

Speed Controller of Dc motor using 555ic timer

Analog communication project

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Introduction

- PWM (Pulse Width Modulation) One method that is Often used for DC motor control using a microcontroller is Pulse Width Modulation (PWM) method. The speed Of the electric motor depends on the modulator voltage. The greater the voltage, the faster the rotation Of an electric motor.
- This project is designed to control the speed of a DC motor using PWM control using 555 IC. The speed of the DC motor is directly proportional to the voltage applied across its terminals. Hence, if the voltage across the motor terminal is varied, then the speed can also be varied.

Components Required

- Breadboard
- 555 timer IC's
- Potentiometer
- Capacitor
- Resistors
- Connecting wires
- Dc motor
- P-N diodes
- 5 volts battery

Working

- In the PWM controller, 555 timer generates PWM signal, as the VCC is given to the circuit the capacitor c1 starts charging via resistor VR1 and VR2 once the capacitor gets charged to the threshold voltage (the voltage at which output changes to 0 or 1).
- The transistor at pin 7 gets triggered which ultimately starts discharging the capacitor C1 the charging and discharging times are not the same as during charging both the resistors are involved whereas during discharging time only VR2 is involved which leads to a rectangle wave (not a square wave) it has unequal on and off-time
- The frequency of output pulse depends on the RC time constant whereas the duty cycle (ON-OFF time) depends on the ratio of resistances of the two potentiometers.
- If we change the POT (potentiometer) VR2 by keeping VR1 0 the minimum duty cycle will be 50. whereas if both the POT are used then the minimum duty cycle can go below 10to 5. The duty cycle may vary but the frequency of the output wave will remain constant.

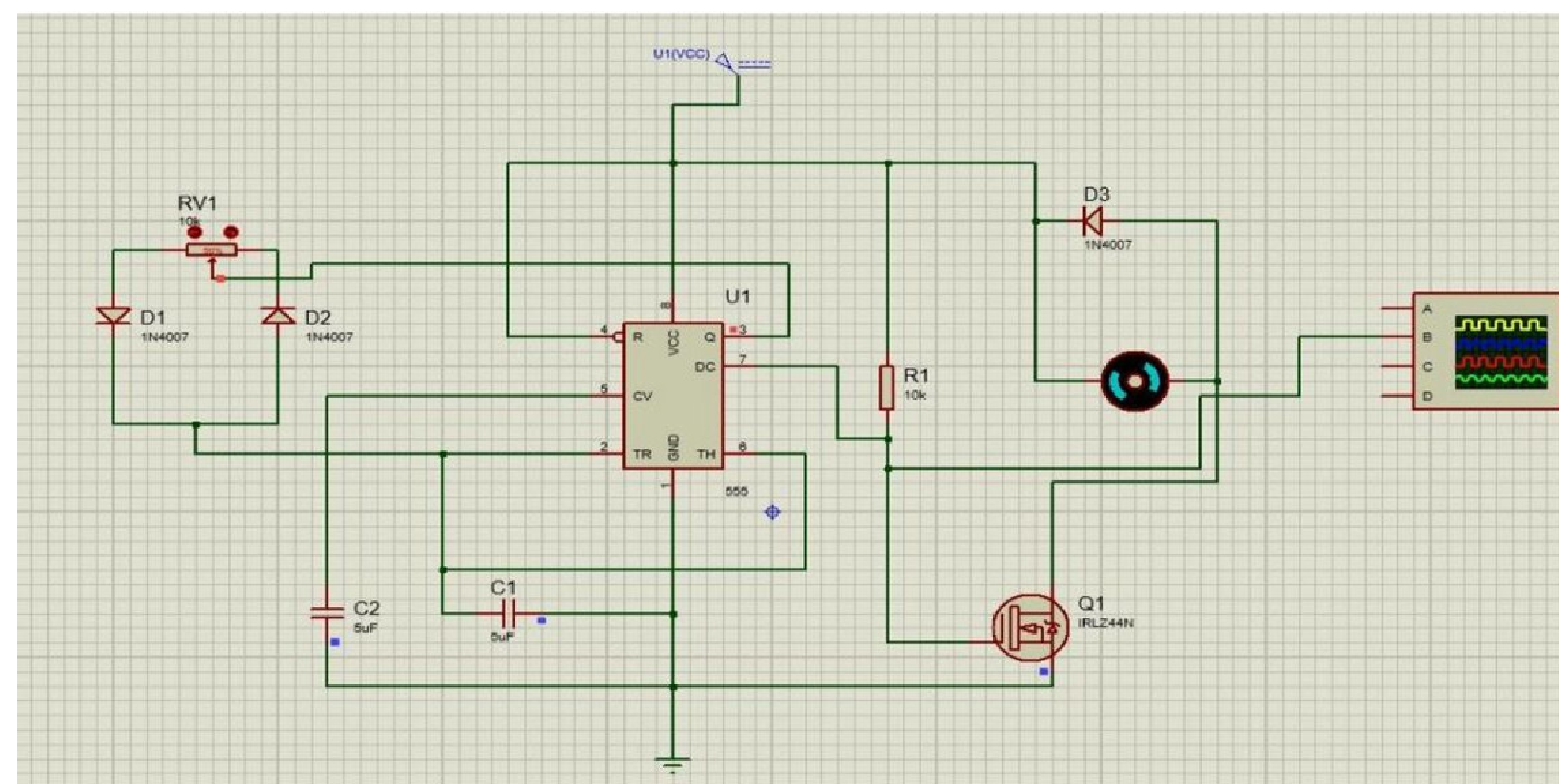
Principle

- The IC 555 Timer is wired in astable mode of operation.
- Using a potentiometer the duty cycle of the 555 timer can be controlled.
- The duty cycle of the timer IC can either be made narrow or broad.
- When the duty cycle of the IC is narrow the speed of the motor decreases and when the cycle is board the speed increases.

Immediately after this happens, the voltage at status rail changes to positive voltage because of the feedback via PN diode. So even if other teams press the trigger now, the voltage at Pin-2 of the respective modules will be at positive voltage and the output doesn't turn ON.

Resetting of states of all the modules is done by applying 0V at the reset pin of all the 555 ICs using reset rail and a dedicated push button.

Proteus Simulation



- The timing capacitor charged and discharged through diodes used to protect the electronic circuit from the inductive loading of the motor.
- The output signal at respective pins of the IC 555 is equal to the supply voltage a switching the transistors fully "ON".
- The change in the duty cycle is called modulation and as the change is occurring in the pulse width it is thereby called PULSE WIDTH MODULATION.
- The Speed of the DC Motor depends on the modulation voltage. The greater the Voltage the faster the rotation of the motor

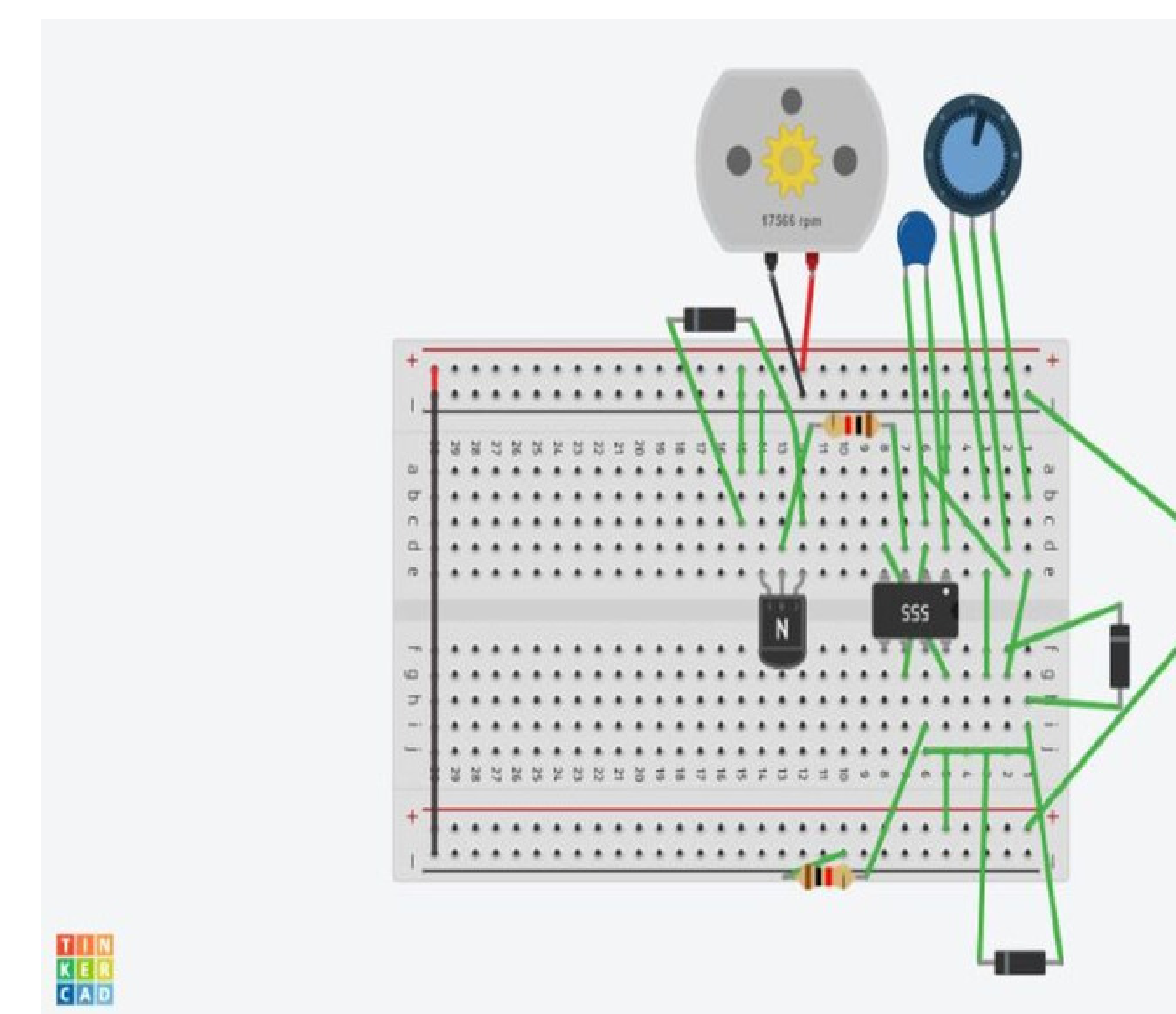
Applications

- Telecommunications
- Speed controller

Advantages

- Power loss in the switching devices is very low
- Highly sensitive
- Low cost and reliable circuit
- Reduction of hi her order harmonics.

Breadboard circuit



log pulse width Modulation technique.

- In that proposed method , duty cycle is varied from 0 percent to 90 percent and motor is controlled at different speeds.
- At 50 percent of duty cycle , speed of DC motor is observed to be half of that at full voltage.

Course Coordinator

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Refrences

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