

Colour Sensor Robotic Arm

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Abstract: This paper presents an application to sort coloured objects with a robotic arm. This robot moves according to colour detecting concept. The detection of the particular colour is done by a light intensity to frequency converter method.

The objective of the project is to detect the bomb and to pick the bomb at another location and the movement of the robot is through colour detection. The controller used AT89S52 which belongs to the familiar 8051 family which produces an output with low delay and also its cost is low and components were easily available. It is interfaced with colour sensor, motors to control the robotic structure. Thus making the proposed system cheap and efficient.

Keywords: Robotic arm, Microcontroller, Light to frequency converter, DC servo motor

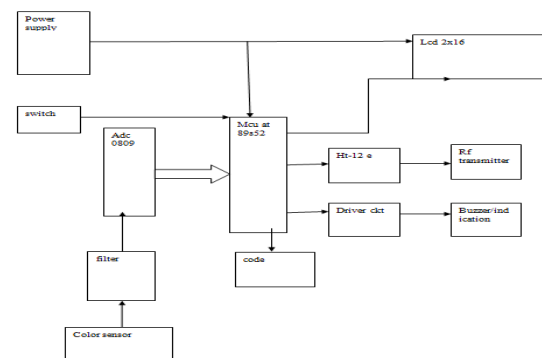
1. INTRODUCTION

A robot is a mechanical artificial agent. It is basically an electro-mechanical machine which is guided by an electronic programming, and is thus able to do tasks on its own. Another common characteristic is that by its appearance or movements. Although the appearance and capabilities of robot vary vastly, all robots share the feature of a mechanical movable structure under some form of control. This control of robot involves three distinct phase- perception, processing and action. In common the preceptors are sensors mounted on the robot, processing is done by onboard microcontroller or processor and task (action) is performed using motor or with some other actuators. Here we introduce a robot which is used to pick the object from one place to another place. Some industrial works are harmful for humans so this robot is mainly used for reduce the risk process and consuming time. It is built by microcontroller, DC motor, colour sensor and metal sensor. Through metal sensor it will be able to sense the metal and the motion of the robot is based on colour sensing. The robot will move according to the sensed colour which will be programmed in it. The programming is done in the keil software. In this way the robot will also able to sense the hidden bomb and will able to defuse the with the help of the colour coding. In this way this robot will be helpful for the Special Agent Bomb Technicians (SABT) and can

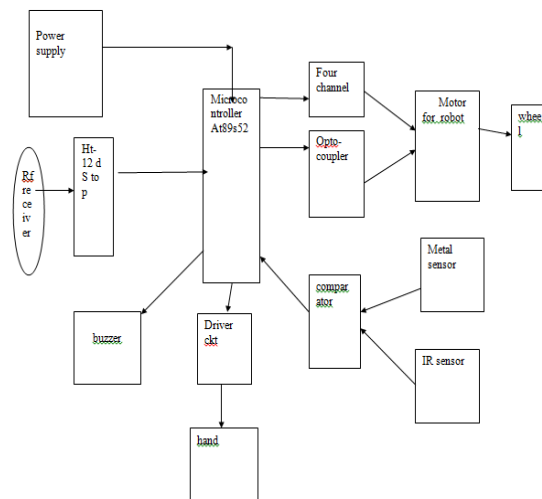
save the lives of many. The wires on the bomb can be cut by the help of the clippers that are present on the hands of the robot. The cutting of the wire can be monitored continuously with the help of the camera present on it.

2. PROPOSED SYSTEM

TRANSMITTER:



RECEIVER:



Photodiode based colour sensor is attached with this system for detecting the colour of the object.

In this concept the colour sensor is used that sense the different type of colour such as

- White
- Black
- Red
- Blue.
- Green.
- Yellow.
- Etc.

This type of command is send to robot and this robot operates according to command.MCU (MICROCONTROLLER UNIT) is the central processing unit, which controls all the functions of other blocks in this system. MCU takes or read data from colour sensor and controls all the functions of the whole system by manipulating these data. MCU controls the gripper motor on the robotic arm that is attached to clipper and help to cut the wire, as per the signal from colour sensor MCU can understand the colour of the object, it controls the arm motor to move towards the specified box, again control the gripper motor to cut the specific wire on the bomb. MCU cannot drive a motor directly, so a motor interface is used here. The motor drive section accepts the low level logical signal from the controller and to provide necessary voltage and current excitation to the motor. Motor driver circuit is required to provide an interface between the 5V logic signal from the microcontroller & the high current/ high voltage power side to drive the motor, because motor is an electromechanical device, which converts electrical energy to rotation/mechanical energy. For this energy conversion large current excitation is required. These much energy cannot be provided by the logical signal pins from the microcontroller. So a motor interface is used here. The motor drive section should have the capability for accepting the low level logical signal from the controller and to provide necessary voltage and current excitation to the motor. Usually high current transistor switches or relays or ICs with motor driver packages are used for this purpose. Here bidirectional motor driver is required so an H-bridge based circuitry is used to control the arm motors and wheel motors. Motor is used to drive the robotic vehicle. The motor should have torque and rpm to meet the requirement like move the vehicle by carrying battery and circuit load. DC motors are the best choice for this purpose. But DC motors are always comes with high rpm 2000 to 3000, and with lesser torque. So usually geared DC motors are used. Geared DC motors are well suitable because which have lesser rpm like 30 or 45 and have sufficient torque to drive the all mechanical load. A 12V motor is preferable because which can be easily connected to 12V battery. Hence geared dc motor is used to drive the robotic vehicle.

LCD display is used for displaying the status of the system. LCD module is a dot matrix liquid crystal

display that displays alphanumeric, kana (Japanese character) and symbols. The built in controller and driver LSI, provide convectional connecting between LCD and most 4 or 8 bit microcontroller. The CMOS technology makes the device ideal for applications in handheld portable and other powered instruments with low power consumptions.

3. WORKING

Researches and experiments in the field of robotics are progressing tremendously. Robotic technology has influenced most of the industrial and domestic areas and has given release to the humans doing heavy, risky and tedious jobs. In many industries it is required to sort objects from a mixture of materials. This machine is a demonstrator of industrial object sorting robot based on colour of object.

Here a robotic system which contains a robotic arm with a colour sensor. A photodiode based colour sensor is attached with the robot, after identifying the colour of the object, the robot will move accordingly and can cut the wire on the bomb according to the colour command given to it.. DC GEARED motors are used here for the different actions and movements of the robotic arm. 6V DC motors are used here in both of its direction as per the requirement. An arrangement to cut the wire is attached with the arm and is also controlled by a DC motor. 6V power supply is used for the arm. Whole movements of all these motors are controlled in bi-direction by the MCU through IC hybrid bridge circuits. The system is used to cut the wire according to the colour command given to it.It can be useful for the SABT.

The colour sensor identifies colour and gives serial output of white, black, red, blue, green, yellow etc. It can identify 16.7 million colour shades giving RGB value for the detected colour. The detected colour is identified as amount of three primary colour values namely Red, Green & Blue with 8 bit accuracy for each primary colour. Any colour can be separated or combined into three primary colours Red, Green and Blue using the RBG values. The output of this colour sensor is connected to RC7 of the MCU.

4. FEATURES

- Integrated IR blocking filter
- 3.8M:1 dynamic range
- Four independent ADC.
- A reference-channel for Colour Analysis(Clear channel photo diodes)

5. BENEFITS

- Minimizes IR and UV spectral component effects to produce accurate colour measurement.
- Enables accurate colour and ambient light sensing under varying lighting conditions.
- Minimizes motion / transient errors.
- Clear-Channel provides a reference allows for isolation of colour content..

6. PROBLEM CONTENT

- Components availability.
- How to decide value of components.
- Circuit designing.
- How to give the effort of soldering properly.
- Programming of sensor.
- Signal sending and.
- LCD interfacing.

7. PROBLEM FORMULATION

We had a robotic arm and the idea of sorting coloured objects using a sensor and the arm .Also we had the idea of interfacing a wireless camera for monitoring the images .As the robotic arm is mounted on a base which has wheels which helps the robot move from one place to other. The motors which drive the robot and the arm are controlled with a RS232 interface. Also the colour sensor used earlier, was sensing red colour even if some other colour object was present. The only idea was to find a controller and a sorting programming language which was simple, efficient and familiar as the entire control mechanism has to be user friendly. We could easily use the Intel 8051 microcontroller but the problem is the code execution is a slow which increases the output time

8. CONCLUSION

The work when implemented provide good research knowledge on robot arm modelling and embedded based control hardware and software implementation provides an easier access to exercise robot manipulation using the functions and programming abilities of the real robots for mounting the different applications. The objects having different colours can be determined by using advanced colour sensor.

Finally the robot became successful to identify the colour and cut the wire according to the command given to it. In this way the bomb can be diffused resulting in saving the lives of many.

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