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AUTONOMOUS ROBOT FOR NAVIGATION PURPOSE

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Abstract: The goal of the project is to create a system that uses a line following algorithm to help a robot pick and put objects. The three primary components of this system are the mechanical design, programming, and electric circuit. Time and labour are essential resources in today's rapidly evolving society for carrying out large-scale tasks. Human labour will be spared in routine and often carried out tasks thanks to autonomous navigation. In essence, this robot is controlled by a number of sensors. the direction marked on a white surface with black tape. The pick and place robot implementation is the focus of this system. Industries are using navigation robotics to reduce human error and improve productivity, accuracy, and efficiency of operations. One of the biggest benefits of integrating navigation robots into industries is their ability to operate in hazardous environments where humans are at risk, such as high temperatures and pressures.

I. INTRODUCTION

In the modern world, people and robots collaborate to complete tasks as given. A self-governing, autonomous robot that can work autonomously to complete tasks is called an assistance robot. These robots are currently being used in a variety of industries, military projects, and medical disciplines. Handling molten metal while performing jobs involving high temperatures or duties like defusing bombs could be fatal for humans. Therefore, people can be replaced by robots to carry out these kinds of risky duties.[1]
In today's rapidly changing world, manpower and time are two of the biggest obstacles to large-scale task completion. The two biggest advantages of using robots instead of

people are that they can operate in hazardous or uncomfortable environments and that they never get tired. Pick and place robots have been employed in a range of material handling applications within the industrial production industry. The project aims to develop a pick-and-place application for autonomous vehicle navigation. The Raspberry Pi 4 is used in this setup. As the primary control system, an Arduino Uno is used to accomplish the desired operation. It's among the most basic and user-friendly. The object is detected using an ultrasonic sensor, and it is subsequently lifted and placed from the designated spot to the desired area using a soft catching arm gripper. Robots are designed to make work easier and safer. Robots are capable of doing risky tasks and can take the place of a human. This robot can move in the following directions: forward, backward, left, right, pick, and place. Voice commands from humans, such as left, right, straight, and many more, are used to fully operate the robot and indicate its direction of travel. Consequently, this robot would make it easier for those with disabilities to carry out their everyday tasks [2].

II. LITERATURE SURVEY

Development Of Robotic Arm Using Arduino UNO is explained in paper [3]. Here they have used 4 servo motors to make joints of the robotic arm and the movement will be controlled with the help of potentiometer. The controller used is Arduino UNO. The analogue input signals of the Arduino's is given to the Potentiometer. The arm has been built by the Cardboard and individual parts are attached to the respective servo motors. The arm is specifically created to pick and place light weight objects. So low torque servos, with a rotation of 0 to 180 degrees have been used. Programming is done using Arduino 1.6.10. Thus, the paper basically focuses on creating a robotic arm with non-useful materials and its application on small purposes.[3]

In [4] Review on Object-Moving Robot Arm basedon Color by Areepen Sengsalonga, Nuryono Satya Widodo the objective of this finding is to make a manipulator which can sort objects on basis of color using specific motors and photodiode sensors programmed with a Arduino Mega series microcontroller. The light photodiode sensor can identify RGB colors. In this system the output of Arduino Mega 2560 is displayed on a LCD screen which is an indication of the observed color. The first step of object moving process is by distinguishing the RGB color. The gripper of robotic arm will move to pick objects based on color, depending on the color input given by the light photodiode sensor. Arduino Mega 2560 is a microcontroller that uses ATmega2560 which is installed in robotic arm having 54 digital i/o ports segregated into different types. In this paper a color sensor testing is also carried out, having a target to determine the ability of Photodiode sensor for distinguishing of color. The resultant voltage from photodiode will be sent to ADC to process and show result on the LCD screen provided. In [5] "Mobile Robot Assistance for Disabled and Senior

Citizens Using Hand Gestures", Numbness and movability impairments impact the autonomy of elder people while performing their independent tasks. Gesture role acts as a bridge between human's ad machines. This work focuses on Human-Robot Interaction (HRI), designed for the assistance of wheelchair-bound people with the assistance of mobile robots.

The study goes on mechanical working of Dc motor referred from K.S fu & R.C Gonzalez [6]. To control robotics, sensing, vision & intelligence details taken from C.S.G Lee [7]. The study of working with DC motor include the selection of motor based on the required about the speed of the robot movement & weight to be carried and also power consumption [8]. In this robotics system the motors used are having high torque & low speed because of it needs to carry some more weight of pick and place arm with it [9].

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III. PROBLEM STATEMENT

Problems with robot navigation

As it can automatically alter a person's destination's location and route, robotic navigation can occasionally lead to serious problems. These problems may be adversely affecting logistical, communication, and other media. Mobile devices can be used to control the robotic navigation system, which can also grow [3]. Navigating the system can be problematic for businesses as it can lead to losses and other problems with business expansion. There are now major concerns because a hacked domestic robot has the potential to physically hurt household members. Different robotic navigating systems have tamperable sensors that are unable to supply further information. Due to connectivity problems, the satellites are also unable to provide locations, which is causing various navigational complications.

IV. NEW APPROACH

In order to prevent card clutter and different PIN problem we have introduced the Smart Card which uses RFID technology to access the different account and Biometric Authentication is used instead of PIN and withdrawing the money can be done through

V. OBJECTIVES

- First and foremost, this project's goal is to get the system to understand user voice commands by detecting their utterance.
- Second, the object has to be recognized by the system, which then needs to approach it autonomously. The robot must then pick up the thing, place it where the voice instruction directs, and then return to its initial location.

VI. BASIC WORKING PRINCIPLE

The design methodology consists of two main components; Hardware (That describes the system's physical components) and Software (Which instructions are encoded on the computer). The block diagram of the system is shown in Figure 1.

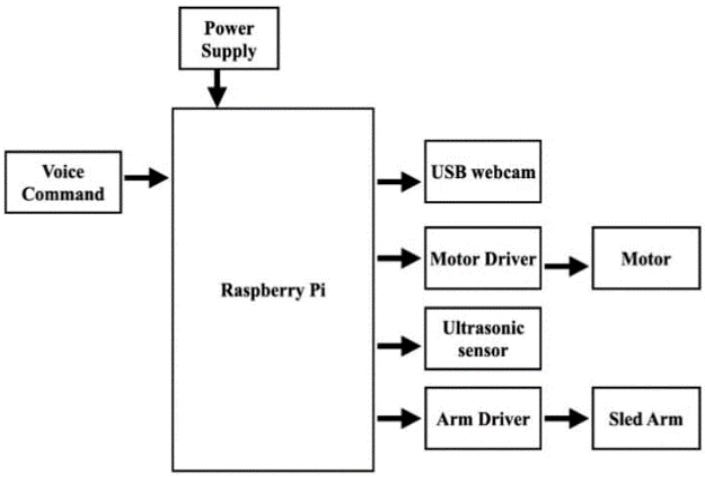

Fig.1 block diagram

VII. BASIC COMPONENTS

The hardware components are

- Raspberry Pi 4
- Roboclaw 2x7A
- GSM (SIM 900A)
- ARDUINO (UNO)
- Ultrasonic Sensor (HC-SR04)
- Sled arms

7.1 Raspberry Pi 4:

It serves as the robot's brain. It does all of the calculations for the robot's movement and task execution. It serves as the central location for all of the electronics and sensors, enabling them to cooperate.

Fig.2 Raspberry Pi 4

7.2. Clawed Robot 2X7A:

The system's two RoboClaws are its main power source. These are the motor controllers that actually enable the robot to move and carry out its necessary functions. The single robotic sled motor that was utilized to pick up the object is controlled by the second RoboClaw, while the first RoboClaw manages both of the tank-tread motors

Fig.3 Clawed Robot 2X7A

7.3 GSM (SIM 900A)

GSM is a standard for mobile communication that allows voice and data transmission over cellular networks. SIM900A GSM module delivers GSM/GPRS 900/1800MHz. The GSM module can transmit data, such as weight measurements or GPS coordinates, to a central server or monitoring station via the Cellular network. Figure 4 shows GSM SIM 900A.

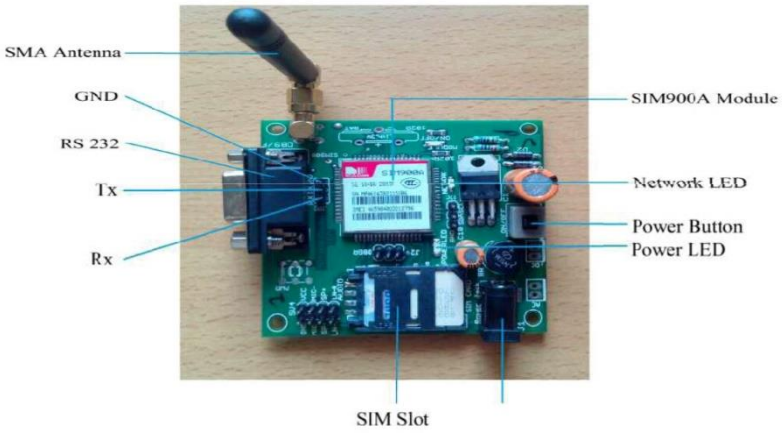

Fig.4 GSM

7.4 ARDUINO (UNO)

Arduino is an open-source electronics platform featuring user-friendly hardware and software components. It includes a programmable microcontroller equipped with digital and analog input/output pins, making it versatile for a wide range of applications. Its simplicity, coupled with the Arduino IDE and a simplified version of C++ programming language, makes it accessible to beginners and hobbyists interested in electronics and programming. Arduino finds applications in diverse fields such as robotics, home automation, art installations, and scientific research. With a vibrant community of users, Arduino encourages collaborative learning and innovation by facilitating the sharing of projects, code, and knowledge. This open approach has democratized electronics, empowering enthusiasts, students, and professionals to create interactive and intelligent projects effortlessly.

7.5 Ultrasonic Sensor (HC-SR04)

The ultrasonic sensor is a non-contact type of sensor used to measure an object's distance and velocity. This sensor operates on sound wave property to measure the velocity and distance of the object.

Ultrasonic sensors can detect the movement of targets and measure the distance to them in many automated factories and process plants. Sensors can have an on or off digital output for detecting the movement of objects, or an analog output proportional to distance. They can sense the edge of the material as part of a web guiding system. Passive ultrasonic sensors may be used to detect high-pressure gas or liquid leaks, or other hazardous conditions that generate ultrasonic sound. In these devices, audio from the transducer (microphone) is converted down to the human hearing range.

Fig.5 Ultrasonic Sensor (HC-SR04)

VIII. RESULT AND DISCUSSION

This robot is quite unique because it can observe objects through a camera using machine learning models and computer vision, and it can react to changes in the object's position in the camera to carry out duties. The model can detect objects and carry out pick-and-place tasks up to a predetermined mass, which in our instance is 06–10 kg. In our scenario, the robot is designed to identify an object a water bottle, for instance. Using Snow Boy, the robot recognized the voice command. "Hey Robot" is the robot's wake-up command. The system then eliminates many spoken instructions. We issue the instruction "water bottle" after ten seconds. The object is identified by the system through the use of an ultrasonic sensor, computer vision, and machine learning. It can detect objects at a maximum distance of 25 cm. It can then travel towards the thing and lift it with its arms up to a maximum weight of 06–10 kg. If the object is not identified, the LED will blink, signalling that it is not located. The robot can operate in extreme conditions, such as low temperatures and high pressure, where human operations would be extremely challenging. In the meantime, this type of robot improves human security while lowering human labour and harsh circumstances.

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CONCLUSION

Automated robots will lower labour costs and work intensity in manufacturing facilities and other industries. Thus, the goal of this project is to create a system that may use line-following application to transfer an object from one place to another. A specific amount of weight will be carried by the robot, which will be helpful in the healthcare system, industrial, library, and residential applications. The ability of autonomous robots to save time is crucial for achieving rapid manufacturing. These days, the biggest obstacles to task completion are manpower and time. Industrial tasks and dangerous operations can be completed quickly, simply, and safely with the help of this technology.

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