Autonomous Robot without Microcontroller

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Abstract- *The important theme of my plan is to how to create an autonomous robot without the use of a microcontroller. Mostly we take the help of microcontroller to create it but here we have taken a direction and path tracker to create it without the use of microcontroller. In this regard WE have included the different ways of creating the robot autonomously without the use of microcontroller that is reflection on white line should be more than the black line. Using this method we try to opt the sensors to sense the pulse and this is modulated accordingly to the way it suppose to be through the MOSFET and another method in this robot is that if the pulse is weak then the speed causing the turning effect all the construction part is as mentioned below.*

Keywords- LED, LCD, TCR, V, LM, CV.

I. INTRODUCTION

The name of the autonomous robot is path tracker. In this regard the autonomous robot which could make the path by the code given to the Microcontroller and the code is executed by the coded Microcontroller makes it activate accordingly. This robot walks on the ground by carrying the some load of about (2-3) kg to the desired place following the time given by the user either two lines what we have seen above without the use of Microcontroller .Actually this robot was designed to detect its path and reach the place safe, if any pits and troughs in the ground it would find the errors and then move in other path and it would detect various objects using the sensors placed in the internal parts of it .This type of robot needs a programmable microcontroller but we could make the robot run like a robot which runs using a programmable microcontroller by using the important way of taking the neutral from the ground with the ground sensor.

Microcontroller

It is a small chip or an IC which is non removable part of device and the passes the interrupt messages to the motors and enables it to run at the synchronous time. We can even control a big machine using a small microcontroller by making all the peripherals activate during the work unless the Micro controller is programmable the action doesn't take place . The device used in this could be applied in different LCD displays to make the desired code to get printed on the screen, this is also used in calculators to get the processed output to be executed. It is also used in the mixture of petrol and diesel in the automobiles in correct ratio. We can find in various products the Microcontroller, they are, Microwave oven has an LED or LCD screen and a keypad. Microcontroller plays a vital role in modern automobiles with the number of one and up to seven. It controls the engine they are anti-lock brakes, the cruise control. It is attached in the products which have the remote control systems. This small chip is also used to construct an autonomous robot but we can construct an autonomous robot without using a microcontroller.

II. DESCRIPTION

The robot's plan is to trace the path and move accordingly using the principle as described before. The parts used in this robot are:

1. 12V dc gear motors(15 rpm)-2
2. TCRT5000(reflective optical sensor)-2
3. Ground sensors-2
4. 12V power supply
5. strip wire
6. Frictionless Wheels-4
7. LM555(timer ic's)-4
8. LM747(dual op-amp)-2
9. R1=6K, R2=1K, R3=20K, R4=10, R5=82, R6=5K(variable), R7=1K-2,C1=1µF, C2=0.1µF, C3=0.1µF

A. 12V dc gear motors(15 rpm)

These motors are made use for sometime of the robot ground with the help of three frictionless wheels which smoothly and slowly on the ground the two motors are attached to the two wheels when one wheel slows down due to various in the pulse modulated when the sensor senses the black line and this makes the turning effect of the robot and also the other concept of escaping the crater or ditches is that it will be extracting the ground from the ground bye which the robot moves only when the surface is clear or else it turns to either side depending on the motor switching these motors. The motors should be provided with the 12v power supply

with the help of external power supply or a normal battery of 9V.

B. Ground sensor

There will be ground sensor is the base of the robot which is capable of taking the neutral polarity from the ground and connects the circuit which draws the phase from the battery's positive terminal.

C. 12V power supply

12v power supply is used to supply the power to the whole apparatus. We use only one 12v lead acid or lithium batteries to conduct electricity in the motors.

D. Frictionless Wheels

Four frictionless wheels are used to create free moment of the robot while turning right or left.

E. Robotic legs

To create robotic leg moment we use two drafters which are used in engineering drawing that make the complete leg moment when the torque is applied at one end at the other end a dynamic lift is created which will be helpful in making the robot run like a human being.

Table: 1

P	Q	P=>Q
T	T	T
T	F	F
F	F	T
F	T	F

P: sensor is connected
Q: current conducts in the motor

In the base motor the motors are aligned such that one motor is dummy and the other motor is used for turning effects if one motor is switched on and the other motor is switched off the leg rotates in the other direction by this the robotic moments can be handled.

Table: 2

P	Q	P=> Q
T	T	T
T	F	F
F	F	T
F	T	F

P: when one left motor is switched on
Q: robot turns right

Table: 3

P	Q	P=> Q
T	T	T
T	F	F
F	F	T
F	T	F

III. THEORY OF OPERATION

A. How it senses a black line

The sensors used for the project are Reflective Object Sensors, TCRT5000.The single sensor consists of an infrared emitting diode and a NPN Darlington phototransistor. When a light emitted from the diode is reflected off an object and back into the phototransistor, output current is produced, depending on the amount of infrared light, which triggers the base current of the phototransistor. In my case, the amount of light reflected off a black line is much less than that of a white background, so we can detect the black line somehow by measuring the current. (This current is converted to voltage.)

B. How to control a DC motor

Instead of applying a constant voltage across a DC motor, we repeat switching on and off the motor with a fixed voltage (Vcc) applied to the motor. This is done by sending a train of PWM (Pulse Width Modulation) pulses to a power MOSFET in order to turn it on and off. Then, the motor sees the average voltage while it depends on duty cycle of PWM pulses. The speed of rotation is proportion to this average voltage.

By PWM method, it's easier to control the DC motor than by directly controlling the voltage across it. All we have to do is to modulate pulse width, in order words, a duty cycle. Also, a power MOSFET consumes only negligible power in switching.

IV. CIRCUIT DIAGRAM

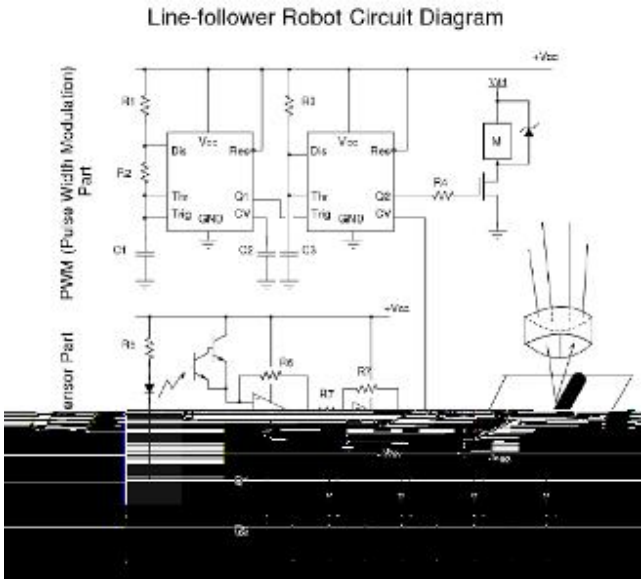

Figure 1.

My circuit consists of two parts: PWM (Pulse Width Modulation) part and a sensor part. First, we take a look at the sensor part. The photodiode turns on the phototransistor and then the output current is converted to output voltage through the first op-amp circuit. The R6 is a variable resistor, so that we can tune the scale of output voltage. The second op-amp circuit is added to change the polarity of voltage. (Positive CV is necessary later.) One thing we should know is that –Vcc to Vcc of voltage rail is needed, not from 0 to Vcc. In the circuit built-up, LM747 Dual Operational Amplifiers were used. Second, in the PWM section, two 555 timers (LM555) are used to produce a pulse-width modulated train of pulses. The timer on the left works in a stable mode to generate regular square-wave pulses. The frequency is fixed by the values of R1, R2 and C1 here. Then, this output Q1 is connected to the trigger pin of the second timer that works in monostable mode this time. As you can see in the diagram, at a falling edge of Q1, a pulse is triggered and stays high during some time. The time (width of a pulse) is purely determined by the value of R3 and C3 if CV (Control Voltage) pin is not connected at all. (Look at the pulse diagrams of Q1 and Q2 at the bottom of the circuit diagram.) CV plays a role of changing the threshold level of a timer. (Without CV, threshold = 2/3 * Vcc) CV just becomes the triggering voltage level.

Therefore, the higher the CV is, the longer it takes time until discharge. In this way, the duty cycle of output pulses Q2 can be controlled. Back to my circuit, the output voltage of the sensor part provides CV. For instance, if any sensor sense?Ba black line, the current from the photodiode decreases, the CV drops, the duty cycle gets low and the motor slows down. Third, the PWM pulses are supplied to the gate of a power MOSFET (IRF520) to switch the DC motor on and off. Then, the DC motor only sees the average voltage proportional to the duty cycle of the pulses. When CV is high, so is the duty cycle and the motor turns fast. In my robot, the distance between sensors and the ground is fixed. So, when a sensor is off the black line (The sensor sees white paper.), CV keeps its maximum value and both motors keep turning in a constant speed. As soon as the sensor enters the black line part, CV drops down and thus duty cycle decreases, which means the slowdown of a wheel.

Some snapshots of my robot are listed below.

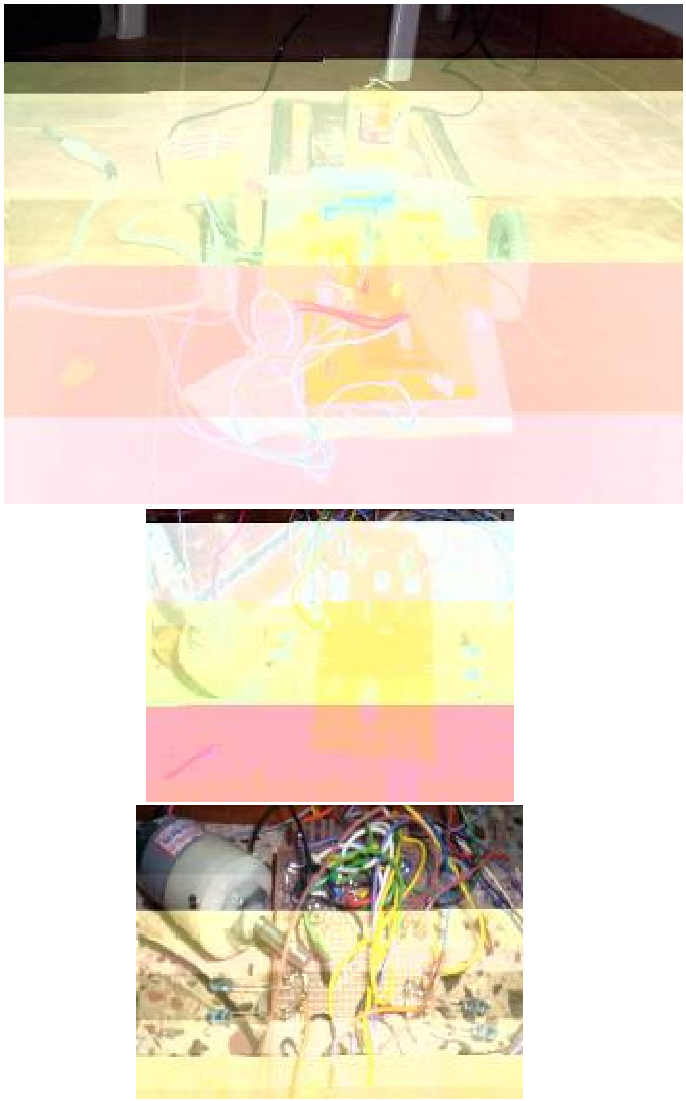

Figure: 2

V. HOW THE FLOW GOES ON

In the above apparatus the energy is neither created nor destroyed but one form of energy is converted into other form that is Chemical energy is converted into Electrical energy and then in turn into Mechanical energy. When we are

extracting the neutral charge from the ground the energy modulated here are 1. Chemical energy (battery), 2. Energy from earth from which we extract the neutral charge. These two forms of energy are converted to mechanical work with the help of dc motors (in case of obstacles only)

Let us assume that the initial flow of charge from battery is q1,The voltage developed across the battery is some V1 volts,The charge in the base motors is due to this sensor this needs some amount of classification which is explained as below:

1. Charge is developed due to gravitational force F
2. To this some amount of charge gets added by the battery q1
3. The force developed is converted to energy after some displacement (s)

Therefore the energy developed due to the battery and ground is w1+w2.

W1=G.Mm/R2 and W2= V*Q therefore the total energy used in the process W1+W2=W=G.Mm/r2 + V*Q is the total energy that is needed to make this robot run the in arena.

VI. CONCLUSION

The main objective of this presentation is to design a autonomous robot without a microcontroller. Normally we do modify a robot into autonomous robot with the help of a microcontroller and also we use heuristic algorithms and genetic algorithms to get this task done by the robot. But the only modification in this is that we can construct a autonomous robot without using the codes and microcontroller.

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