LINE FOLLOWING ROBOTIC VEHICLE USING MICROCONTROLLER INTERFACE

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ABSTRACT

A robotic arm is a robotic manipulator, usually programmable, with similar functions to a human arm. Humans pick things up without thinking about the steps involved. In order for a robot or robotic arm to pick up or move something, someone has to tell it to perform several actions in a particular order — from moving the arm, to rotating the "wrist" to opening and closing the "hand" or "fingers". So, we can control each joint. . This paper presents a three joint automatic robotic arm which can be used in industries to do repetitive task such as moving the things from conveyor to another place, a sensor will be used to detect the obstacles if present while carrying out the task. If there is any obstacle while moving the object, the arm will wait for a predefined time for the clearance of the object. If the obstacle is cleared, the arm will continue its work. If the obstacle is still present, a buzzer will be turned on so that personnel from the industry can attend the problem and clear the obstacle.

Keyword:- *End effector, Shaft, Degrees of freedom , manipulator ,wrist .*

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1. INTRODUCTION

The word robot originated from the Czech word robot a meaning work. A definition used by the robot institute of America is: "A robot is a programmable multifunction manipulator designed to move material, parts, tools, or specialized devices through variable programmed motions for the performance of a variety of tasks". In this highly developing society, time and manpower are critical constrains for completion of task. The automation is playing important role to save human efforts in most of the regular and frequently carried work .The idea that machines can begin to imitate human actions, even in ways we have not thought of, the main motives for the creation of robot have been very practical. First, as modern industry has become more complex, there has been a growing need for getting work done in environments that are dangerous for humans. As an example, work in a nuclear reactor plant often requires contact with radioactive materials. Second, as robots became more advanced and less expensive, they are being set up in industry situations where working conditions are not so much dangerous as unpleasant for various reasons. These situations typically involve high degrees of the following: - Heat, Noise, Poisonous gases, Risk of injury by machines, Monotonous, boring work. Robots have already taken over a number of such unpleasant jobs in industry- welding in automobile factories, which involves heat, noise and heavy exertion. Robots are obedient, untiring and precision welders. Simple robots do many routine jobs in industry.

BLOCK DIAGRAM

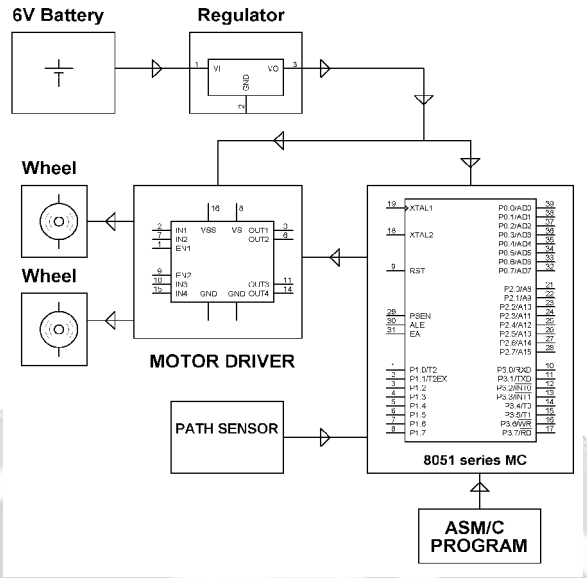

Fig-1 Basic Block Diagram Of Line Following Robotic vehicle Using Microcontroller

CIRCUIT DIAGRAM

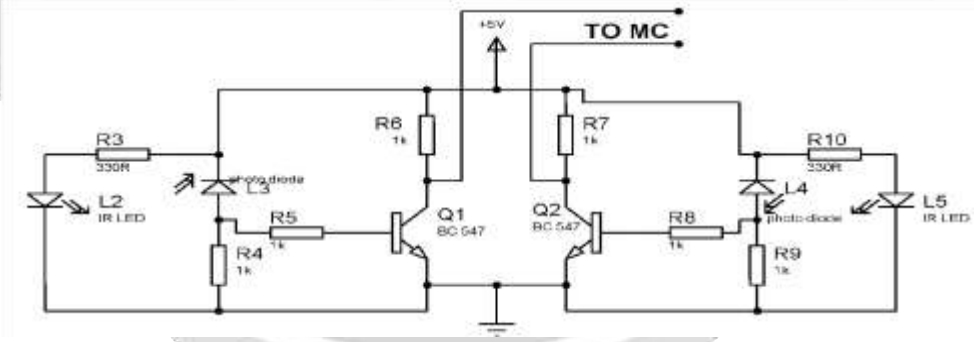

Fig-2 Circuit Diagram Of Line Following Robotic vehicle Using Microcontroller

1.1CIRCUIT DESCRIPTION

Here, PHOTO DIODE is connected to the non-inverting terminal of the comparator L293 and variable resistor is connected to the inverting part of comparator and in this connection when the LED-Photo diode sensor pair will be on the white surface then light will be reflected to the Photo diode and the resistance across the Photo diode will be less and it will allow the current and voltage to pass through it and Vmax (voltage across non-inverting terminal) > Vmin (voltage across inverting terminal). So, the comparator will generate logic 1" that will turn on the circuit and this sensor pair will be on black surface, thenVmax < Vmin and will generate logic 0" which will turn off the circuit.

1.2 COMPARATOR CIRCUIT

The 10k component is potentiometer which will be used to set the maximum range. This resistance, ideally should be near (R (light) * R (dark)) ^1/2; where, R(light) is the approximate resistance of Photo diode during light and R(dark) is the resistance of the same in dark.

1.3MICROCONTROLLER

A microcontrollers a high integrated functional computer system-on-a-chip. It contains an integrated memory and programmable input/output peripherals. Microcontrollers often operate at very low speed. They consume

relatively little power. It is used to controls the motor activation and deactivation operations and also reads sensor signals. Further details of microcontroller given below.

1.4MOTOR DRIVER CIRCUIT

order to provide the required amperage to the motor using the low current signal from the microcontroller. 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.
Enable pins 1 and 9 (corresponding to the two motors) must be high for motors to start operating. When an enable input is high, the associated driver gets enabled. As a result, the outputs become active and work in phase with their inputs. Similarly, when the enable input is low, that driver is disabled, and their outputs are off and in the high-impedance state.

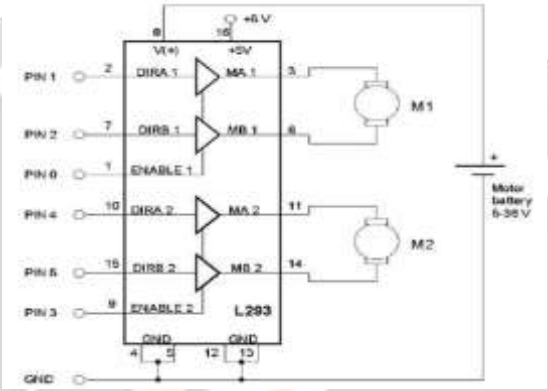

Fig-3 Block diagram of motor driver circuit

L293D has 2 set of arrangements where one set has input 1, input 2, output 1 and output 2 and other set has input 3, input 4, output 3 and output 4, according to block diagram if pin no 2 & 7 are high then pin no 3 & 6 are also high. In this project only one set is been used.
If enable 1 and pin number 2 are high leaving pin number 7 as low then the motor rotates in forward direction. To vary the speed of the motor, PWM pulses are given to ena1 pin of L293D using this speed of the motor can be increased and decreased accordingly.

1.5MOTORS

An electric motor is an electromechanical device that converts electrical energy into mechanical energy. Electric motors can be powered by direct current sources, such as from batteries. Microcontrollers command these motors through the driver circuit to take the necessary action.

1.6POWER SUPPLY

A regulated power supply is an embedded circuit, the function of which is to supply a stable voltage, to a circuit or device that must be operated within certain power supply limits. This is used to supply the power to the microcontroller and the driver circuits.

1.7OBSTACLE SENSOR

This sensor is used to detect the obstacles while carrying out the task. IR sensor is used to sense the obstacles in the front. IR led is connected along with three pin sensor or receiver. Here we will use TSOP 1738 for this purpose. IR led will be continuously transmit whenever an obstacle appears IR light is reflected back and this is sensed by a sensor which in turn signals microcontroller to take necessary action.

1.7WORKING PROCEDURE

In this project, we are using three geared DC motors each of which can be controlled by L293D motor driver. Here, two reference positions are chosen. First reference position is the place from where t arm has to pick the object and second reference position is the place where the robot has to place the object. First the microcontroller he signals the motor-3 via driver circuit one to make the rotation of the arm to the desired direction. Then the signal from microcontroller is given to driver circuit1 to drive the 2nd motor so that it can make up and down movement. Next motor 1 which is situated at the gripper is activated so that gripper holds

the object. Next, motor-3 is again activated to turn the motor towards destination direction, motor is then activated to make the down movement of the arm and finally, gripper motor is activated to release the object. Meanwhile, an obstacle sensor, which is connected to the microcontroller, is programmed such that it senses the presence of the obstacle in a radius of about 10cm and first time it senses the obstacle, it pauses its work for some time. If again the obstacle is not cleared, a buzzer will be turned on to grab the attention of a personnel to clear the object.

2. DESIGN OF ROBOTIC ARM

To proceed in the direction of design aspects, first mechanical structure has to be designed. Depending on the design requirements electronic parts are configured with that of mechanical design.

2.1.MECHANICAL DESIGN

Mechanical design involves the selection of suitable motor for our application, deciding on the material to be used for the construction of the arm, i.e the shaft material and deciding on the location where the motor has to be placed.

2.2.SELECTION OF MOTOR:

The main criteria to be considered while selection of motor is Torque and the speed of the motor, many different motors are available in the market like servomotors, stepper motor, dc motors with and without gears. These different motors are used according to their applications and requirements. for e.g. If we want high torque and precise speed we need to use servo motors, if we want to only position and if high torques not required then stepper motors are used. The motor can be selected once we know the torque and speed required for our application.

2.3 ELECTRONIC DESIGN

Electronic design involves designing and choosing of the electrical components as per our requirements. Some of those used in our project are given below.

2.4MICROCONTROLLER

A micro controller is similar to a processor in a computer. The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory.The device is manufactured using Atmel's high-density non volatile memory technology and is compatible with the industry standard 80C51 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional non volatile memory programmer. By combining a versatile 8-bit CPU with in-system programmable Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications. The AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the AT89S52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning. The Power-down mode saves the RAM contents but freezes the oscillator, disabling all other chip functions until the next interrupt or hardware reset.

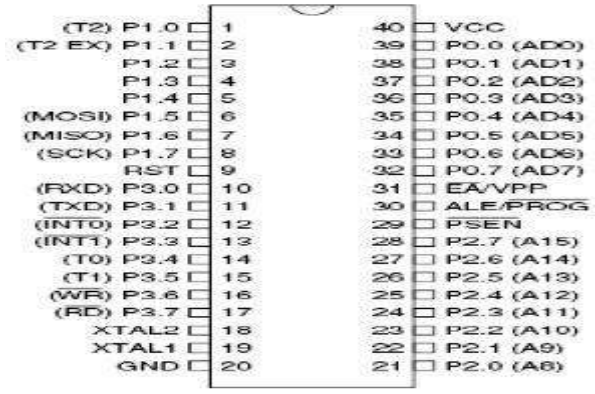

Fig-4 Pin Configurations of AT89S52

2.5Features:

• Compatible with MCS®-51 Products
• 8K Bytes of In-System Programmable (ISP) Flash Memory
– Endurance: 10,000 Write/Erase Cycles
• 4.0V to 5.5V Operating Range
• Fully Static Operation: 0 Hz to 33 MHz
• Three-level Program Memory Lock
• 256 x 8-bit Internal RAM
• 32 Programmable I/O Lines
• Three 16-bit Timer/Counters
• Eight Interrupt Sources
• Full Duplex UART Serial Channel
• Low-power Idle and Power-down Modes
• Interrupt Recovery from Power-down Mode
• Watchdog Timer
• Dual Data Pointer
• Power-off Flag
• Fast Programming Time
• Flexible ISP Programming (Byte and Page Mode)
• Green (Pb/Halide-free) Packaging Option

2.6POWER SUPPLY

A regulated power supply is an embedded circuit, the function of which is to supply a stable voltage, to a circuit or device that must be operated within certain power supply limits. This is used to supply the power to the microcontroller and the driver circuits. Microcontroller and drivers requires +5v supply. A DC source is given as the power supply

2.7OBSTACLE SENSOR

Infrared (IR) optical sensors take advantage of invisible light waves to sense objects in their environment. These are very effective for use in noncontact object sensing. The advantage to measuring in the IR range is that ambient lighting has very little effect on the reading (assuming there are only low IR emissions from surrounding lighting). These sensors use an LED to emit light in the IR range and an IR light detector to determine whether an object is "close" or not. The detector varies its output to the computer based on the intensity of IR light it sees. This allows you to adjust how sensitive your proximity sensor is (although most come pre-adjusted for a specific distance) .

3.SOFTWARE REQUIREMENTS

Keil an ARM Company makes C compilers, macro assemblers, real-time kernels, debuggers, simulators, integrated environments, evaluation boards, and emulators for ARM7/ARM9/Cortex-M3, XC16x/C16x/ST10, 251, and 8051 MCU families.

Keil development tools for the 8051 Microcontroller Architecture support every level of software developer from the professional applications engineer to the student just learning about embedded software development. When starting a new project, simply select the microcontroller you use from the Device Database and the µVision IDE sets all compiler, assembler, linker, and memory options for you.

Keil is a cross compiler. So first we have to understand the concept of compilers and cross compilers. After then we shall learn how to work with keil.

4. CONCLUSION

This project finds its application in the many fields. We have used gripper as an end effector. It can placed by other appropriate tools for operations like welding, painting, surgery, etc. Further, additional improvements can be done by incorporating wheels to the robot so that it can move from one location to another and thus can be used for multitasking.

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6.REFRENCES

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