

Synthesis of Visual Attention-Based Robotic System and Its Present Utilization in Engineering



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Abstract In the field of robotics, individual visual attention is used to illustrate the current huge interest of robots on the vision-guided side. This functionality is commonly called Vision Guided Robotics (VGR). It is a technology that is developing at a fast pace and underlines the high costs of production and the difficulties that countries face in order to reduce labor and save production. The vision guide is applied in dynamic areas such as a medical robot, industrial robot, agricultural robot, mobile robot, telebot, and service robot, and the list goes on and on. In this article, we illustrate the approach to the design of a robotic system, focusing on the camera vision. Tasks are as follows: (1) development of a visual attention-based robotic system, (2) preparation of a vision-based system, and (3) preparation of a hardware application. We have developed and implemented a robotic system that recognizes different colors and follows the assigned paths.

Keywords Machine visualisation • Global machine vision market • Vision guided robot • Movement of robot • Matlab • DC motor • Hardware • Research report on vision guided robots

1 Introduction

In the field of robotics, the current view of robots can be shown on one side [1]. This functionality is usually called robotic powered by vision (VGR). Research reports that the machine market in the world market considers the market that describes the scope of the project. According to the report “The Mechanism and Market Robotics (2010–2015),” the global mechanical vision system and segmental total market are

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likely to reach \$15.3 billion by 2015 [1]. The total market for income, cameras and smartphones will be around 27.3%. It is expected that from 2010 to 2015, the market for mechanical extension systems and companies will grow at a speed of 9.3%. The market has improved rapidly for machine visualization systems and companies to meet growing demand for traditional and non-traditional applications [2]. Mechanical extension systems have recently become effective with the development of innovative interface and smartphone capabilities and the ability to present them. As a result of recent advancements, problems of tasks decreased and costs and process strength increased. In this way, the use of machine vision technology has been increased for a broader application [3, 4].

2 Our Design and Implementation

From the earlier chapters, we have seen the different perspectives in the designing of the vision-guided robots [2]. Based on that knowledge, we have designed and implemented a vision-guided robot, which recognizes the red, blue, and green colors and takes the direction as forward, right, and back, respectively [5].

In this section, we will discuss the designing of robot and detailed explanation of each and every component and their functions by considering the neighboring components of the particular component. First of all, let us see the overview of the implemented design which gives information about the components and signal flow [2, 6] (Fig. 1).

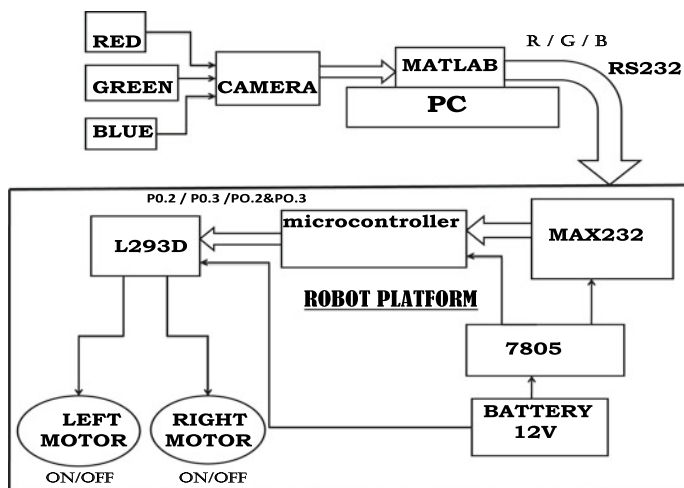


Fig. 1 Block diagram representing various components and the signal flow

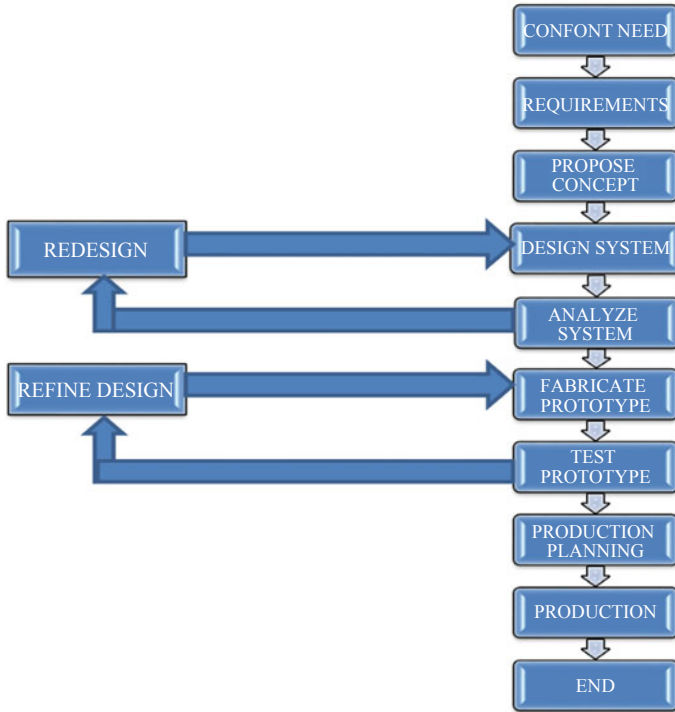


Fig. 2 Sequential design process

3 Explanation of Each Part and Its Output

See Fig. 2.

Camera

We used an iBall Face2Face C8.0 camera with interpolator-based 8.0 mega pixel static image resolution, 4 mega pixel video resolution, and 5G lenses with wide angle provision provides smooth video and clarity. And its specifications are given below [7].

Software Tool MATLAB

The information gathered by the camera is fed to PC. MATLAB program is used to detect which color is having highest proportionality in the image grabbed by the camera [8].

In the image captured by the camera, if the proportion of red is greater than the blue and green, then red color wins and the signal “R” is fed to the microcontroller through MAX232 IC. In the similar manner, when the green color is having the higher proportion when compared to the others, then the signal “G” is the output and when the blue signal is having highest proportion, then the signal “B” will be

the output. In that manner, in order to find out the highest proportionate color or winning color, the robot takes direction accordingly [9]. The program for our implementation is given in the program sheet which is on page number. Whenever these three colors are in same proportion, then no signal will be fed to the microcontroller, and then the robot will be in STOP position [10].

RS232

The RS-232 signal is an address (activated or deactivated), depending on whether the DEE OR the DEE signal [11].

MAX232

MAX232 is an IC that switches the RS-232 serial port signals into the correct indications for use in a digital logic circuit compatible with TTL. The MAX232 is a controller/receiver and generally converts the signals, such as TX, RX, RTS, and CTS, and provides RS-232 voltage level output (approximately ± 7.5 V) [11].

Microcontroller

We use the AT89S52, a low-power, high-performance 8-bit CMOS microcontroller with 8 bytes of programmable flash memory in the system. This integrated circuit is manufactured using ethelle's non-memory diversity high-density technology and is having compatibility with the standard Indscore 80C51 input set and the peanut [12]. The Flash on-chip program is supported by the memory reprogramming system or by a conventional nanolateral memory program. The AT89S52 is a high-performance microcontroller that provides economical and high-resolution solutions for many integrated control applications [13].

DC Motor

Industrial Use: Drills, lathes, shapers, spinning and weaving machines, boring mills, electric traction, brands, air compressors, elevators, vacuum cleaners, sewing machines, presses, shears, hair drier, and reciprocating machines [13].

In our project, we used two small DC motors. They receive signals from L293D and acts accordingly. The below section explains crystal clearly about mechanism of L293D and how the ROBOT is taking diversions [12].

L293D

L293D is a two-motor controller so that we can integrate two DC motors with a single microchip which can be controlled in the direction of clock, and clock and can be a controlled control motor [9].

You can use all four inputs/outputs to connect four depot motors. L293D has 600 MW output and a circle output current 1.2 per channel. In addition, the safety of the reverse voltage eff circuit has been included in the circuit. Output voltage (VCC2) has a wide range of 4.5–36 V, making L293D a good choice for a DC motor [11].

Using two motors, we can run our robots in any direction. This robot management method is called "differential drive" [14] (Figs. 3 and 4).

Our total equipment are robot connected to the laptop and a camera of laptop which recognizes the red color, and the motor takes right turn. The experiment is done with blue and green colors also.

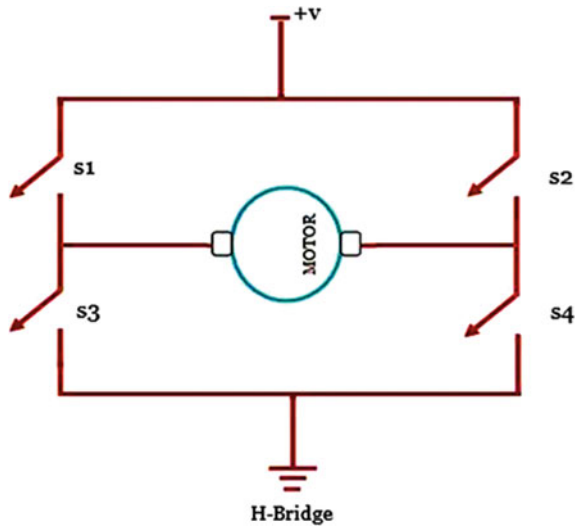


Fig. 3 H-bridge circuit diagram

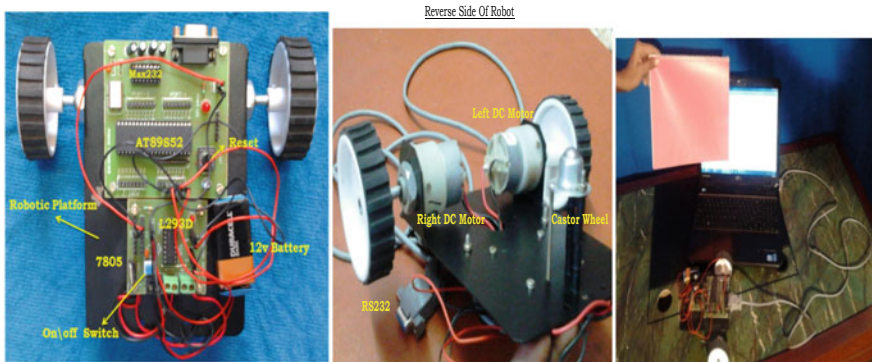


Fig. 4 Hardware, its parts, and our testing images

4 Conclusion

From unmanned aerial vehicles (UAV) to toy, laparoscopic surgery to the industrial sewing machine, addition of vision guidance to the systems increases the reliability, efficiency, and flexibility of the particular system. Vision-guided robotics extremely increases the performance of the system, highly increases flexibility, and reduces manual work efficiency and reliability. From the **Research Report on Vision-Guided Robotics**, [8] gives us the information on how the vision-guided technology is having its great impact on the era of technology in the upcoming

years. As the cost of production of vision-guided systems is decreased drastically, it can be suited for all the classes of industries or in any field of working [15]. Security and traffic are the two application areas with high growth potential. The applications such as traffic flow monitoring, automatic number plate recognition, traffic surveillance, and other related areas are witnessing more utilization and integration of machine vision systems. In the recent economic turmoil, badly hit application areas such as semiconductors and automotive are witnessing less demand, while infrastructure industries and medical are witnessing steady growth.

Therefore, undoubtedly, we can proclaim that vision-guided robotics is the technology which is going to be ruling the whole world.

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