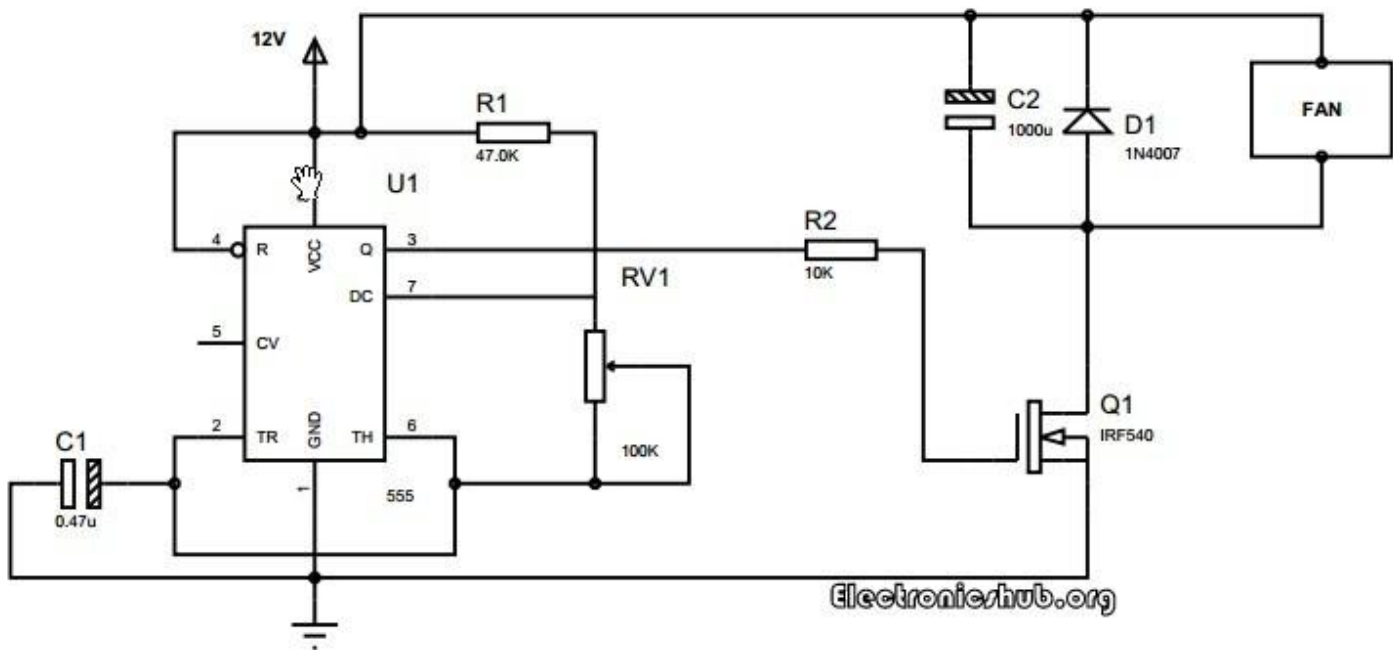


Speed Control of DC Motor Using Pulse Width Modulation

We use DC fans in many systems in our day to day life. For example, CPU fans, fume extinguishers and many more appliances which we make use of are operated by DC. Most of the times we will have a need to adjust the speed of the motors to our requirement. Although some systems have an automatic adjustment system for fan speed, not all systems possess this functionality. So, we will have to adjust the speed of our fan ourselves occasionally.

To adjust the speed of our fan manually, there are multiple ways to do that. We can adjust the speed by using a resistance in series with the motor. This is the simplest of all ways but it is not usually preferred because if we want to use any devices like microcontrollers or any other digital equipment for automating our DC fan speed, then this method will not work in general. A more efficient way to proceed is by using pulse width modulation technique to manage the speed of our DC motor.

Circuit Diagram of PWM Based DC Fan Controller:



In this circuit, the DC motor is operated by a 555 integrated circuit. The IC 555 in this circuit is being operated in astable mode. In this mode, the circuit can be used as a pulse width modulator with a few small adjustments to the circuit. The frequency of operation of the circuit is provided by the passive parameters of resistances and capacitances attached to it. The resistance between pin-7 and pin-8, the resistance between pin-6 and pin-7 and the capacitance between pin-2 and the ground govern the frequency of operation and duty cycle of the ic 555 in astable mode. The duty cycle is governed by the resistor which is in between pin-6 and pin-7 of the IC 555 timer. So, by taking advantage of the circuits working, we can change the 555 astable multivibrator into a pulse width modulator by using a variable resistor instead of a constant resistor in between pin-6 and pin-7.

One of the best things about this circuit is that we can make it work as an astable multivibrator with little hardware and by little cost which can save both the cost involved in making it as well as the space on the printed circuit board is saved. If we want a sophisticated pulse width modulator which works more accurately and which can have more adjusting capabilities, then it is better to use a microcontroller based pulse width modulator than the one which we are using now. However, the circuit or the application for which we are using a pulse width modulator is not so sensitive and hence does not demand so much of accuracy. In such a case, the circuit which we are using with a bare IC 555 is better as it saves our monetary as well as space resources in building the circuit.

The duty cycle of the circuit can be changed by changing the resistance between pin-7 and pin-6. If we increase the duty cycle, the speed of the motor increases and if we decrease the duty cycle, the speed of the motor decreases.

Source: <http://www.electronicshub.org/speed-control-of-dc-motor-using-pulse-width-modulation/>