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IOT BASED ROBOTIC ARM FOR ASSISTING OLDER PEOPLE AND SMART HOME AUTOMATION SYSTEM

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Abstract :

Robotic arm is a reprogrammable and multifunctional manipulator design to assist human in various surroundings. It is able to overcome human inefficiency in performing repetitive task such as pick and place operation. The Robotic Arm is controlled by Raspberry pi 4 with the help of Internet of Things(IOT). The programming used in Raspberry pi 4 is java to control the Robotic Arm. Internet of things (IOT) allow data to be exchange between devices through the connection of many devices. The integration of internet of things with robotic arm allows smart industry to be realized. The Robotic Arm helps older people in giving medicines etc. The Robotic Arm consists of servo motors and assigned with Pulse Width Modulation Signals. We can control the movement of Robotic Arm by using Blynk App with the help IOT.

In Addition to this we are controlling the bulb and dc fan with the help of IOT by using Node MCU with the help of IOT,NOD MCU is an opensource connect objects and let data transfer using the Wi-Fi protocol. To see the visuals of the elderly people we have used camera which is interfaced visuals by using Blynk app. With the help of this prototype we can control the elderly persons from anyplace with the help of IOT.

1.INTRODUCTION:

In today's world 15% of the population or some 1 billion individuals live with one or more disabling conditions. More than 46 percent of older persons , those aged 60 years and over have disabilities and more than 250 million older people experience moderate to severe disability. Looking ahead, the global trends in ageing populations and the higher risk of disability in older people are likely to lead to further increases in the population affected by disability. Older people or physically handicapped people usually cannot walk and do things as efficiently as young people . Such people need a care taker to carry out their regular activities. Instead of such care takers, one can make use of current technologies and develop an embedded system that can help them in carrying out their regular activities without the need to move from one place to other. One such application is robotic arm that can help elderly people or physically handicapped people in bringing the things they require with the help of a controlling device .

Embedded Systems

An embedded system is a microprocessor-based computer hardware system with software that is designed to perform a dedicated function, either as an independent system or as a part of a large system. At the core is an integrated circuit designed to carry out computation for real-time operations.Complexities range from a single microcontroller to a suite of processors with connected peripherals and networks; from no user interface to complex graphical user interfaces. The complexity of an embedded system varies significantly depending on the task for which it is designed.
Embedded system applications range from digital watches and microwaves to hybrid vehicles and avionics. As much as 98 percent of all microprocessors manufactured are used in embedded systems.

Embedded systems are managed by microcontrollers or digital signal processors (DSP), application-specific integrated circuits (ASIC), field-programmable gate arrays (FPGA), GPU technology, and gate arrays. These processing systems are integrated with components dedicated to handling electric and/or mechanical interfacing.
Embedded systems programming instructions, referred to as firmware, are stored in read-only memory or flash memory chips, running with limited computer hardware resources. Embedded systems connect with the outside world through peripherals, linking input and output devices.

Basic structure of embedded systems

The basic structure of an embedded system includes the following components:

Sensor: The sensor measures and converts the physical quantity to an electrical signal, which can then be read by an embedded systems engineer or any electronic instrument. A sensor stores the measured quantity to the memory.

A-D Converter: An analog-to-digital converter converts the analog signal sent by the sensor into a digital signal.
Processor & ASICs: Processors assess the data to measure the output and store it to the memory.

D-A Converter: A digital-to-analog converter changes the digital data fed by the processor to analog data

Actuator: An actuator compares the output given by the D-A Converter to the actual output stored and stores the approved output.

The current Internet revolution along with the increasing robotics in many day-to-day operations of the Internet of Things has taken over all
the heavy loads from the person to itself.

Internet of things :

The internet of things, or IoT, is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.
A thing in the internet of things can be a person with a heart monitor implant, a farm animal with a biochip transponder, an automobile that has built-in sensors to alert the driver when tire pressure is low or any other natural or man-made object that can be assigned an Internet Protocol (IP) address and is able to transfer data over a network.Increasingly, organizations in a variety of industries are using IoT to operate more efficiently, better understand customers to deliver enhanced customer service, improve decision-making and increase the value of the business.

An IoT ecosystem consists of web-enabled smart devices that use embedded systems, such as processors, sensors and communication hardware, to collect, send and act on data they acquire from their environments. IoT devices share the sensor data they collect by connecting to an IoT gateway or other edge device where data is either sent to the cloud to be analyzed or analyzed locally. Sometimes, these devices communicate with other related devices and act on the information they get from one another. The devices do most of the work without human intervention, although people can interact with the devices for instance, to set them up, give them instructions or access the data.

2.COMPONENTS:
The Raspberry Pi is a single computer board the size of a credit card that can perform many of the functions that your computer can, including gaming, word processing, spreadsheets, and HD video playback. The Raspberry Pi Foundation, based in the United Kingdom, founded it. It's been available to the public since 2012, with the goal of creating a low-cost educational microcomputer for students and children. The Raspberry Pi board was created with the primary goal of encouraging school-aged pupils to learn, experiment, and innovate. The Raspberry Pi board is small and inexpensive. The majority of Raspberry Pi computers are found in mobile phones. The rapid development of mobile computer technologies in the twentieth century was unprecedented.

NODE_MCU:
Node MCU is an open-source Lua-based firmware and development board designed specifically for Internet of Things (IoT) applications. It includes firmware that runs on Espressif Systems' ESP8266 Wi-Fi SoC and hardware based on the ESP-12 module. The ESP-12E module on the Node MCU ESP8266 development board contains an ESP8266 chip with a TensilicaXtensa 32-bit LX106 RISC microcontroller. This microprocessor runs on a configurable clock frequency of 80MHz to 160MHz and supports RTOS. To store data and programs, the NodeMCU contains 128 KB of RAM and 4MB of Flash memory. It is perfect for IoT projects due to its high processing power, built-in Wi-Fi / Bluetooth, and Deep Sleep Operating capabilities. The Node MCU is powered through a Micro USB jack and a VIN pin (External Supply Pin). It supports UART, SPI, and RS232.

RELAY MODULE:

The relay module is an electrically controlled switch that can be turned on or off, allowing or disallowing current flow. They're made to run on low voltages like 3.3V (like the ESP32, ESP8266, and others) or 5V (like your Arduino). A relay is an electro-mechanical component that serves as a switch. DC energises the relay coil, allowing contact switches to be opened or closed. A coil and two contacts, such as normally open (NO) and normally closed (NC), are usually included in a single channel 5V relay module (NC)

ROBOTIC ARM :
A robotic arm is a programmed robot manipulator and mechanical arm that performs functions comparable to a human arm. The manipulator's linkages are joined by joints that provide rotational motion (as in an articulated robot) or translational (linear) displacement. The manipulator's linkages can be thought of as a kinematic chain. The end effectors, which are equivalent to the human hand, are the business end of the manipulator's kinematic chain. Depending on the application, the end effectors can be constructed to execute any desired task, such as welding, grabbing, spinning, and so on. The robot arms can be controlled manually or autonomously and can perform a wide range of tasks with great precision. Fixed or mobile robotic arms are available.

LEAD ACID BATTERY:
Two electrodes are submerged in a sulfuric acid electrolyte in a lead–acid battery. The positive electrode is formed of

metallic lead oxide grains, and the negative electrode is linked to a metallic lead grid. There are two types of lead–acid batteries: flooded and valve-regulated. Flooded lead–acid batteries are less expensive than valve–regulated lead–acid batteries, but they require more maintenance and ventilation. Lead–acid batteries are extensively employed in renewable energy systems, owing to their portability and inexpensive cost. These batteries, on the other hand, face a number of challenges, including a low number of charging–discharging cycles over their lifetimes, low discharge intensities, limited lifetimes, and slow charging rates. More improved lead–acid batteries are being introduced all the time. Carbon is used on the surface of new lead–acid batteries.

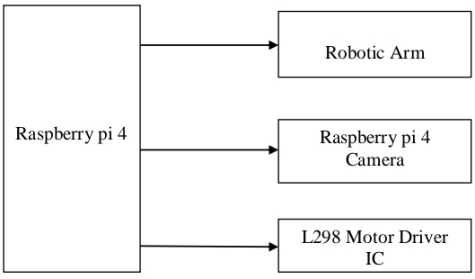
L298 MOTOR DRIVER：

An L298 Motor Driver IC is a monolithic chip that controls the speed of a DC motor in motor driver modules. In comparison to L298 at the moment, the most commonly used motor driver ICs are L293D and L2938N. This IC is commonly seen in RC cars and self-driving robots. A controller, such as Arduino, provides the input to a motor driver module.

As a result, this logic input is only utilised to control the direction of the motor attached to the motor driver IC. The motor driver module primarily consists of a motor driver IC, which is an important component. This single IC can control the motor on its own, but by connecting it to Arduino via the motor driver module, it may be made more powerful.

3.METHODOLOGY :

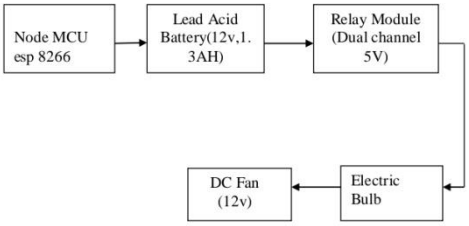
3.1 CONTROLLING OF ROBOTIC ARM:



This Block diagram gives the functionality of controlling the robotic arm with the help of raspberry pi4 using IOT. The Robotic arm ,IP camera and L298 motor driver is connected with raspberry pi 4. When the raspberry pi 4 is configured. then the whole setup will connected with internet and the Blynk app will gets activated. when we want to move the robotic arm we should pass the instruction with the help the blynk app to raspberry pi 4 then it will control the robotic arm with the help of servo motor.we have created one slider in Blynk Application to close and open the claws of robotic arm.IP camera is used to see the visuals in the blynk app using ip address. L298 motor driver IC is used for the movement of chasis. L298 motor driver has four outputs which can control four wheels of the chasis. We have created the four buttons in blynk App for the movement of chasis which intstructs to move left,right,forward,backward.

The working of the robatic arm , the chasis and raspberry camera respectively in the form of flow chart.Intially format using SD card formatter and install Raspbian buster software into the new SD card using eject flasher and flash it.Insert SD card into the holder in raspberry pi and power it using universal power cable and connect it to Wi-Fi router using ethernet cable. Now HDMI to HDMI connector is used to connect raspberry pi to HDMI display in desktop using the VNC server.Install VNC viewer app in the laptop to virtually connect with raspberry pi 4 board (to navigate your raspberry pi files with ease).The VNC viewer comes in the form of a prompt window that enables the inputting of the unique IP address,username,and password for your raspberry pi. Click ok and the VNC window to access the graphical user interface of your raspberry pi 4 model B. That's just about it the raspberry pi has been successfully connected to your laptop via HDMI. We can now make use of a laptop to view the files on your raspberry pi successfully. The Raspberry pi 4 is connected with Robotic Arm,L298 Motor Driver IC, camera. The Robotic Arm is controlled by Raspberry pi 4 with the help of IOT. To move the robotic arm claws we should pass the instructions to Raspberry pi 4 using Blynk App with help of IOT. We use L298 Motor Driver IC for movement of robotic arm from one place to another place. The signals from L298 Motor Driver IC will go to the motors of wheels and this help in the movement of robotic chasis to move forward ,backward left and right as per our instructions. The Raspberry pi 4 camera is intefaced with Raspberry pi 4 with help of this camera we can see the visuals of the old age persons in our mobile phone using Blynk App from anywhere.

3.2 SMART HOME AUTOMATION SYSTEM



The block diagram gives the functionality of the home automation system. The Node MCU unit is the microcontroller or the main controlling unit of the system. The user uses the mobile application in setting commands for functioning of the appliances. The mobile application interprets the command form in user in switch mode and sends signal to the Node MCU unit, over a wireless network established by Wi-Fi communication. Hence the Wi-Fi module (actually inbuilt into Node MCU), helps the microcontroller establish Wi-Fi communication with a device and take commands from an application over wireless network. The Node MCU on further receiving the signal then turns on/off the appliance with the help of relay. The Node MCU, relay and the final appliances are bulb and dc fan

4.RESULTS

5. REFERENCES

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