provisioning still faces several challenges such as cost efficiency. Cloud computing is an emerging paradigm that may aid in tackling these challenges. It has three main facets: Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS). Virtualization is a technique that allows the abstraction of actual physical computing resources into logical units; it enables efficient usage of resources by multiple users. Its role is a key to resource efficiency. Virtualization can be performed at both node and network level. This thesis focuses on the IaaS aspects of robotic applications as cloud computing services.

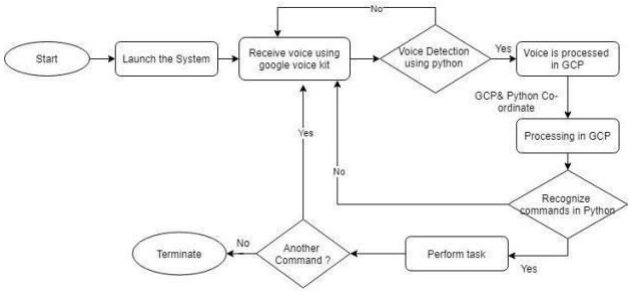


Fig. 1 Proposed system flowchart

### 3.1 System Architecture

The system architecture is given in Figure 1. Each block is described in this Section.

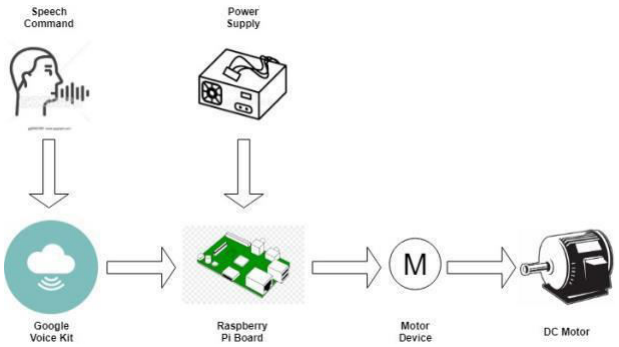


Fig. 2 Proposed system architecture

***A. Google voice kit:*** The AIY Voice Kit from Google lets you build your own natural language processor and connect it to the Google Assistant or Cloud Speech-to-Text service, allowing you to ask questions and issue voice commands to your programs. All of this fits in a handy little cardboard cube, powered by a Raspberry Pi Figure 1.

***B.*** **Raspberry Pi board**: The Raspberry Pi 4 uses a Broadcom BCM2711 SoC with a 1.5 GHz 64-bit quad-core ARM Cortex-A72 processor, with 1 MiB shared L2 cache. ... The Raspberry Pi Zero and Zero W use the same Broadcom BCM2835 SoC as the first generation Raspberry Pi, although now running at 1 GHz CPU clock speed.

***C.*** **Motor Device**: An electric motor is an electrical machine that converts electrical energy into mechanical energy. Most electric motors operate through the interaction between the motor's magnetic field and electric current in a wire winding to generate force in the form of torque applied on the motor's shaft.

***D.*** **DC Motor:** A DC motor is any of a class of rotary electrical motors that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields.

In our proposed system the whole database system is replaced GCP (Google cloud platform) .GCP requires no authentication for the voice input. We have used GCP software service for controlling movement. GCP has various features like it is an on demand service you use it when you need it. It uses the internet as a medium and it can have multiple clients .SAAS (Software as a service) SAAS the first level of GCP can be accessed anywhere at any platform. It's a lightweight application that can be accessed through any browser.

The main advantage of our system is that the command can be dynamic unlike the existing system in which the voice commands should match the previous voice samples from the database.

## 3 Requirement Analysis

The implementation detail is given in this section.

### 3.1 Software

The Python programming language is the programming language that is used to implement our prototype. Google App Engine (GAE) to implement the Wildfire Suppression Application. GAE is a Platform as a Service (PaaS) cloud computing platform used for developing and hosting web applications on Google's Infrastructure. And OS being Raspbian OS

### 3.2 Hardware

The experiment setup is carried out on a computer system which has the different hardware and software specifications as AIY voice-kit, servo motor (6), connecting wires, Speakers, microphone , memory card ,card reader, HDMI cable and LAN cable. Device with 4GB RAM.

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