WIRELESS MOTOR SPEED CONTROL USING RF SENSOR

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Abstract-**As we know there are lots of good-quality motor speed controls on the market. However, their costs are relatively high. It is difficult to control speed of the motor with both low cost and good performance, if it is as such it will be able to sell because people want to buy it. It is useful for low mobility applications. Wire based connectivity is costly and very difficult to do the connection.The wireless connectivity has a nature of low cost and less environmental limitations. So we can control the speed of the DC motor from remote place with the help of wireless communication. With these ideas together, we came up with this project is High-performance low-cost low-loss wireless DC motor speedcontrol unit.**

In this project two section receiver section and transmitter section is present.The control signal which is transmitted from transmitter, part of the received signal is extracted and is changed to microcontroller-preferred format. Here the system is capable of controlling the motor by receiving control signal. Microcontroller is the heart of our system, which controls the operation of entire system.

I. INTRODUCTION

A DC motor is designed to run on DC electric power. It has been popular in the industry control area for a long time, because they have many good characteristics, for example: high speed torque characteristic, high performance, and it can be linearly control. There are different control approaches available depending on the different performance of motors. Because the peripheral control devices are enough, there is the more extensive application in the industry control system

As we know we can easily control the speed of the DC motor, this project is used to control the speed of the DC motor from the remote place. It uses the microcontroller to control the DC motor, by usingRF wireless communication we can control the DC motor speed and direction. In this project we are using encoder(HT12E), decoder(HT12D), keys, and relay driver.

Previously, speed of DC motor is control with wire based scheme which need large physical connection, even though efficiency of this scheme is less than wireless controlling scheme. It removes drawbacks of previous controlling scheme.

EXISTING SYSTEM:

In early days, the speed of the DC motor in industry is controlled only through electric switch, knobs and

Regulator. But it is not possible to control the speed of the motor from the remotearea. Since this is one of the drawbacks for controlling the speed of the DC motor

. PROPOSED SYSTEM:

In this proposed system, the speed of the DC motor can be controlled through RF communication from the remote place.Keys is used as control signal generator which gives control signal to encoder, after receiving signal encoded data is given to transmitter.

The RF transmitter transfers the encoded signal to RF receiver. The RF receiver receives the data from transmitter and decodes the incoming data that data is fed to microcontroller.

BLOCK DIAGRAM

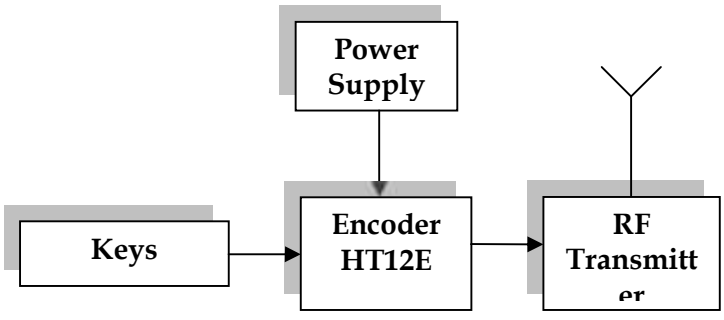

Fig 1.1 Transmitter section

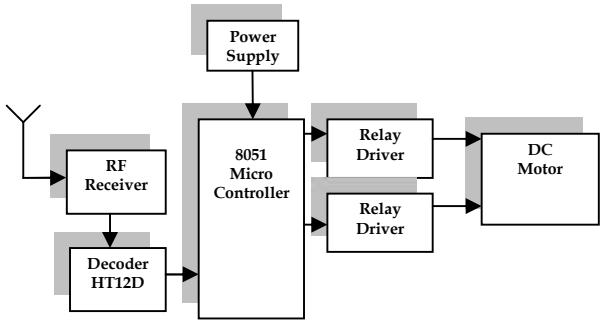

Fig 1.2 Receiver section

The DC motor is interfaced with the controller with the help of relay circuit. Depending on the message received from RF transmitter, the controller controls the speed.

II LITERATURE SURVEY

GSM Based Motor Speed Control

***Abstract* -** In this paper, the design aspects of an embedded device which can control up to 8 devices by sending a Specific SMSmessage from a mobile phone are presented. This controller is extremely useful at places where we have to control the ON and OFF switching of the devices but no wired connection to that place is available. A GSM modem is connected to a programmed microcontroller. The control signal part of the received SMS is extracted and is changed to microcontroller-preferred format. A PC which is connected to the microcontroller using a serial communication through RS232 the monitoring is also done by interfacing a LCD to the microcontroller. Global Systems for Mobile Communication is widely used because of its simplicity in both transmitter and receiver design, it can operate at 900 or 1800MHZ bandwidth. It is faster and trusted to work well and globally network. Here the system is having capacity of controlling the motor by receiving control message from an authorized mobile number. Microcontroller is the important part of our system, which controls the entire operation of our system. System is always alert in order to receive SMS from valid number and that message can be displayed on the LCD. In the project GSM technology based automatic control system is designed to monitor and control speed of an Induction motor/DC motor and also performs necessary operation like start, stop, accelerate and decelerated etc.

Rotor-Positionover a Radio-Frequency Link For Motor Speed Control

Abstract: We demonstrate the feasibility of controlling the speed of an induction motor using a wireless positionfeedback over a radio-frequency (RF) link and compare its performance under dynamic- and steady-state conditionswith those obtained using a wirebased position-feedback control. Due to wireless scheme the need for thecable is not necessary that feeds position from the sensor to the controller, hence we can minimize feedback-noise pickup and cost forsome applications. It also increase the possibility of using a low-resolution and low-cost sensor, with the help of simple estimation algorithms, which may potentially provide an alternative to or back-up support for conventionalposition-sensorless control for wide range of motors and speed. Further, using a composite-Lyapunov-functionbased approach, we determine the effect of time delay on the stability of the overallsystem.

III.HARDWARE DESIGN DETAILS

3.1 RF RECEIVER

The RF receiver also works at 433.92MHz, and it is sensitive to 3uV. The TWS-434 receiver works from 4.5 to 5.5 volts-DC, it has both linear and digital outputs. The P2_0, P2_1, P2_2 and P2_3 which is pin of controller is make it as data transmit pins. The DATA_OUT pin of RF Transmitter is connected to the DATA_IN pin of DECODER and then the data is processed by the decoder.

3.2 RF TRANSMITTER

The transmitter also operates at 434MHz, and make hand held transmitter. The TWS-434 transmitter operates from 1.5 to 12 volts-DC, and has both linear and digital outputs. The P2_0, 1, 2, 3 pin of controller is assumed as data transmit pins. The OUT pin of encoder is connected to the IN pin of RF transmitter and then it transmits the data to the receiver

IV. POWER SUPPLY

This section explains how to generate +5V DC power supply

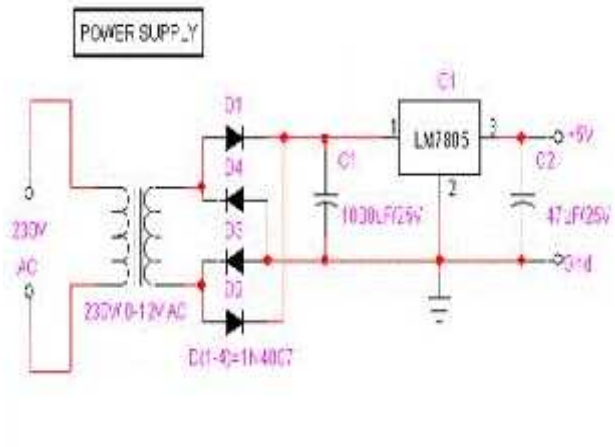

Fig 1.3 power supply

The power supply deliver constant output regulated power supply for successful working of the project. For this we are using 0-12V/1 mA transformer. The part of this transformer is connected in to main supply through on/off switch& fuse for protecting from overload and short circuit protection. The second part is connected to the diodes to convert 12V AC to 12V DC voltage. And it filtered by the capacitors, which is further regulated to +5v, by using IC 7805.

4.2 WORKING PRINCIPLE

Transformer

In this project we need +5 v power supply.Thetransformer will step down the power supply voltage (0-230V) to (0-6V) level. Then the secondary of the transformer will be connected to the rectifier, which is constructed with the help of op–amp.

Rectifier

Rectifier is electrical device that converts alternative current DC which is periodically reverse in DC. When four diode is connected, D2 and D3 is forward biased, D2 and D4 reverse biasing D1 and D3. Point A is a positive potential, and point B a negative potential. The positive potential at point A will forward bias D3 and reverse bias D4.At point B D1 will forward bias and D2 will reverse D2. At this time D3 and D1 are forward biased and will allow current flow to pass through them; D4 and D2 are reverse biased and will block current flow

It has one advantage over a ordinary full-wave rectifier is that with a given transformer the bridge rectifier produces a voltage output that is nearly twice that of the conventional full-wave circuit

IC voltage regulators

Voltage regulators widely usedIntegratedCircuits. Generally voltage regulators is used for regulating high voltage to low voltage. In this paper 7805 IC is used for regulating +5v power. Alternative if we want +6v, 7806 IC, like this for different power, different Ics are available Regulator units contain, comparator amplifier,

controldevice, and overload protection. All these features available in a single IC. IC units gives regulation of either a fixed positive voltage, or fixed negative voltage, or we can adjust the voltage. The IC regulators can be select for operation with load currents from hundreds of milli amperes to tens of amperes, corresponding to power ratings from milli watts to tens of watts.

V.MICROCONTROLLER

Microcontroller is important part of our project. The 8051 is an 8-bit, high performance microcontroller. It consumes low power. There are a large number of devices in 8051 family with similar architecture and each member of the family is downward campatible with each other. A microcontroller is a small computer on a single integrated circuit consisting of a relatively simple CPU. It supportsfunctions such as a crystal oscillator, timers and etc. Microcontrollers is automatically controlled products and devices, such as automobile engine control systems, remote controls communication, office machines, home appliances, power controlling tools, and toys.

The main reason for their great success and popularity is a skillfully chosen configuration which satisfies different need of a large number of users allowing at the same time constant expansions (refers to the new types of microcontrollers). Even though, the software has been developed broadly with in the small time, and it simply was not profitable and easy to change anything in the microcontroller's basic core. Therefore great number of various microcontrollers which basically are solely upgraded versions of the 8051 family is available.

The whole configuration is used to satisfy the needs of most programmers for development of devices. One of its advantages is everything is present in single chip, that nothing is missing and nothing is too much. In other words, we cansay that it is created exactly in accordance to the average user requirements. One more advantages are RAM organization, the operation of Central Processor Unit (CPU) and ports which helps in difficult .situationand enable further upgrade.

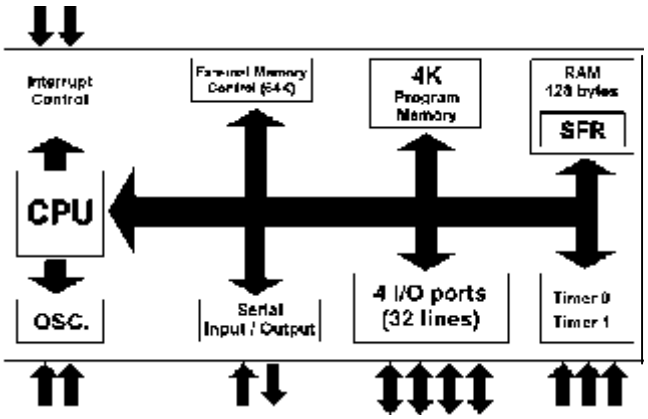

Fig 1.4 8051 schematic

The input and output device or connected to port pins of the controller. Mostly input and output devices include switches, relays, LEDs, various LCD displays, radio frequency devices etc. The device, such as GSM, GPS and RFID are connected to the controller via serial communication i.e. transmit and receive pins

5.1Pinout Description

Pins 1-8: Port 1 these pins can be configured as an input or an output.

Pin 9: RS When we are giving logic one on this pin it disables the microcontroller and clears the contents of most registers. As we can say, the positive voltage on this pin resets the microcontroller. When this pin is at logic zero, the program starts execution from the beginning.

Pins10-17: Port 3 it is similar to port 1, each of these pins configured as general input or output. As well as, all of them have alternative functions:

Pin 10:RXDThis pin is configured as Serial asynchronous communication input or Serial synchronous communication output.

Pin 11: TXD Serial asynchronous communication output or Serial synchronous communication clock output.

Pin 12: INT0 Interrupt 0 input.

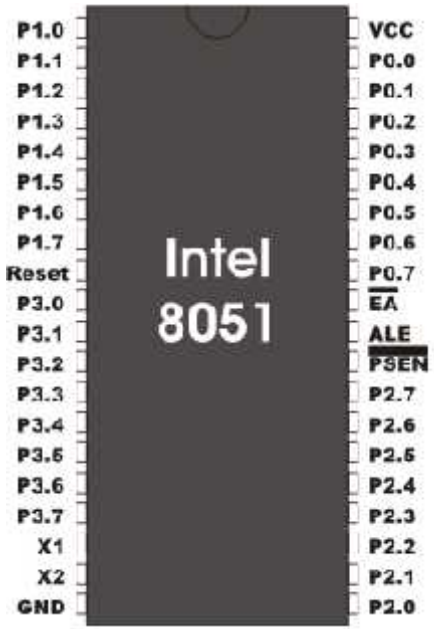

Fig1.5 pin diagram

Pin 13: INT1 Interrupt 1 input.

Pin 14: T0 Counter 0 clock input.

Pin 15: T1 Counter 1 clock input.

Pin 16: WR Write to external (additional) RAM.

Pin 17: RD Read from external RAM.

Pin 18, 19: X2, X1 Internal oscillator input and output. A quartz crystal which specifies operatingfrequency is usually connected to these pins. In place of it, smaller size ceramics resonators can also be used for frequency stability. Later versions of microcontrollers work at a frequency of 0 Hz up to over 50 Hz.

Pin 20: GND Ground.

Pin 21-28: Port 2 If there is no need to use external memory then these port pins are used as general inputs/outputs. If external memory is used, A8-A15 will appear on this port. We can't use memory with capacity of 64Kb.

Pin 29: PSENif external ROM is used for storing program then a logic zero (0) appears on it every time the microcontroller reads a byte from memory.

Pin 30: ALE when microcontroller puts the lower address byte (A0-A7) on P0 and activates the ALE output. When ALE pin gives signal, the external register store the state of P0 and uses it as a memory chip address. When ALU pin is

returned its previous logic state and then P0 is used as a Data Bus.

Pin 31: EAP2 and P3 are used for data and address transmission with no regard to whether there is internal memory or not, when these pins are configured as logic zero. If there is aprogram written to the microcontroller, it will not be executed. It will execute only when the programiswritten to external ROM. If EA pin is logic zero, the microcontroller will use both memories, first it will use internal memory then external memory.

Pin 32-39: Port 0these are similar to P2, if external memory is not needed, these pins can be used as general inputs/outputs. Otherwise, P0 is address output (A0-A7) when the ALE pin is driven high (1) or as data output (Data Bus) when the ALE pin is driven low (0).

Pin 40: VCC +5V power supply.

VI.DRIVEN CIRCUIT

The ULN2003 is a monolithic high voltage and high current Darlington transistor arrays. It has seven NPN Darlington pairs. Features of seven NPN Darlington pairs are high-voltage outputs with common-cathode clamp diode for switching inductive loads. The collector-current measurement of a single Darlington pair is 500mA. For higher current capability the Darlington pairs may be paralleled. ULN2003 is used in different applications such as relay drivers, hammer driverdisplay drivers, line drivers, and logic buffer. The ULN2003 series input resistors selected for operation directly with 5 V TTL or CMOS. These devices will handle many member interface needs particularly those beyond the capabilities of standard logic buffers

The ULN2003 have series input resistors for operation directly from 6 V to 15 VCMOS or PMOS logic outputs. One of example of standard Darlington arrays is ULN2003.

The outputs are able to sinking 500mA and will withstand at least 50 V in the OFF state. For higher load current Capability outputs may be paralleled.

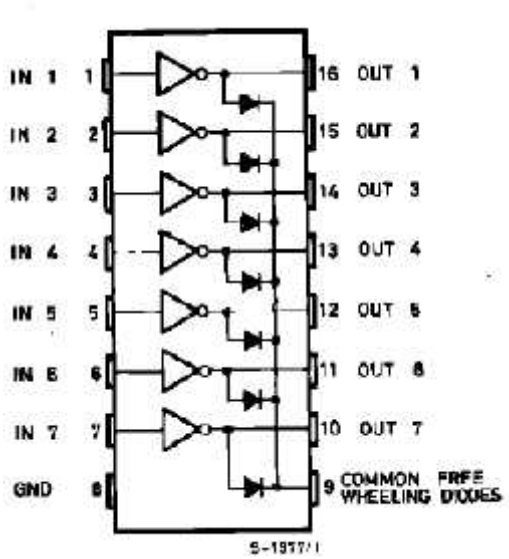

Fig 1.5 ULN2003

VII.DC MOTOR:

A DC motor is designed to run on DC electric power. Standard examples of pure DC designs are Michael Faraday's homopolar motor (which is uncommon), and the ball bearing motor, which is (so far) a novelty. Previously most common DC motor types are the brushed and brushless types, which use both internal and external commutation to create an oscillating AC current from the DC source—so they are not purely DC machines in a strict sense.We in our project are using brushed DC Motor, which will operate in the ratings of 12v DC 0.6A which will drive the flywheels in order to make the robot move.

Brushes, commutator contacts, and rotor windings are parts of dc motor, and geometry of these parts is such as when power is applied, the polar point of the energized winding and the stator magnet(s) are misaligned, and the rotor will rotate until it is maximum aligned with the stator's field magnets. When the rotor reaches maximum alignment, the brushes change its position to the next commutator contacts, and after it will energize the next winding. Example of two-pole motor, direction of current through the rotor winding rotate the motor in reverse direction, leading to a "flip" of the rotor's magnetic field, driving it to continue rotating

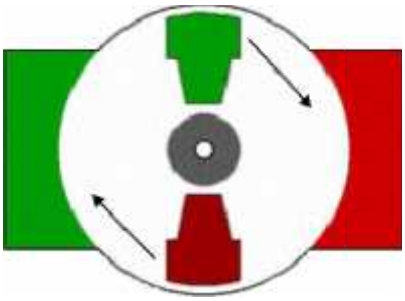

Fig 1.6 two pole motor

In real life, though, DC motors will always have more than two poles (. In particular, this avoids "dead spots" in the commutator. We can imagine how with our example two-pole motor, if the rotor alignment is exactly at the middle of its rotation it will get stuck there.

Fig 1.7 DCmotor

VII.RELAYDRIVER

A relay is an electrically operated switch. When electric current pass through the coil of the relay it creates a magnetic field which attracts a lever and changes the switch contacts. We can ON or OFF the coil current so relays have two switch positions and there are double-throw (changeover) switches.It consists of a coil of wire surrounding a soft iron core, an iron yoke, which makes a low reluctance path for magnetic flux, a movable iron armature, and a set, or sets of contacts.

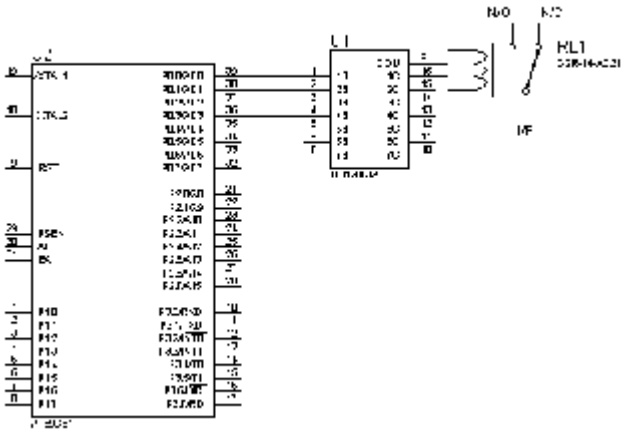

Fig 1.7 delay driver

In this condition, one of the two sets of contacts in the relay pictured is closed, and the other set is open. The P0_0, P0_1, 2, 3, pin of controller is assumed as data transmit pins to the relay through relay driver ULN 2003. ULN 2003 is just like a current driver which gives current to microcontroller. Number of relay circuit depends that how many control signal we are using.

IX.KEYS

This unit is controlled by five push buttons and generates a 3-bit control code. These keys are also known as control signal generator.

The codes we assigned to each command is shown in the following table

Commands	Codes
Start	1100
Stop	1111
Accelerate	1000
Decelerate	0000
Reset	0001

By using these codes we give command to DC motor for different operation such as start, stop etc and also control the dc motor.

X.CONCLUSION

The hardware design of an embedded monitoring system for real time applications is presented in this paper. We are

clearly showing the feasibility of a DC motor speed control scheme using wireless position feedback andcompare its performance with those obtained using a wirebased position feedback. Although the wireless sensing scheme includes the need for a multi-wire physical connection (thereby saving cost), the performance of the motorusing this scheme is very close to that obtained using wirebased position feedback.But the wireless scheme isapplicable up to zero speed, in this paper, the lower speed limit of 20 rpm (~ 0.3333 Hz) is because of the lowerbandwidth limitation of the analog RF transmitter. Our recent work with complete digital implementationovercomes this limitation.

Under good channel condition and within the bandwidth of the RF transceiver, the noise pickup of thefeedback position signal is found to be lower for the wireless sensing schemewhich also exhibits little sensitivity to the channel separation between the transmitter and receiver units. RF transmitter transfers the encoded signal to receiver. RF receiver receive the signal and then decodes the incoming data and fed to microcontroller. Thus,although channel disruption in the wireless scheme cause data loss (and delay), a successfully transmitted data picksup less noise than the data transmitted using wirebased feedback because of the absence of the cable in the former

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