Robotic Arm Control through Video Surveillance of a Robot Using Raspberry Pi 3

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Abstract: The main objective of this paper is to create a fully controlled raspberry pi robot remotely which includes additionally a Pi-Camera and Robotic Arm to pick and place the object. The mobile robot can be controlled wirelessly to avoid human interaction with dangerous places like chemical factories etc and to reduce human risk. It gives the user the comfort and ease for using home devices with minimal effort. This paper also proposes a technique for controlling an Automatic Arm utilizing an application build in the android platform. An indication is produced in the android application that will be received through the raspberry pi board and also the automatic arm works according towards the predefined program. The robot is controlled remotely from anywhere and at anytime through internet remotely. The user can give commands from a webpage to raspberry pi of robot. This mobile robot uses a camera that allows the live streaming of the surrounding environment in which robot exits (i.e, to search a particular area) to the webpage. Database designed with server to store monitoring data and display in real time. Without being in the working area a user can know the condition and work with dangerous chemicals. This program is written within the python language within the raspberry board

Keywords:Pi-Robot,Robotic ARM, Pi-Camera, Android Application, RaspberryPi, Python.

I.INTRODUCTION:

Mobile robots have many applications including surveillance and security, delivery of material, household purposes, and etc.

These robots use vision for detecting and avoiding obstacles .In this project, we present a network-based mobile robot designed with the goal of remote control and surveillance via the Internet using WebIOPi IoT framework. Remote control of robotic systems has been applied in manufacturing, storage rank inspection, nuclear power plant maintenance, space exploration, etc.

To use a camera over the web, the user can watch and control the robot movements. With a robot, you have strong interaction. For instance, with a mobile robot equipped with an arm you can move along the floor and grasp objects. Raspberry pi 3 is to receive the commands from the web application and takes the data and controls the motors of the robot using the motor driver L293D. The robot can able to move forward, reverse, left and right directions. Mostly, available mobile robots using Bluetooth or zigbee technology as mode of communication which has limited the control distance.

II.PROPOSED WORK

A.Objectives of the Proposed Work:

The objective of this project is low cost and reliable mobile robot that can be used remotely. Achieving wireless internet data transfer, reaching long distances and low latency between the operator and the robot .And to have a remote surveillance, monitoring and control system.

B.Block Diagram:

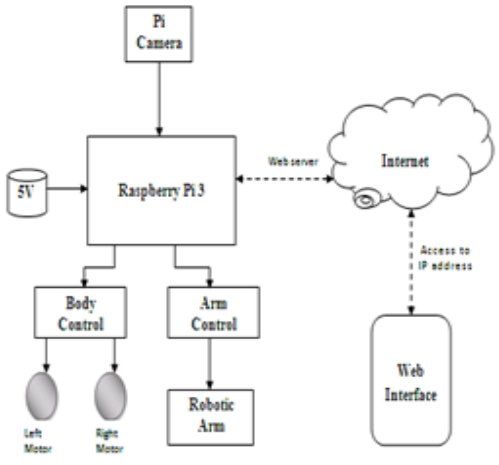

Fig 1:Block diagram

III.HARDWARE COMPONENTS:

a.Raspberry pi controller

b. Power supply

c. Robotic arm

d. PI camera

e.L293D Driver

f.DC motor

a.Raspberry PI:

Raspberry pi3 is dependent on a Broadcom BCM2835 system on a chip (SoC). It incorporates an ARM1176JZF-S 700 MHz processor.

Fig 2: Raspberry PI

The Raspberry Pi Foundation began served by a256MB RAM, that was labeled as Model A, and later made one B with 512MB RAM. The GPU used may be the Video Core IV, possessed through the Broadcom. The Raspberry Pi's GPIO port is situated on top-left of the p cb, it's labeled as P1. It's a 26-pinport, fitted with two rows of 13 male 2.54 mm headers at the factory [3]. The spacing of those headers is particularly important: 2.54 mm pin spacing,) is a type of sight in electronics, and it is the conventional spacing for prototyping plat forms which include ss trip board and breadboards. Each pin of the GPIO port features its own purpose, with several pins working together also it forms particular circuits.

b.Automatic ARM:

The automatic arm has four rotational joints, the bottom, make, elbow and wrist. The bottom rotates the arm around the vertical z-axis, as the other three rotate it around the x-axis. The positive x-axis is mentioning of the page, and it is think of it as around the "right".

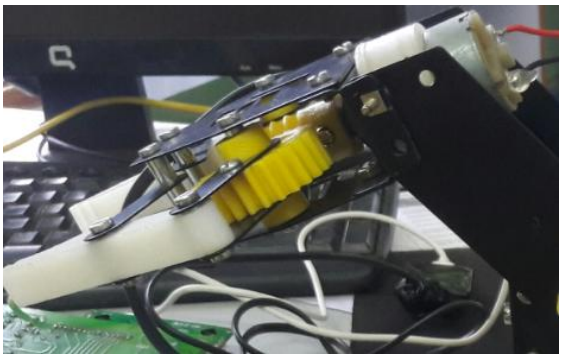

Fig 3:Robotic Arm

Each joint has the rotation limit within the backwards and forwards directions as well as the wrist, elbow and shoulder, and also to the left and suitable for the bottom, that will become important later when rotations are implemented using position values Gravity does mean the arm's rotational velocity is not constant that's for instance, rotating the shoulder joint downwards will require a shorter period than rotating it upwards by the same amount. Take into consideration may be the battery power supply - because the batteries fade, the same is true the arm's speed.

c.USB Camera

A camera is an optical instrument that records images that can be stored directly, transmitted to another location, or both. These images may be still photographs or moving images such as videos or movies. The term camera comes from the word camera obscura(Latin for "dark chamber"), an early mechanism for projecting images. The modern camera evolved from the camera obscura. The functioning of the camera is very similar to the functioning of the human eye.

Fig 4:USB Camera

The chemical part or the filmRaspberry pi 3 is to receive the commands from the web application and takes the data and controls the motors of the robot using the motor driver L293D. The robot can able to move forward, reverse, left and right directions. Mostly, available mobile robots using Bluetooth or Zigbee technology as mode of communication which has limited the control distance.

d.DC MOTOR:

A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances.

Fig 5:DC Motor

e. DC Motor Drivers

L293D is a dual H-bridge motor driver integrated circuit (IC). Motor drivers act as current amplifiers since they take a low-current control signal and provide a higher-current signal. This higher current signal is used to drive the motors. L293D contains two inbuilt H-bridge driver circuits. In its common mode of operation, two DC motors can be driven simultaneously, both in forward and reverse direction. The motor operations of two motors can be controlled by input logic at pins 2 & 7 and 10 & 15. Input logic 00 or 11 will stop the corresponding motor. Logic 01 and 10 will rotate it in clockwise and anticlockwise directions, respectively

IV.HARDWARE RESULTS:

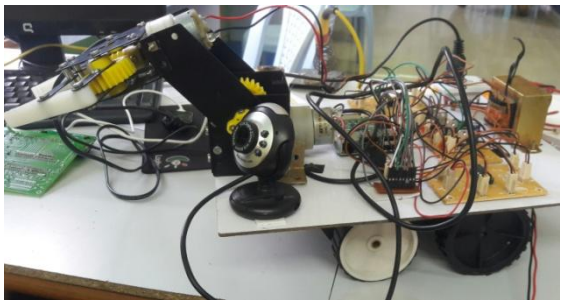

Fig 6:Robot

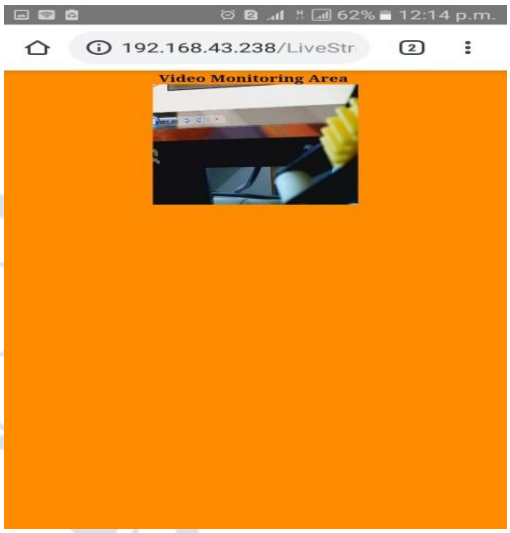

Fig 7:Video monitoring through Camera

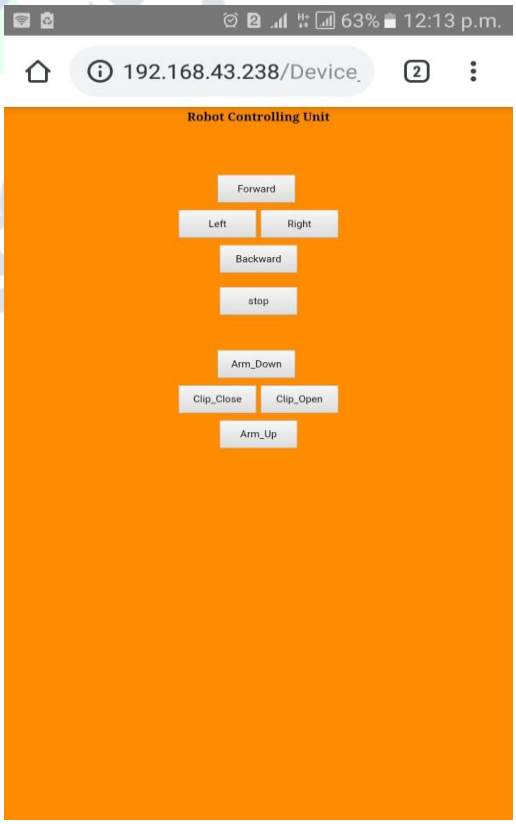

Fig 8:Robot Controlling Unit

V.CONCLUSION:

The Raspberry Pi can be used as the charge of a Robotic Arm with Smartphone from the remote area. The present scenario internet controlled robot has lots of disadvantages such as wired limitations and server problems. In this smart phone technique the delay and server problems are reduced because the Wi-Fi can be used the quickest usage of internet. In present situation most people uses the smart phone worldwide. The automatic arm are capable of doing nearly same actions while using Electricity motors getting a precise control.

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