ROBOTICS SURVEILLANCE PROJECT

A Project Report on

Submitted by

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IN

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KALSEKAR TECHNICAL CAMPUS

PANVEL

2014-15

DECLARATION

We hereby declare that the project entitled **ROBOTICS SURVEILLANCEPROJECT**submitted for the B.E. Degree is our original work and the project has not formed the basisfor the award of any degree, associateship, fellowship or any other similar titles.

Signature of the Students:

Mr. MATIUR REHMAN

Mr. SALIM SAYYED

Mr. MEHTAB ALAM

Place:

Date:

CERTIFICATE

This is to certify that the project entitled'' **ROBOTICS SURVEILLANCE PROJECT**" is the bonafide work carried out by EXTC students of B.E., KALSEKAR Technical Campus, Panvel, during theyear 2014, in partial fulfillment of the requirements for the award of the Degree of B.E EXTC and that the project has not formed the basis for the award previously of any degree, diploma, associateship, fellowship or any other similar title.

Prof.MujibTamboli
(H.O.D)

Prof. Rahul khadase
(project Guide)

(External)

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ABSTRACT:

Object tracking is a challenging task in spite of all sophisticated methods that have been developed. The major challenge is to keep track of the object of a particular choice. In this work, a new video moving object-tracking method is proposed. The segmentation of the video is done by contextual clustering. Clustering is an important method in data analysis because of its ability to 'discover' the inherent features in the data. The fundamental concept in clustering techniques is to group a given set of objects into subsets according to properties associated with each object, so that the members in each individual subset share some similar properly defined features. A multitarget human tracking is attempted.

ACKNOWLEDGEMENT:

During this year long project several people have provided many forms of help and support. Firstly Iwould like to thank **Prof. MujibTamboli (HOD)** of our department for selecting me to do this project and forcontinuous guidance throughout the project. Secondly I would like to thank the other team memberswho have provided ideas, been cooperative and made the team work so well. There have been nooccasions where a conflict of opinion has not been resolved successfully Finally, I would like to thank our guide Prof.Rahul khadaseand all the group members who helped me develop the skills necessary to tackle this project. Without them it islikely I would not be on this project and even if I were the chances are I would be struggling.

Chapter 1

INTRODUCTION

Surveillance is the monitoring of behavior Systems surveillance is the process of monitoring the behavior of people, objects or process within systems for conformity to expected ordesired norms in trusted systems for security orsocial control. Intelligent visual surveillance systems deal with the real time monitoring of persistent and transient objects within a specific environment.

The primary aims of these systems are to provide an automatic interpretation of scenes and to understand and predict the actions and interactions of the observed objects based on the information acquired by sensors. The main stages of processing in an intelligent visualsurveillance system are: moving object detection and recognition, tracking, behavioral analysis and retrieval.

These stages involve the topics of machine vision, pattern analysis, artificial intelligence and data management.

The technological evolution of video based surveillance systems started with analogue closed circuit television (CCTV) systems. These systems consist of a number of cameras located ina multiple remote location and connected to a set of monitors, usually placed in a single control room, via switches (a video matrix). Conventional CCTV cameras generally use a digital charge coupled device (CCD) to capture imagesThedigital image is then converted into an analogue composite video signal, which is connected to the CCTV matrix, monitors and recording equipment generally via coaxial cables. The digital to analogue conversion does cause some picture degradation and the analogue signal is susceptible to noise. It is possible to have CCTV digital systems by taking advantage of the initial digital format of the captured images and by using high performance computers

The technological improvement provided by these systems has led to the development of semi-automatic systems, known as second generation surveillance systems. Most of the research in second generation surveillance systems is based on the creation of algorithms for automatic real-time detection events aiding the user to recognize the events. The increasing

demand for security by society leads to a growing need for surveillance activities in many environments.

The demand for remote monitoring for safety and security purposes has received particular attention, especially in the following areas. Transport applications include airports, maritime environments, railways underground, and motorways to survey traffic Public places such as banks, super markets homes, department stores and parking lots use such surveillance systems. Remote surveillance of human activities such as attendance at footballmatches or other activities and surveillance toobtain certain quality control in many industrialprocesses, surveillance in forensic application and remote surveillance in military applications are in use.

Recent events, including major terrorist attacks, have led to an increased demand for security in society. This in turn has forced governments to make personal and assess security a priority in their policies. This has resulted in the deployment of large CCTV systems.

Surveillance systems created forcommercial purposes differ from surveillance systems created in the academic world, where commercial systems tend to use specific-purpose hardware and an increasing use of networks of digital intelligent cameras. The common processing tasks that these systems perform are intrusion and motion detection and detection of packages. Research in academia tends to improve image processing tasks by generating more accurate and robust algorithms in object detection and recognition, tracking, human activity recognition, database and tracking performance evaluation tools.

Chapter 2

LITERATURE SURVEY

Survey1.

Adario Strange published an article in April 2013 in Businessweek.com website that explained how the **Google's self-driving car** see the world. The article talks about what Silicon Valley's leading techies has invented what could be considered as the visual equivalent for Google's much talked about self-driving cars. Gross, the long-time head of technology incubator Idea lab and the organization behind a wide range of tech companies, posted this on web. Gross claimed that Google's self-driving car gathers almost 1GB data per second. Figure 1 shows what it 'sees' while making a left turn. Google's self-driving cars use a ton of sensors including lasers and radars to carefully react to pedestrians and streets accurately and safely.

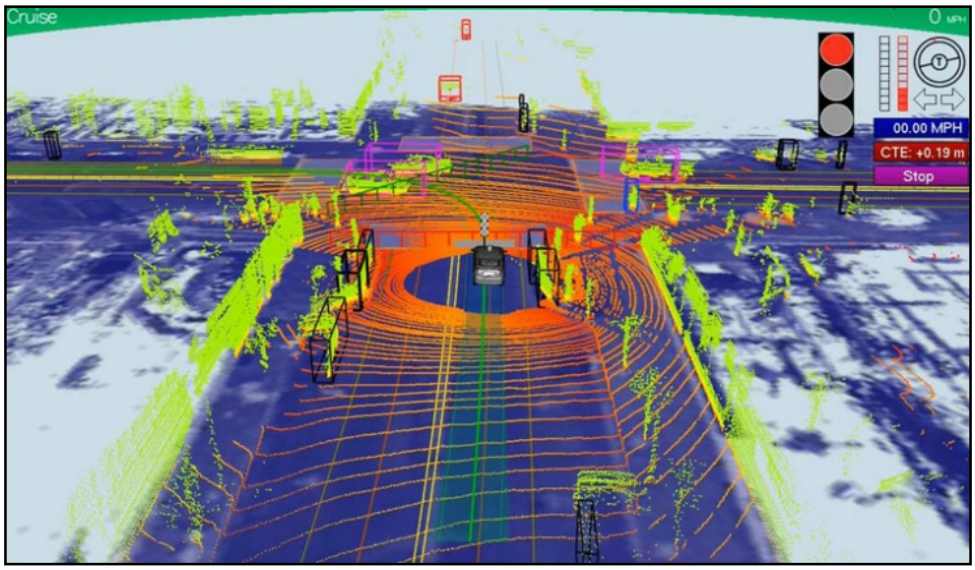


Figure 1: The data what Google's Self-Driving car gathers while making a left turn

Survey2.

On May 23,2013 Manfred Auer shared an image via youtube that explained the applications of st tells us more about how and why self-driving car was rebuilt by Ionut Alexandru Budisteanu which was earlier the idea proposed and built by a 19 year old from Romanian. **Google's autonomous driving vehicle** costs $75,000, whereas Budisteanu's system—which uses 3D radar and a mounted camera to detect traffic lanes and curbs—can be had for $4,000. For that, he won the Gordon E. Moore Award at Intel's (INTC) International Science and Engineering Fair this year.

Figure 2: The image captured by a Self Driving Car

In today's date the race is to drive down the costs for similar vehicles. Researchers at the University of Oxford have disclosed their plans to build a system of self-driving-car cameras for £5, 00. That's good, because apparently consumers have been comfortable enough with the concept that they're worried about the price.

According to a J.D. Power & Associates (MHFI) survey published in April, 39 percent of people would be interested in owning an autonomous car, but only 21 percent said they'd be interested if it cost them an extra $3,000; whereas the drivers were much more interested in paying a premium for semiautonomous features, such as emergency braking and steering or electronic parking assistance—fortunately for them, these features are actually available. The interest in self-driving cars is about the same as it was a year ago, but the novelty seems to have worn off, says Michael Van Nieuwkuyk, executive director of global automotive at J.D. Power.

Lawmakers are likely the biggest hurdle. Autonomous vehicles are legal for testing purposes in Nevada, California, and Florida, and Google (GOOG) is reportedly buttering up federal regulators. Also there are a few safety questions. Insurance is also a major unknown.

Survey3.

On May 29, 2013 Dan Graziano through his article in **The New York Times** made a point that Affordable self-driving cars could be available within the next three years.

Figure 3: The image of Autonomous vehicle

Further it states that Driverless cars have the potential to drastically reduce accident rates and saves hundreds of thousands of lives worldwide each year. . Google has been hard at work making autonomous vehicles a reality but it is equipped with a large array of bulky cameras and sensors that cost thousands of dollars, making mass production unlikely. Israeli company has created a relatively low-cost system that could see self-driving cars come to market sooner than we thought.

Mobileye Vision Technologies created a self-driving system for the Audi A7 car at a low cost. Mobileye founder AmnonShashua explained "You cannot have a car with $70,000 of equipment and imagine that it will go into mass production,"

Gaby Hayon, senior vice president for research and development at Mobileye, in an interview with *The New York Times* said "The idea is to get the best out of camera-only autonomous driving,"

Unlike Google's self-driving system, which can merging onto freeways, make turns and even pass slower vehicles, Mobileye's technology can only handle driving in a single lane at highway speeds, accelerating and stopping at traffic lights. It can be easily commercialized.

Mobileye has partnered with more than five major automakers to offer a limited system this summer. The technology includes a feature known as "traffic jam assist" that allows vehicles to drive safely in stop-and-go traffic, although drivers are required to keep their hands on the wheel. The

company is planning to introduce more advanced systems that will include highway driving support as soon as 2016.

Survey4.

Figure 4: Autonomous Benthic Explorer (ABE)

The ABE since its introduction in 1995 is a pioneer of unmanned deep-sea exploration. It was lost while exploring the Chile Triple Junction in March, 2010.

The advantage of ABE is that it can cover large areas of underwater terrain. To monitor underwater areas over long periods of time can be very expensive using surface ships and manned submersibles for repeated visits to address scientists' frequent needs.

ABE is designed to perform a predetermined set of maneuvers, take photographs, and collect data and samples within an area about the size of a city block. After accomplishing its mission, ABE "goes to sleep," conserving its power supply for months at a time, allowing for future missions without recharging its batteries.

It was developed by a team of engineers, who assembled robot's body, muscles, nerves and brain. The final design allows scientists to program ABE to maneuver independently in three dimensions, and at a range of speeds. These features allow ABE to follow the contours of underwater mountain ranges, fly around sheer pinnacles, and dive into narrow trenches.

Chapter 3

PROJECT OVERVIEWS

Basic Specification Ideas

This section outlines some of the ideas, considerations and possible choices at the beginning of theproject. There were three basic ideas on which the specification could be built upon.

Single Intelligent Robot

The first idea was a single intelligent robot that would probably integrate a laptop on the chassis, whichwould allow for image processing, making decisions and communications. This would likely use most if not all of the budget and the available time. However, if the necessary time and budget wereavailable, relatively simple duplication could result in two or three of these robots. These could interactwith each other; the complexity of this interaction depends directly on the time available.

Multiple Simple Robots

The second idea was to make multiple simple robots, each being much less complex than the first idea they could have some relatively simple rules on how to interact with each other so they could lookintelligent. For example simple rules can be applied to each bird in a simulation and when combined into a flock of these birds they will move like a real flock of birds moving and changing direction.

Single Intelligent Robot with Multiple Simple Robots

The final idea involved combining the two previous ideas to have a single complex robot (perhapssimpler than the first idea) with many smaller simple robots. Various ways they could interact werediscussed:

• Mother duck, ducklings and nest – the simple robots could run away when fully charged and the intelligent robot has to gather them up again. The mother could either 'scoop them up' or emit an audible sound which makes the duckling follow.

• Sheepdog and sheep – the intelligent robot has to herd the simple robots, which would act like thesheep.

• Predator and prey – the intelligent robot has to hunt the simple ones!

RobotCup

RobotCup is an organization that challenges groups of people to build robots for specific tasks and use them in various challenges against one another. Robocop @ Home is a relatively new league that focuses on real-world applications and human-machine interaction with autonomous robots. The aim is to develop useful robots that can assist humans in everyday life. Due to this league being new there was the possibility of entering it with a chance of building a competitive effort. However it was decided that if this route was chosen then the specifications would be set and many of the potential choices would be lost. Of the ideas previously stated, only a single intelligent robot would be suitable for entering this competition.

General Principles of Surveillance Robot

Surveillance robot is to recognize and detect motion automatically around a robot's environment. The robot design has been partitioned into sensor, control, and planning subsystems. Robotic surveillance appliance is built on a moving platform designed for surveillance and security tasks this robot can be operated in "remote eyes" or "automatictrip" modes.

This means it can be steered remotely by a human watchman as a moving surveillance camera or it candrive autonomously along an undefined route, detecting allinconsistencies in the video input. Secret surveillance intightly constrained spaces is demanded in many military and civilian activities, such as cave-in enemy raids and indoor hostage rescue missions. These special applications require a kind of miniature mobile robot to function covertly in highly confined environments. In our approach, moving targets can be detected by the robot using motion detection sensor and wireless camera.

To adapt to different lighting conditions, the target model is updated regularly based on an update mechanism to ensure robust tracking, the robot detects abnormal human behavior by tracking the upper body of a person. To lower the false alarms by motion detection system, gas detector, fire sensor, metal detector directs the robot to the scene where events occur and the robot can employ its camera to further confirm the occurrence of the events.

Chapter 4

Existing System

In recent days, the wireless communicationtechnology has become an integral part of several types of communication devices as it allows users to communicate even from remote areas. The devices used for wireless communication are cordless telephones, mobiles, GPS units, ZigBee technology, wireless computer parts, and satellite television, etc.

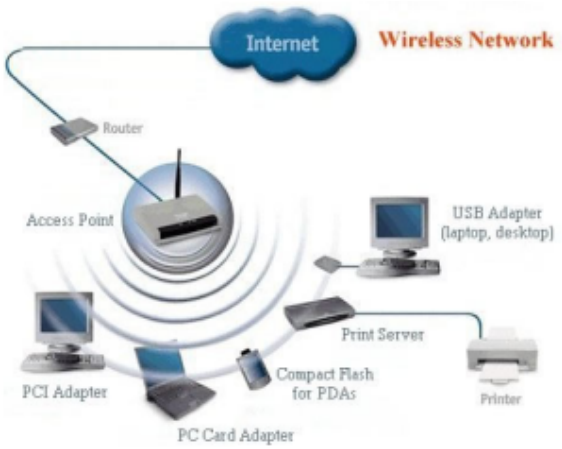
Types of Communication Technologies

Wireless Networking

Wireless Networking technologies connect multiple computers, systems and devices together without requiring wires or cables: a wireless local area network or WLAN comes under Wi-Fi.

WiMAX

There are wireless broadband systems that offer fast Web surfing without being getting connected through cable or DSL (Example of wireless broadband is WiMAX). Although WiMAX can potentially deliver data rates of more than 30 Megabits per second, yet the providers offer average 0 data rates of 6 Mbps and often deliver less, making the service significantly slower than the hard-wired broadband. The actual cost of the data available using WiMAX widely varies with the distance from the transmitter. WiMAX is also one of the versions of 4G wireless available in phoneas Sprint's 4G technology.



Wireless Networking

Wi-Fi

Wi-Fi is a form of low-power wireless communication used by many electronic devices such as laptops, systems, smart phones, etc. In a Wi-Fi setup, a wireless router serves as the communication hub. These networks are extremely limited in range due to low power of transmissions allowing users to connect only within close proximity to a router or signal repeater. Wi-Fi is common in home networking applications which provides portability without any need of cables. Wi-Fi networks need to be secured with passwords for security purposes in order not to be accessed by others.

Advantages

- Ease of Integration and Convenience – The wireless nature of such networks allows users to access network resources from nearly any convenient location.
- Mobility – With the emergence of public wireless networks, users can access the internet even outside their normal working environment.
- Expandability – Wireless networks are capable of serving a suddenly-increased number of clients with the existing equipment. In a wired network, additional clients require additional wiring.

Wireless Networking WiFI

Disadvantages

- Wireless LANs may not be desirable for a number of reasons.
- Radio Frequency transmission and wireless networking signals are subjected to a wide variety of interference including the complex propagation effects that are beyond the control of the network administrator.
- Security Problems – Wireless networks may choose to utilize some of the various encryption technologies.
- Range will be insufficient for a larger structure – and, in order to increase its range, repeaters or additional access points have to be purchased.
- The speed on most wireless networks will be slower than the slowest common wired networks.
- Installation of an infrastructure-based wireless network is a complex to set up.

Bluetooth Technology

Bluetooth technology allows you to connect a variety of different electronic devices wirelessly to a system for the transfer and sharing of data and this is the main function of Bluetooth.

Cell phones are connected to hands-free earpieces, wireless keyboard, mouse and mike to laptops with the help of Bluetooth as it transmits information from one device to other device. Bluetooth technology has many functions, and it is used most commonly in wireless communications' market.

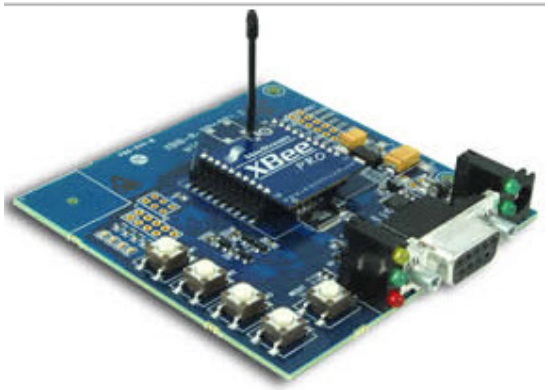
Bluetooth Technology

Features

- Bluetooth technology uses radio waves to communicate between devices. Most of these radio waves have a range of 15-50 feet.
- According to the official Bluetooth website, Bluetooth uses a low-power signal with a maximum range of 50 feet with sufficient speed to enable transmission of data.
- The pairing process identifies and connects any two devices to each other. It also prevents interference from other non-paired Bluetooth devices in the area.
- It uses maximum power only when it is required, thus preserving battery life.

ZigBee

ZigBee is a wireless communication standard designed to address the unique needs of low-power, low-cost wireless sensor, and control networks. ZigBee can be used almost anywhere, as it is easy to implement and requires little power to operate. Zigbee has been developed looking into the needs of the communication of data with a simple structure like the data from the sensors.



Zigbee Technology

Features

- ZigBee devices are designed for low-power consumption.
- ZigBee is used in Commercial Applications like sensing and monitoring applications.
- ZigBee uses very low power and extremely long device battery life.
- ZigBee gives flexibility to do more with the reliable wireless performance and battery operation.

Sensors

A sensor is a device that measures a physical quantity and converts itinto a signal which can be read by an observer or by an instrument. For accuracy, all sensors need to be calibrated against known standards.

A sensor is a device which receives and responds to a signal or stimulus. Here, the term "stimulus" means a property or a quantity that needs to be converted into electrical form.

A Passive Infra-Red sensor (PIR sensor) is an electronic device which measures infrared light radiating from objects in its field of view. Apparent motion is detected when an infrared source with one temperature, such as a human, passes in front of an infrared source with another temperature, such as a wall.

Design: Infrared radiation enters through the front of the sensor, known as the sensor face. At the core of a PIR is a solid state sensor or set of sensors, made from approximately 1/4 inches

square of natural or artificial pyro electric materials, usually in the form of a thin film, out of gallium nitride (GaN) caesium nitrate ($CsNO_3$), polyvinyl fluorides, derivatives of phenyl pyrazine, and cobalt phthalo cyanine. Lithium tantalate ($LiTaO_3$) is a crystal exhibiting both piezoelectric and pyro electric properties.

These are not particularly of interest to the special engineering project because the robot will have no hands and is not designed to touch anyone or anything. Examples of non-contact state sensors include proximity sensors, accelerometers, compasses, gyroscopes and optic encoders. Optic encoders are commonly used in mobile robots for tasks such as measuring and controlling motor speed and acceleration, as well as providing an odometer. The robot built as part of the special engineering project could have been improved by using some of these sensors, such as a compass and optic encoders.10External navigation sensors are normally employed to measure the environment and its features.

Chapter 5

Hardware Implementation

LIST OF COMPONENTS:

- ARDUINO MICRO-CONTROLLER.
- 4 MOTORS (Aprox 100-150 RPM).
- MOTOR DRIVER IC (L298N).
- BATTERY OF 12V.
- ZIGBEE MODULE FOR WRELESS CONNECTION.
- WIFI-CAMERA.
- LAPTOP.

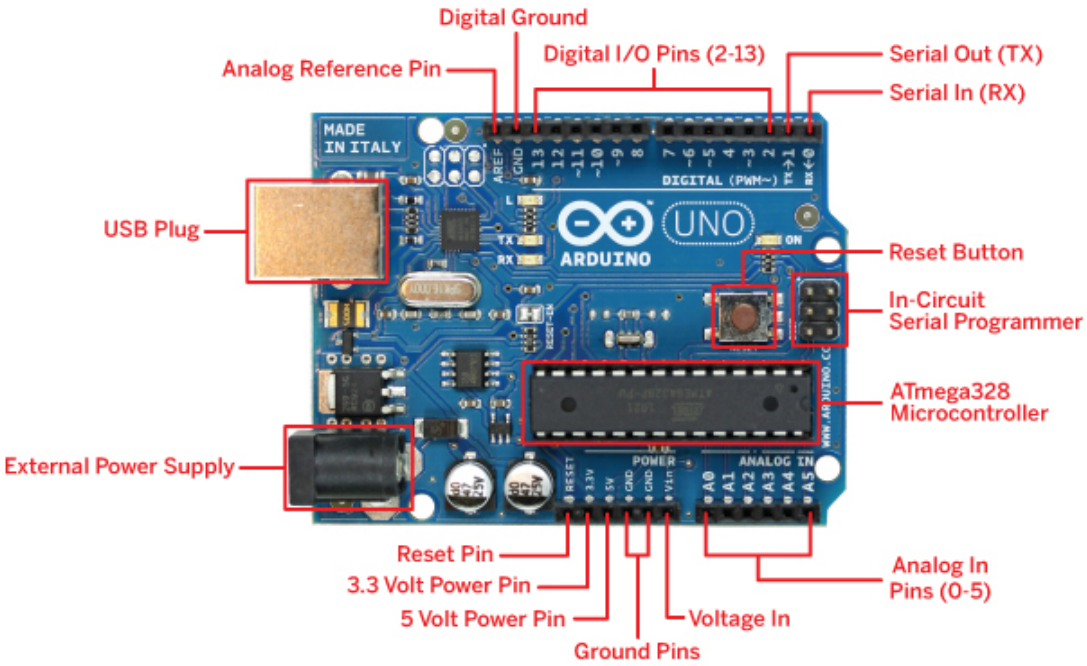
- **ARDUINO MICRO-CONTROLLER**

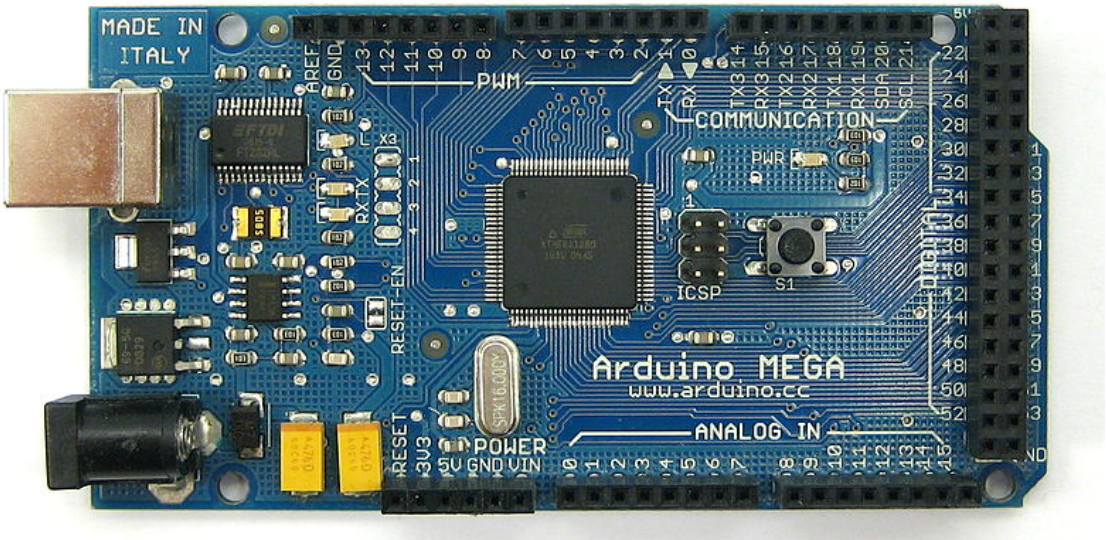
An Arduino board consists of an Atmel 8-bit AVR microcontroller with complementary components that facilitate programming and incorporation into other circuits. An important aspect of the Arduino is its standard connectors, which lets users connect the CPU board to a variety of interchangeable add-on modules known as shields. Some shields communicate with the Arduino board directly over various pins, but many shields are individually addressable via an I²C serial bus—so many shields can be stacked and used in parallel. Official Arduino have used the megaAVR series of chips, specifically the ATmega8, ATmega168, ATmega328, ATmega1280, and ATmega2560. A handful of other processors have been used by Arduino compatibles. Most boards include a 5 volt linear regulator and a 16 MHz crystal oscillator (or ceramic resonator in some variants), although some designs such as the LilyPad run at 8 MHz and dispense with the onboard voltage regulator due to specific form-factor restrictions. An Arduino microcontroller is also pre-programmed with a boot loader that simplifies uploading of programs to the on-chip flash memory, compared with other devices that typically need an external programmer. This makes using an Arduino more straightforward by allowing the use of an ordinary computer as the programmer.

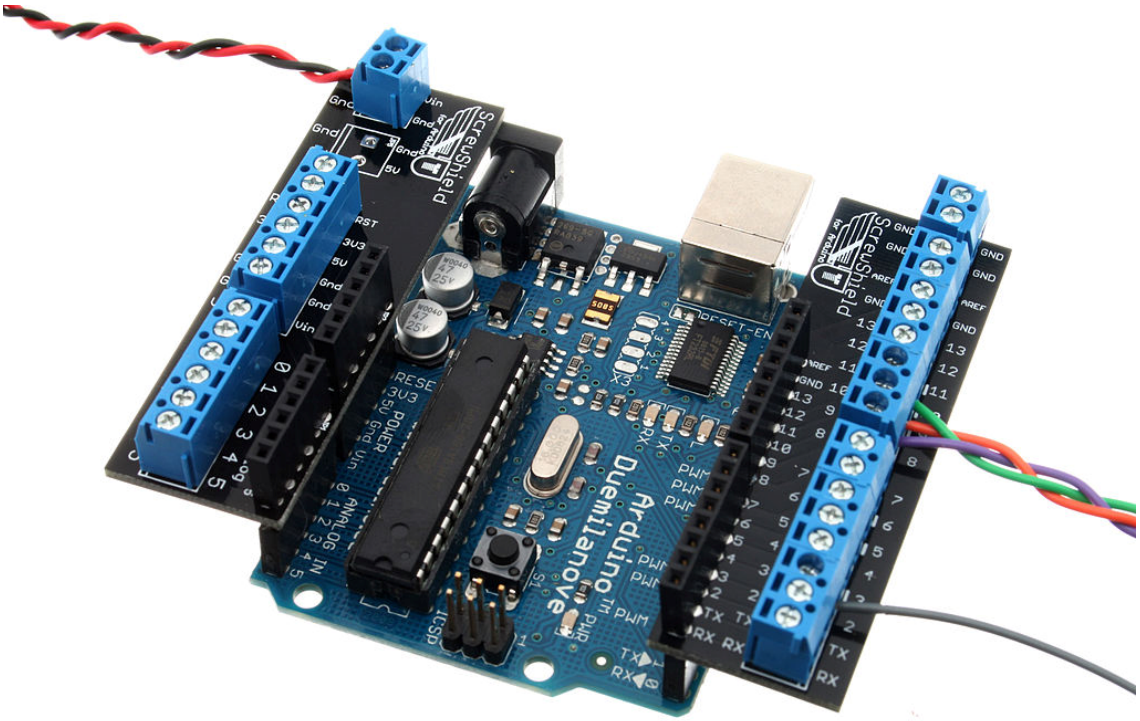
At a conceptual level, when using the Arduino software stack, all boards are programmed over an RS-232 serial connection, but the way this is implemented varies by hardware version. Serial Arduino boards contain a level shifter circuit to convert between RS-232-level and TTL-level signals. Current Arduino boards are programmed via USB, implemented using USB-to-serial adapter chips such as the FTDI FT232. Some variants, such as the Arduino Mini and the unofficial use a detachable USB-to-serial adapter board or cable, Bluetooth or other methods. (When used with traditional microcontroller tools instead of the Arduino IDE, standard AVR ISP programming is used.)

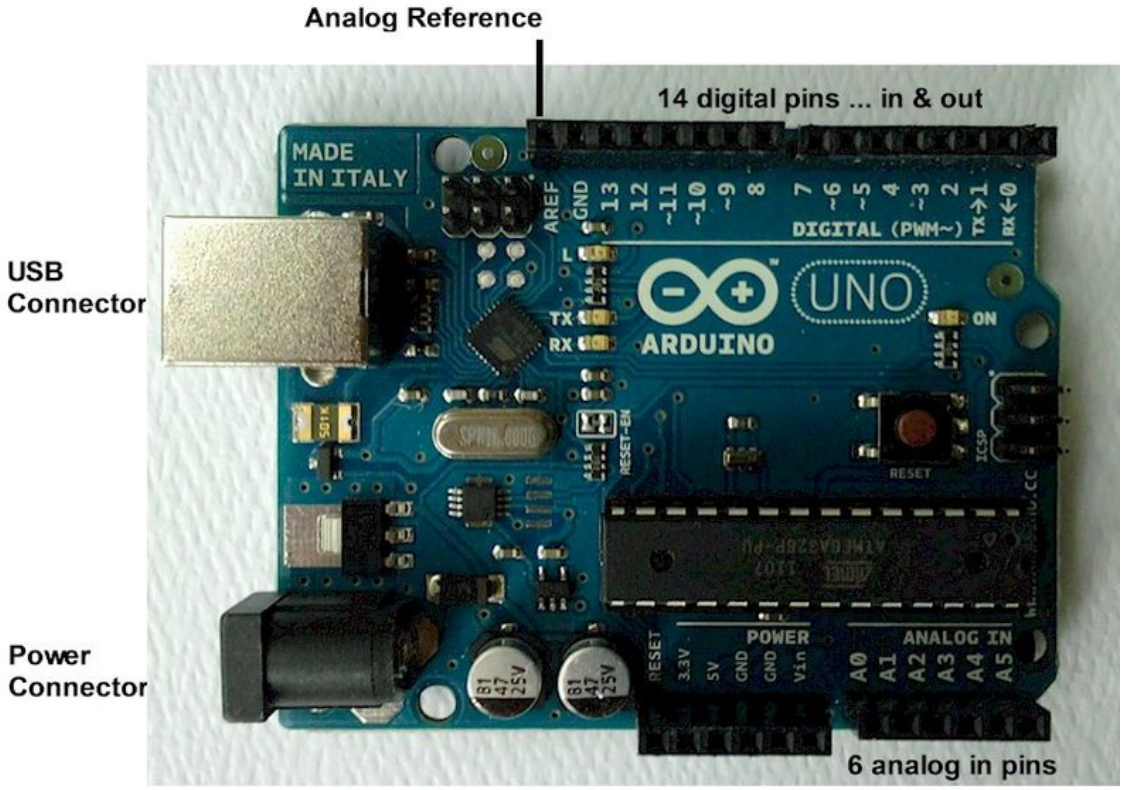
The Arduino board exposes most of the microcontroller's I/O pins for use by other circuits. The Decimals, and current Uno provide 14 digital I/O pins, six of which can produce pulse-width modulated signals, and six analog inputs, which can also be used as six digital I/O pins. These pins are on the top of the board, via female 0.10-inch (2.5 mm) headers. Several plug-in application shields are also commercially available. The Arduino and Arduino-compatible Bare Bones Board and Bo Arduino boards may provide male header pins on the underside of the board that can plug into solderless breadboards.

There are many Arduino-compatible and Arduino-derived boards. Some are functionally equivalent to an Arduino and can be used interchangeably. Many enhance the basic Arduino by adding output drivers, often for use in school-level education to simplify the construction of buggies and small robots. Others are electrically equivalent but change the form factor—sometimes retaining compatibility with shields, sometimes not. Some variants use completely different processors, with varying levels of compatibility.

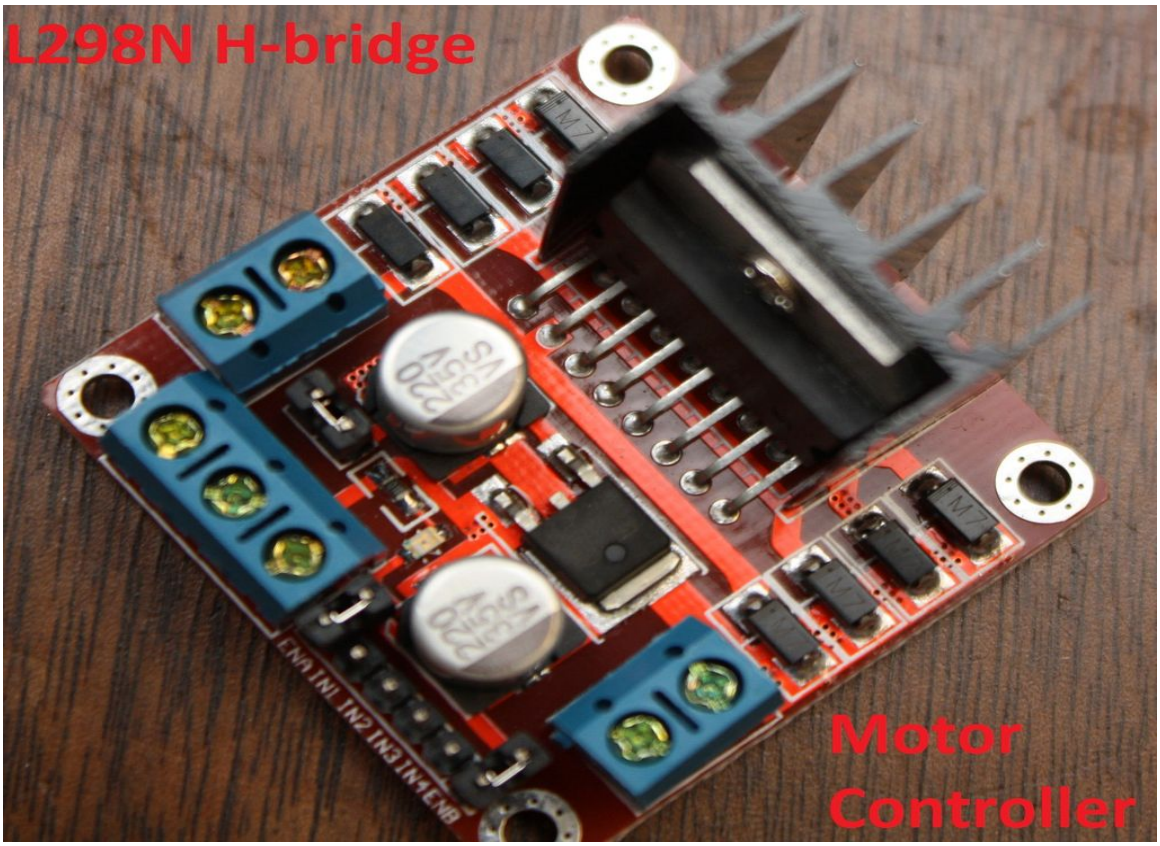

Digital Ground
Analog Reference Pin
Digital I/O Pins (2-13)
Serial Out (TX)
Serial In (RX)
USB Plug
Reset Button
In-Circuit
Serial Programmer
ATmega328
Microcontroller
External Power Supply
Reset Pin
3.3 Volt Power Pin
5 Volt Power Pin
Ground Pins
Voltage In
Analog In
Pins (0-5)


MADE IN
ITALY
PWM
COMMUNICATION
ICSP
S1
Arduino MEGA
www.arduino.cc
ANALOG IN
POWER


Arduino Duemilanove
DIGITAL (PWM~)
POWER
ANALOG IN


Analog Reference
14 digital pins ... in & out
USB Connector
Power Connector
6 analog in pins
MADE IN ITALY
DIGITAL (PWM~)
UNO
ARDUINO
POWER
ANALOG IN

L293D Motor Driver IC



Quick and simple start guide for using and exploring an L298N Dual H-Bridge Motor Controller module with an Arduino.

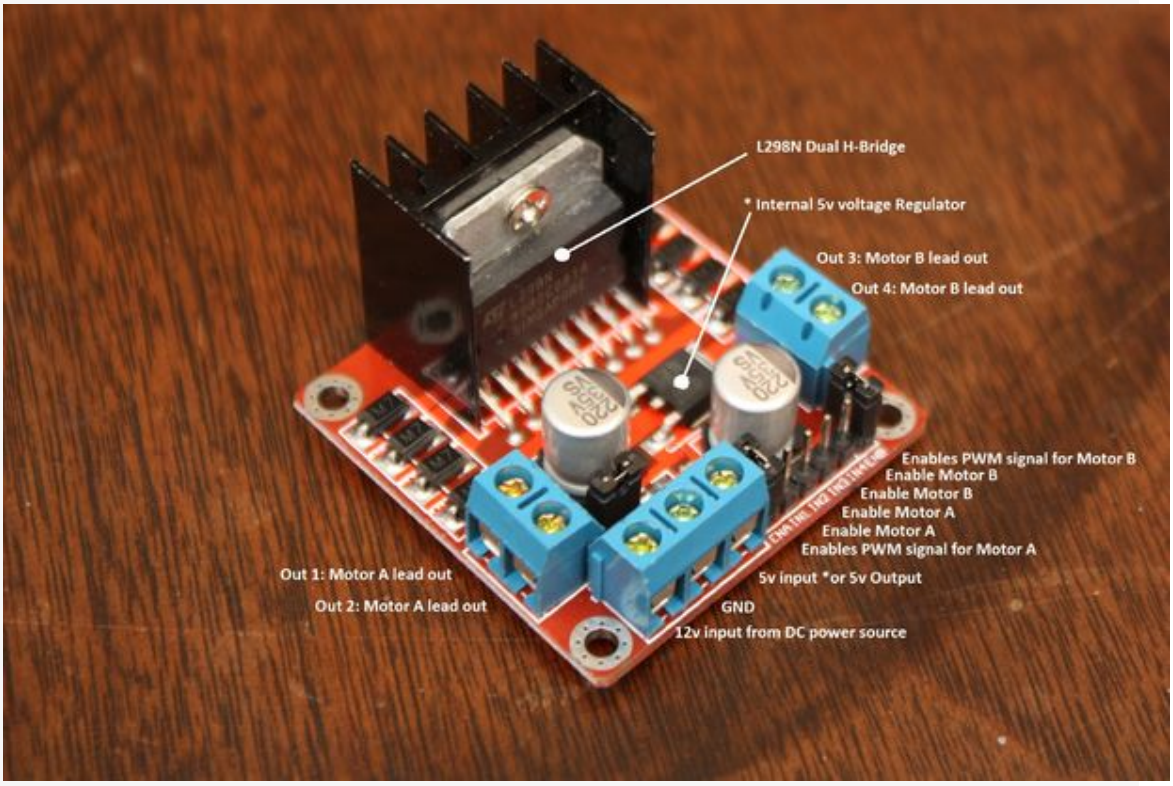
The model in the example I am using is from Ebay.

Materials needed:

- L298N Dual H-Bridge Motor Controller module (various models will work)
- Male to Female jumper wires
- An Arduino, any flavor.

- A DC power supply, 7-35v
- A motor that is the correct voltage for your power supply used.

Step 1: Getting to know your L298N Dual H-Bridge Motor Controller module:



Usage:

H-Bridge are typically used in controlling motors speed and direction, but can be used for other projects such as driving the brightness of certain lighting projects such as high powered LED arrays.

How it works:

An H-Bridge is a circuit that can drive a current in either polarity and be controlled by *Pulse Width Modulation (PWM).

* Pulse Width Modulation is a means in controlling the duration of an electronic pulse. In motors try to imagine the brush as a water wheel and electrons as a the flowing droplets of water. The voltage would be the water flowing over the wheel at a constant rate, the more water flowing the higher the voltage. Motors are rated at certain voltages and can be damaged if the voltage is applied to heavily or if it is dropped quickly to slow the motor down. Thus PWM. Take the water wheel analogy and think of the water hitting it in pulses but at a constant flow. The longer the pulses the faster the wheel will turn, the shorter the pulses, the slower the water wheel will turn. Motors will last much longer and be more reliable if controlled through PWM.

Pins:

- Out 1: Motor A lead out
- Out 2: Motor A lead out
- Out 3: Motor B lead out
- Out 4: Mo (*Can actually be from 5v-35v, just marked as 12v*)
- GND: Ground
- 5v: 5v input (*unnecessary if your power source is 7v-35v, if the power source is 7v-35v then it can act as a 5v out*)
- EnA: Enables PWM signal for Motor A (Please see the "Arduino Sketch Considerations" section)
- In1: Enable Motor A
- In2: Enable Motor A
- In3: Enable Motor B
- In4: Enable Motor B
- EnB: Enables PWM signal for Motor B (Please see the "Arduino Sketch Considerations" section)

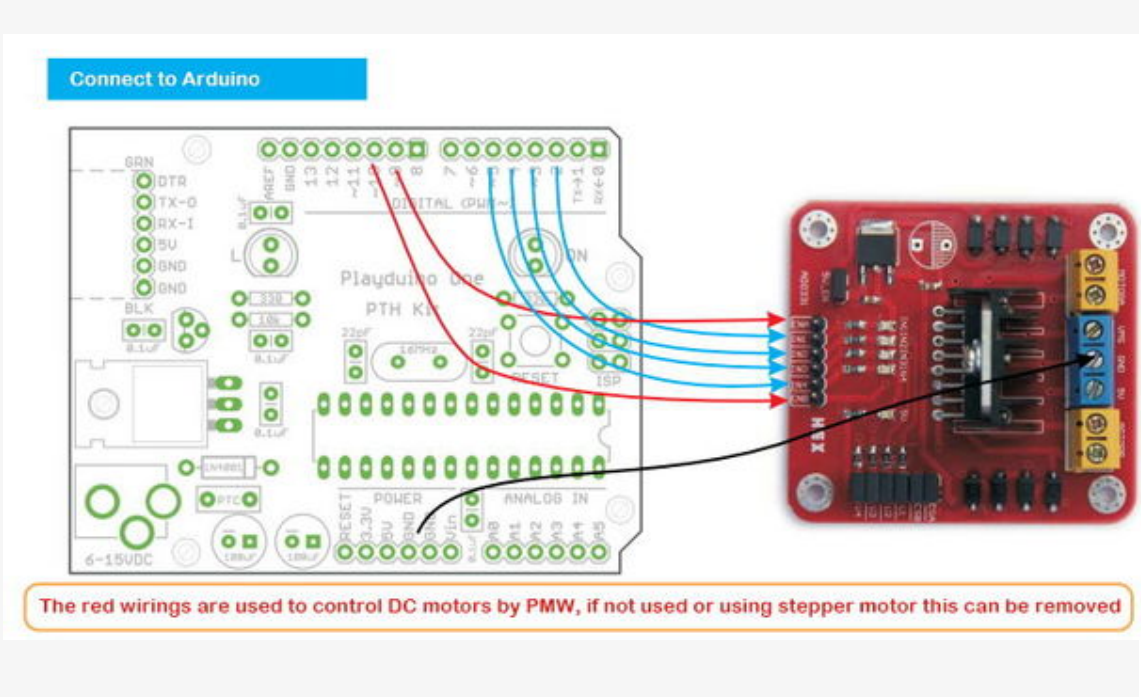
Specifications:

- Double H bridge Drive Chip: *L298N*

- Logical voltage: *5V Drive voltage: 5V-35V*
- Logical current: *0-36mA Drive current: 2A (MAX single bridge)*
- Max power: *25W*
- Dimensions: *43 x 43 x 26mm*
- Weight: *26g*

**Built-in 5v power supply, when the driving voltage is 7v-35v*

Step 2: Wiring to an Arduino:



There are several different models of these L298N Dual H-Bridge Motor Controllers. The generic wiring schematic above should do the trick for most.

Two things to mention;

- Make sure you have all of your grounds tied together; Arduino, Power source, and the Motor controller.
- The PWM Pins are unnecessary if you do not want to control PWM features.

Step 3: Arduino Sketch Considerations:

The Arduino code sketch is pretty straight forward. Since there isn't a library for the L298N Dual H-Bridge Motor Controller you just have to declare which pins the controller is hooked to.

The **"intdir(number)Pin(letter)"'** pins can be connected to any available digital pin you have available, as long as you declare the correct pin in your sketch. This makes the L298N Dual H-Bridge Motor Controller very versatile if your project is using a lot of Arduino pins.

The **int "speedPin(letter)"** pins need to be connected to a PWM pin on the Arduino if you want to enable speed control through PWM.

As a quick cheat I have included a list of PWM pins for the main two types of Arduino's I use:

- **AT MEGA – PWM:** 2 to 13 and 44 to 46. Provide 8-bit PWM output with the analog Write function.
- **UNO – PWM:** 3, 5, 6, 9, 10, and 11. Provide 8-bit PWM output with the analogWrite function.

Step 4: Arduino Sketch Example:

This code example I wrote to allow a serial monitor program such as Putty to control the L298N Dual H-Bridge Motor Controller via a keyboard with key presses.

Controls:

Key Motor

1 Motor 1 Forward

2 Motor 1 Stop

3Motor 1 Reverse

4Motor 2 Forward

5Motor 2 Stop

6Motor 2 Reverse

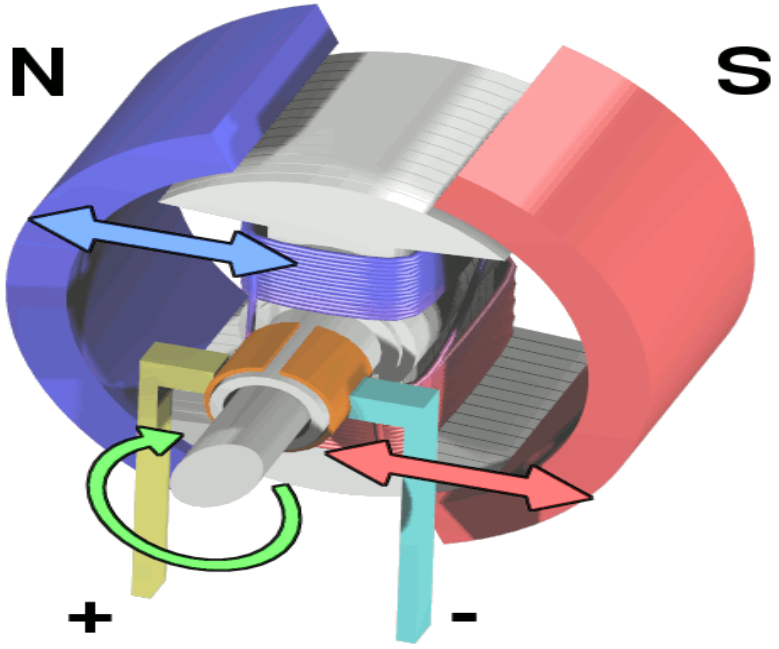
• **DC MOTORS**

A DC motor relies on the fact that like magnet poles repel and unlike magnetic poles attract each other. A coil of wire with a current running through it generates an electromagnetic field aligned with the center of the coil. By switching the current on or off in a coil its magnetic field can be switched on or off or by switching the direction of the current in the coil the direction of the generated magnetic field can be switched 180°.

A simple DC motor typically has a stationary set of magnets in the stator and an armature with a series of two or more windings of wire wrapped in insulated stack slots around iron pole pieces (called stack teeth) with the ends of the wires terminating on a commutator. The armature includes the mounting bearings that keep it in the center of the motor and the power shaft of the motor and the commutator connections.

The winding in the armature continues to loop all the way around the armature and uses either single or parallel conductors (wires), and can circle several times around the stack teeth. The total amount of current sent to the coil, the coil's size and what it's wrapped around dictate the strength of the electromagnetic field created. The sequence of turning a particular coil on or off dictates what direction the effective electromagnetic fields are pointed. By turning on and off coils in sequence a rotating magnetic field can be created.

These rotating magnetic fields interact with the magnetic fields of the magnets (permanent or electromagnets) in the stationary part of the motor (stator) to create a force on the armature which causes it to rotate. In some DC motor designs the stator fields use electromagnets to create their magnetic fields which allow greater control over the motor. At high power levels, DC motors are almost always cooled using forced air.

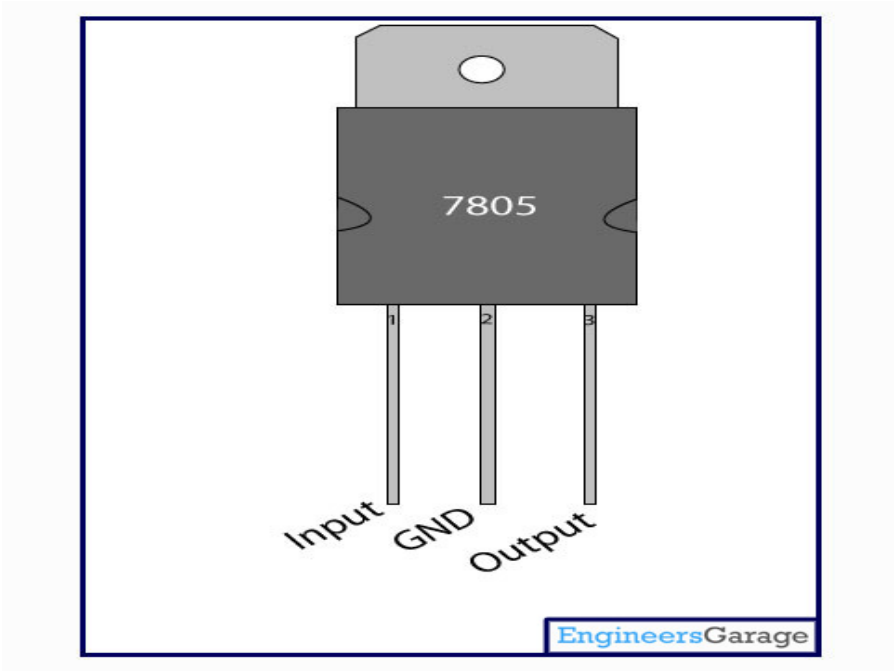

N
S
+
-

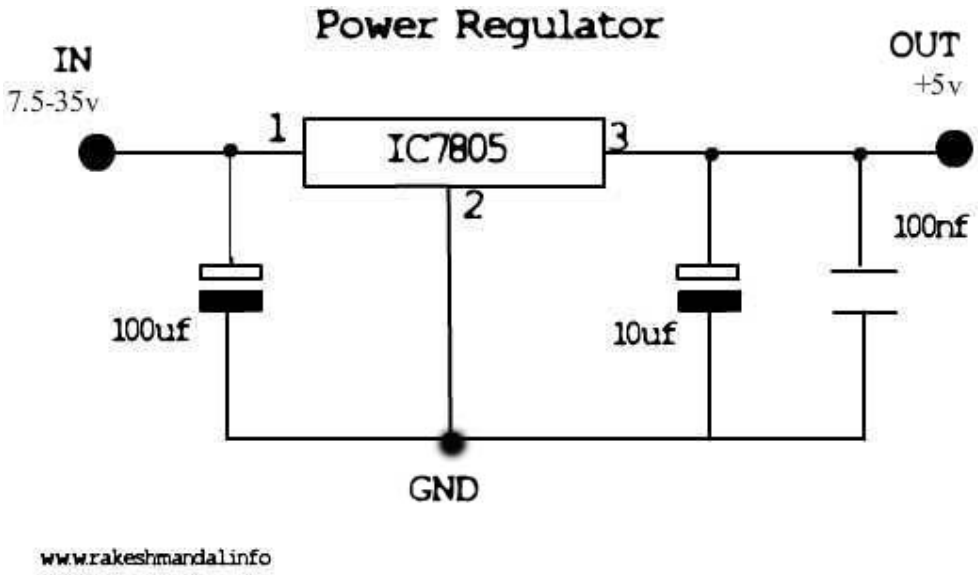
IC 7805 (Voltage Regulator IC)

7805 is a voltage regulator integrated circuit. It is a member of 78xx series of fixed linear voltage regulator ICs. The voltage source in a circuit may have fluctuations and would not give the fixed voltage output. The voltage regulator IC maintains the output voltage at a constant value. The xx in 78xx indicates the fixed output voltage it is designed to provide. 7805 provides +5V regulated power supply. Capacitors of suitable values can be connected at input and output pins depending upon the respective voltage levels.

As we have previously talked about that regulated power supply is a device that mechanized on DC voltages and also it can uphold its output accurately at a fixed voltage all the time although if there is a significant alteration in the DC input voltage.

ICs regulator is mainly used in the circuit to maintain the exact voltage which is followed by the power supply. A regulator is mainly employed with the capacitor connected in parallel to the input terminal and the output terminal of the IC regulator. For the checking of gigantic alterations in the input as well as in the output filter, capacitors are used. While the bypass capacitors are used to check the small period spikes on the input and output level. Bypass capacitors are mainly of small values that are used to bypass the small period pulses straightly into the Earth.


7805
1
2
3
Input
GND
Output
EngineersGarage


Power Regulator
IN
7.5-35v
OUT
+5v
1
IC7805
3
2
100nf
100uf
10uf
GND
www.rakeshmandal.info

The 78xx family is commonly used in electronic circuits requiring a regulated power supply due to their ease-of-use and low cost. For ICs within the family, the xx is replaced with two digits, indicating the output voltage (for example, the 7805 has a 5 volt output, while the 7812 produces 12 volts). The 78xx line are positive voltage regulators: they produce a voltage that is positive relative to a common ground. There is a related line of 79xx devices which are complementary negative voltage regulators. 78xx and 79xx ICs can be used in combination to provide positive and negative supply voltages in the same circuit.

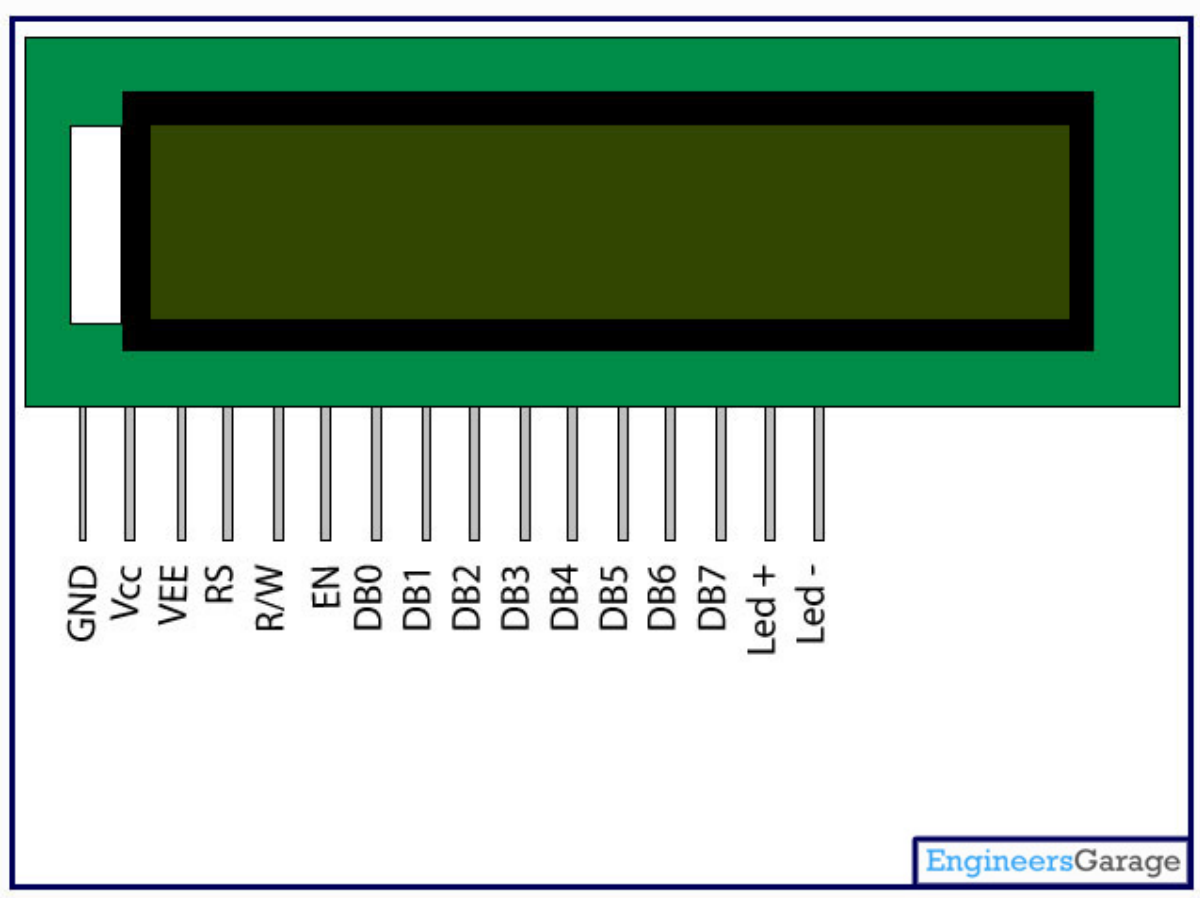
LCD 16*2

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom character (unlike in seven segments), animations and so on.

A **16x2 LCD** means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.

The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD. Click to learn more about internal structure of a LCD.

Pin Diagram:


GND
Vcc
VEE
RS
R/W
EN
DB0
DB1
DB2
DB3
DB4
DB5
DB6
DB7
Led +
Led -
EngineersGarage

Pin Description:

Pin No	Function	Name
1	Ground (0V)	Ground
2	Supply voltage; 5V (4.7V – 5.3V)	Vcc
3	Contrast adjustment; through a variable resistor	V_{EE}
4	Selects command register when low; and data register when high	Register Select
5	Low to write to the register; High to read from the register	Read/write
6	Sends data to data pins when a high to low pulse is given	Enable
7	8-bit data pins	DB0
8		DB1
9		DB2
10		DB3
11		DB4
12		DB5
13		DB6
14		DB7
15	Backlight V_{CC} (5V)	Led+
16	Backlight Ground (0V)	Led-

We wanted to make it easier for people to get these LCD into their projects so we devised a shield that lets you control a 16x2 Character LCD backlight with a potentiometer AND 5 keypad pins using 6 digital pins on the Arduino!

This shield is perfect for when you want to build a stand-alone project with its own user interface. The 4 directional buttons plus select button allows basic control without having to attach a bulky computer.

- Comes with a 16x2 green backlight LCD, negative display
- Plug and play with any Arduino 'classic' - UNO, duemilanove, diecimilla, etc.
- Uses 6 pins of Arduino to control LCD and A0 pin for 5 buttons.

The LCD and Keypad Shield gives you a handy 16-character by 2-line display, 5 buttons and a controllable backlight, plug it straight in on top of your Arduino board or other project

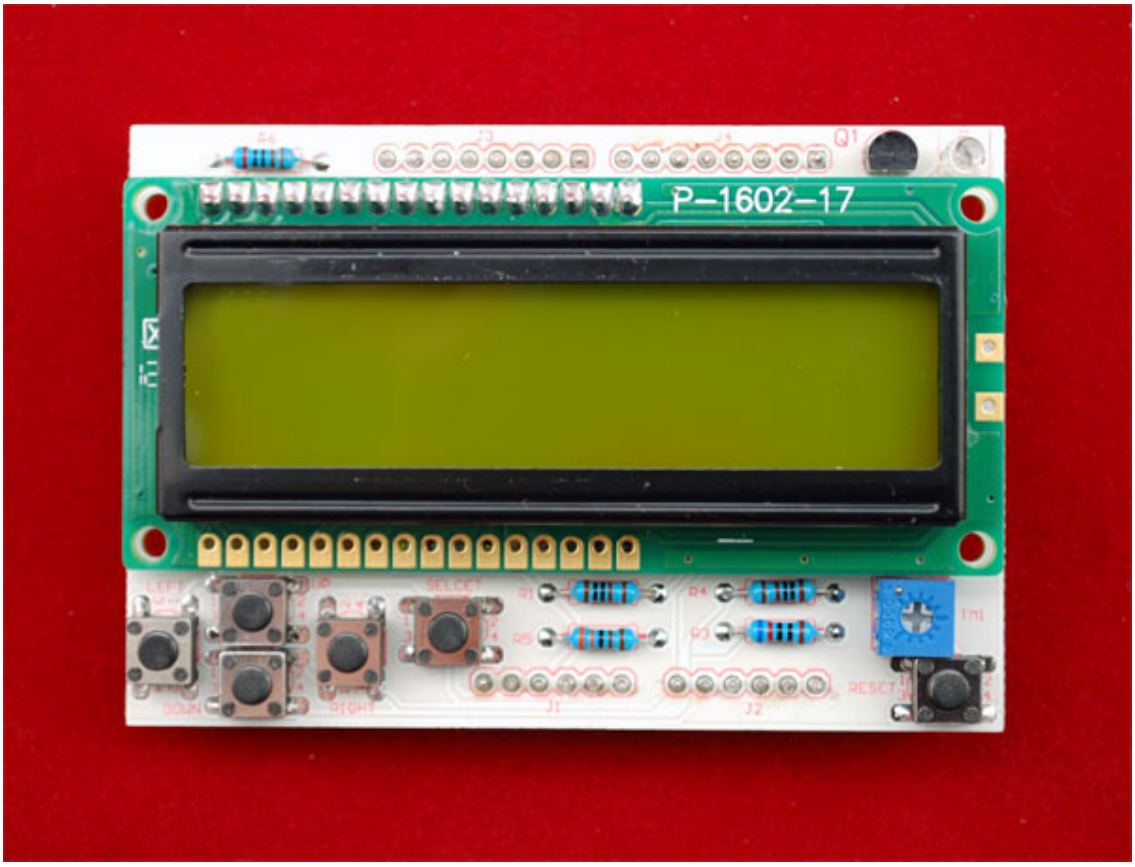
shields. The display is set behind the shield for a low profile fitment and nice look and we've included panel mounting screw holes in the corners.

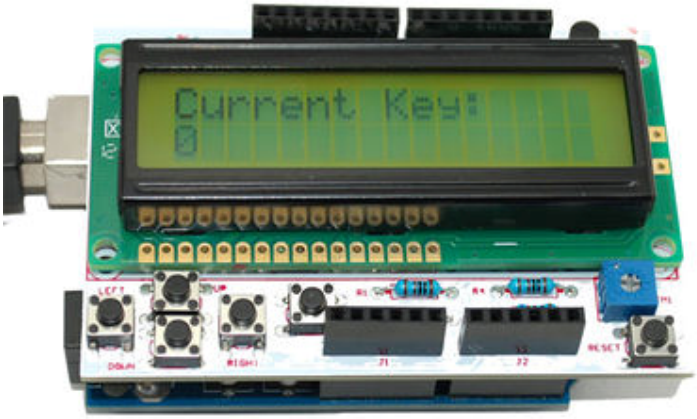
It's great when you want to build a stand-alone project with its own user interface that doesn't require a computer attached to send commands to your Arduino.

Works perfectly in 4-bit mode with the "LiquidCrystal" library included with the Arduino IDE, allowing you to control the LCD with a total of just 6 digital I/O lines. We've deliberately picked D4-D9 so that it doesn't interfere with pins required by other popular products such as the Ethernet Shield and EtherTen, so you can stack this on top of other shields to give you a local display.

The buttons provide "left", "right", "up", "down", and "select" while using just one analog input. That leaves the other analog inputs free for you to use in your projects.

The LCD backlight is connected to a potentiometer can be controlled for on/off, brightness.





Features

- 16x2 LCD using HD44780-compatible display module (black characters on green background).
- 5 buttons on one analog input (A0).
- LCD backlight with current limiting, brightness and on/off controllable by a adjustable potentiometer.
- Recessed LCD, panel mount screw holes and button layout suitable for panel or cabinet mounting if desired.
- Reset button.
- Power supply smoothing capacitor.

Zigbee PRO

ZigBee PRO, also known as Zigbee 2007, the enhanced ZigBee Pro Specification, was posted on 30 October 2007, and was finalized that same year]. ZigBee PRO is fully backward-compatible with ZigBee 2006 devices. A ZigBee 2007 device may join and operate on a ZigBee 2006 network and vice versa. Due to differences in routing options, ZigBee PRO devices must become non-routing ZigBee End-Devices (ZEDs) on a ZigBee 2006 network and ZigBee 2006 devices must become ZEDs on a ZigBee PRO network. The applications running on those devices work the same, regardless of the stack profile beneath them. The first ZigBee Application Profile, Home Automation, was announced November 2, 2007.

The ZigBee Smart Energy V2.0 specifications define an IP-based protocol to monitor, control, inform and automate the delivery and use of energy and water. It is an enhancement of the ZigBee Smart Energy version 1 specifications,[16] adding services for plug-in electric vehicle (PEV) charging, installation, configuration and firmware download, prepay services, user information and messaging, load control, demand response and common information and application profile interfaces for wired and wireless networks. It is being developed by partners including:

HomeGrid Forum responsible for marketing and certifying ITU-T G.hn technology and products

HomePlug Power line Alliance

International Society of Automotive Engineers SAE International

IPSO Alliance

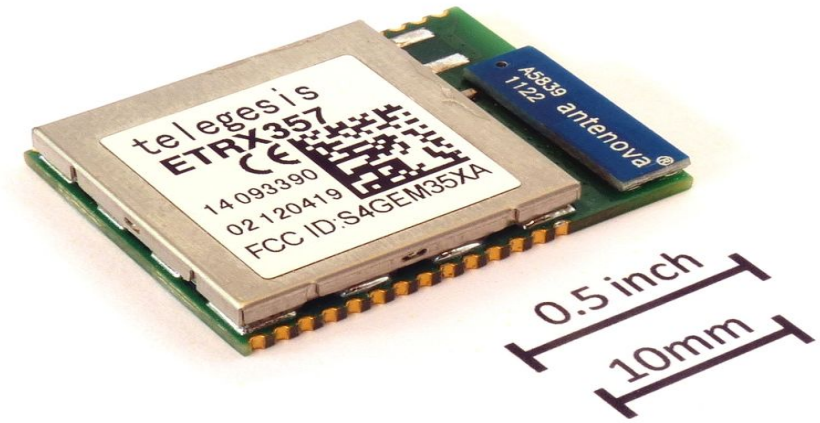
SunSpec Alliance

Wi-Fi Alliance.

Zigbee is a specification for a suite of high-level communication protocols used to create personal area networks built from small, low-power digital radios. ZigBee is based on an IEEE

802.15 standard. Though its low power consumption limits transmission distances to 10–100 meters line-of-sight, depending on power output and environmental characteristics, ZigBee devices can transmit data over long distances by passing data through a mesh network of intermediate devices to reach more distant ones.

ZigBee is typically used in low data rate applications that require long battery life and secure networking (ZigBee networks are secured by 128 bit symmetric encryption keys.) ZigBee has a defined rate of 250 kbit/s, best suited for intermittent data transmissions from a sensor or input device. Applications include wireless light switches, electrical meters with in-home-displays, traffic management systems, and other consumer and industrial equipment that requires short-range low-rate wireless data transfer. The technology defined by the ZigBee specification is intended to be simpler and less expensive than other wireless personal area networks (WPANs), such as Bluetooth or Wi-Fi.



zigbee is a low cost low-power, wireless mesh network standard targeted at wide development of long battery life devices in wireless control and monitoring applications. Zigbee devices have low latency, which further reduces average current. ZigBee chips are typically integrated with radios and with microcontrollers that have between 60-256 KB flash memory. ZigBee operates in the industrial, scientific and medical (ISM) radio bands: 2.4 GHz in most

jurisdictions worldwide; 784 MHz in China, 868 MHz in Europe and 915 MHz in the USA and Australia. Data rates vary from 20 kbit/s (868 MHz band) to 250 kbit/s (2.4 GHz band).

The ZigBee network layer natively supports both star and tree networks, and generic Mesh networking. Every network must have one coordinator device, tasked with its creation, the control of its parameters and basic maintenance. Within star networks, the coordinator must be the central node. Both trees and meshes allow the use of ZigBee routers to extend communication at the network level.

ZigBee builds on the physical layer and media access control defined in IEEE standard 802.15.4 for low-rate WPANs. The specification includes four additional key components: network layer, application layer, *ZigBee device objects* (ZDOs) and manufacturer-defined application objects which allow for customization and favor total integration. ZDOs are responsible for a number of tasks, including keeping track of device roles, managing requests to join a network, as well as device discovery and security .consume

ZigBee is one of the global standards of communication protocol formulated by the relevant task force under the IEEE 802.15 working group. The fourth in the series, WPAN Low Rate/ZigBee is the newest and provides specifications for devices that have low data rates, very low power and are thus characterized by long battery life. Other standards like Bluetooth and IrDA address high data rate applications such as voice, video and LAN communications.

- ## Digital wireless cameras

Digital wireless is the transmission of audio and video analog signals encoded as digital packets over high-bandwidth radio frequencies.

Advantages include:

Wide transmission range usually close to 450 feet (open space, clear line of sight between camera and receiver

High quality video and audio

Two way communication between the camera and the receiver

Digital signal means you can transmit commands and functions, such as turning lights on and off.

You can connect multiple receivers to one recording device, such as security DVR.

- **Home security systems**

Wireless security cameras are becoming more and more popular in the consumer market, being a cost-effective way to have a comprehensive surveillance system installed in a home or business for an often less expensive price. Wireless cameras are also ideal for people renting homes or apartments. Since there is no need to run video extension cables through walls or ceilings (from the camera to the receiver or recording device) one does not need approval of a landlord to install a wireless security camera system. Additionally, the lack of wiring allows for less "clutter," avoiding damage to the look of a building.[2]

A wireless security camera is also a great option for seasonal monitoring and surveillance. For example, one can observe a pool or patio in summer months and take down the camera in the winter.

Wireless range

Wireless security cameras function best when there is a clear line of sight between the camera(s) and the receiver. Outdoors, and with clear line of sight, digital wireless cameras typically have a range between 250 to 450 feet. Indoors, the range can be limited to 100 to 150 feet. Cubical walls, drywall, glass, and windows generally do not degrade wireless signal strength. Brick, concrete floors, and walls degrade signal strength. Trees that are in the line of sight of the wireless camera and receiver may impact signal strength.

The signal range also depends on whether there are competing signals using the same frequency as the camera. For example, signals from cordless phones or routers may affect signal

strength. When this happens, the camera image may freeze, or appear "choppy". Typical solution involves locking the channel that wireless router operates on.

Resistance thermometer

Resistance thermometers, also called resistance temperature detectors (RTDs), are sensors used to measure temperature by correlating the resistance of the RTD element with temperature. Most RTD elements consist of a length of fine coiled wire wrapped around a ceramic or glass core. The element is usually quite fragile, so it is often placed inside a sheathed probe to protect it. The RTD element is made from a pure material, typically platinum, nickel or copper. The material has a predictable change in resistance as the temperature changes and it is this predictable change that is used to determine temperature.

Common RTD sensing elements constructed of platinum, copper or nickel have a repeatable resistance versus temperature relationship (R vs T) and operating temperaturerange. The R vs T relationship is defined as the amount of resistance change of the sensor per degree of temperature change.[2] The relative change in resistance (temperature coefficient of resistance) varies only slightly over the useful range of the sensor.

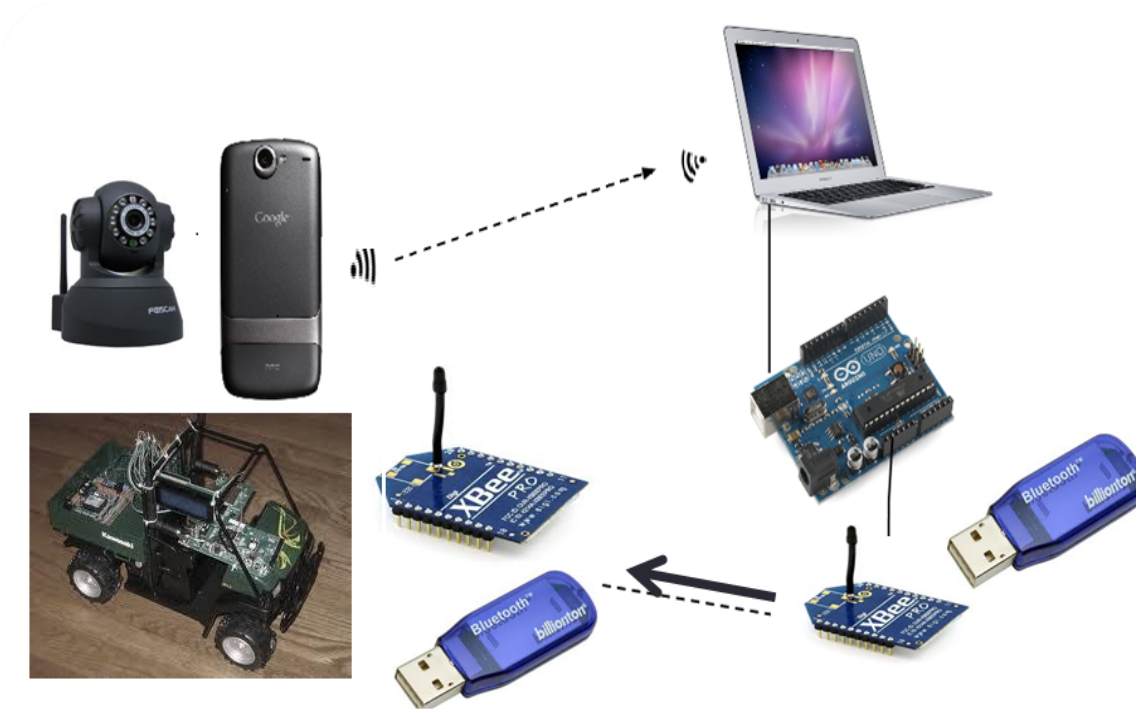
Platinum was proposed by Sir William Siemens as an element for resistance temperature detector at the Bakerian lecture in 1871:[3] it is a noble metal and has the most stable resistance-temperature relationship over the largest temperature range. Nickel elements have a limited temperature range because the amount of change in resistance per degree of change in temperature becomes very non-linear at temperatures over 572 °F (300 °C). Copper has a very linear resistance-temperature relationship, however copper oxidizes at moderate temperatures and cannot be used over 302 °F (150 °C).

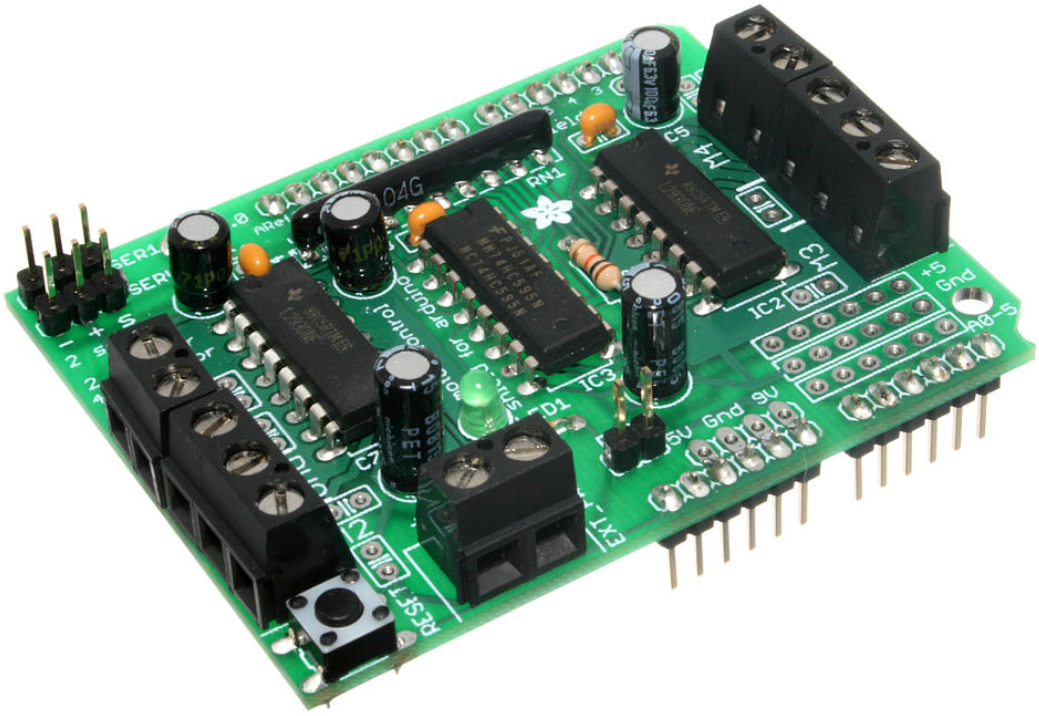
Platinum is the best metal for RTDs because it follows a very linear resistance-temperature relationship and it follows the R vs T relationship in a highly repeatable manner over a wide temperature range. The unique properties of platinum make it the material of choice for temperature standards over the range of -272.5 °C to 961.78 °C, and is used in the sensors that define the International Temperature Standard, ITS-90. Platinum is chosen also because of its chemical inertness.

The significant characteristic of metals used as resistive elements is the linear approximation of the resistance versus temperature relationship between 0 and 100 °C.

SYSTEM STUDY AND ANALYSIS

MAJOR COMPONENTS USED*:*





Sensors Used In Robotics

A **motion detector** is a device that detects moving objects, particularly people. A motion detector is often integrated as a component of a system that automatically performs a task or alerts a user of motion in an area. Motion detectors form a vital component of security, automated lighting control, home control, energy efficiency, and other useful systems.

Many different types of sensors have been developed that are used in robotics. These sensors and their functions can be divided into two distinct categorisesone is internal state sensors and the other is external navigation sensors.

Internal state sensors are mainly used to measure the internal states of a robot. For example they are used to measure velocity, acceleration, and temperature Using these measurements the system can be maintained, and potential problems detected in advance and possibility avoided altogether. There are two kinds of internal state sensors, specifically contact and non-contact sensors. Examples of contact state sensors are micro switches and potentiometers.

Direct physical contact is required with the objects of interest in order to obtain sensor readings. These sensors are cheap, typically have a fast response ,and are relatively easy to construct and operate. An example of their use is on a robotic hand so that it can detect an object's presence or absence.

These are not particularly of interest to the special engineering project because the robot will have no hands and is not designed to touch anyone or anything. Examples of non-contact state sensors include proximity sensors, accelerometers, compasses, gyroscopes and optic encoders. Optic encoders are commonly used in mobile robots for tasks such as measuring and controlling motor speed and acceleration, as well as providing an odometer. The robot built as part of the special engineering project could have been improved by using some of these sensors, such as a compass and optic encoders.10External navigation sensors are normally employed to measure the environment and its features.

Motion sensor circuit

PIR-based motion detector: In a PIR-based motion detector, the PIR sensor is typically mounted on a printed circuit board which also contains the necessary electronics required to interpret the signals from the chip. The complete circuit is contained in a housing which is then mounted in a location where the sensor can view the area to be monitored. Infrared energy is able to reach the sensor through the window because the plastic used is transparent to infrared radiation (but only translucent to visible light). This plastic sheet prevents the introduction of dust and insects which could obscure the sensor's field of view.

A few mechanisms have been used to focus the distant infrared energy onto the sensor surface. The window may have Fresnel lenses molded into it. Alternatively, sometimes PIR sensors are used with plastic segmented parabolic mirrors to focus the infrared energy; when mirrors are used, the plastic window cover has no Fresnel lenses molded into it. A filtering window (or lens) may be used to limit the wavelengths to 8-14 micrometers which is most sensitive to human infrared radiation (9.4 micrometers being the strongest). The PIR device can be thought of as a kind of infrared 'camera' which remembers the amount of infrared

energy focused on its surface. Once power is applied to the PIR the electronics in the PIR shortly settle into a quiescent state and energize a small relay. This relay control set of electrical contacts which are usually connected to the detection input of an alarm control panel.

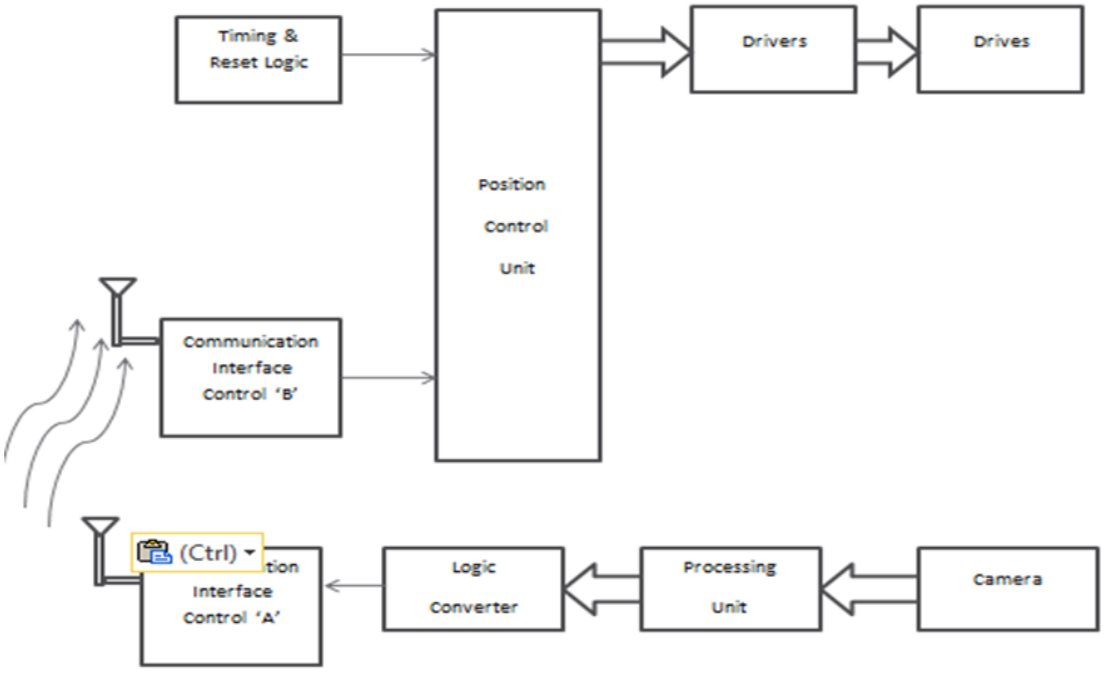
An electronic motion detector contains an optical, microwave, or acoustic sensor, and in many cases a transmitter for illumination. However a *passive* sensor only senses a signal emitted by the moving object itself. Changes in the optical, microwave, or acoustic field in the device's proximity are interpreted by the electronics based on one of the technologies listed below. Most inexpensive motion detectors can detect up to distances of at least 15 feet (5 meters). Specialized systems are more expensive but have much longer ranges. Tomographic motion detection systems can cover much larger areas because the radio waves are at frequencies which penetrate most walls and obstructions, and are detected in multiple locations, not just at the location of the transmitter.

Motion detectors have found wide use in domestic and commercial applications. One common everyday application is activation of automatic door openers in businesses and public buildings. Motion sensors are also widely used in lieu of a true occupancy sensor in activating street lights or indoor lights in walkways (such as lobbies and staircases). In such "Smart Lighting" systems, energy is conserved by only powering the lights for the duration of a timer, after which the person has presumably left the area. A motion detector may be among the sensors of a burglar alarm that is used to alert the home owner or security service when it detects the motion of a possible intruder. Such a detector may also trigger a security camera in order to record the possible intrusion.

Chapter 6

Proposed Design

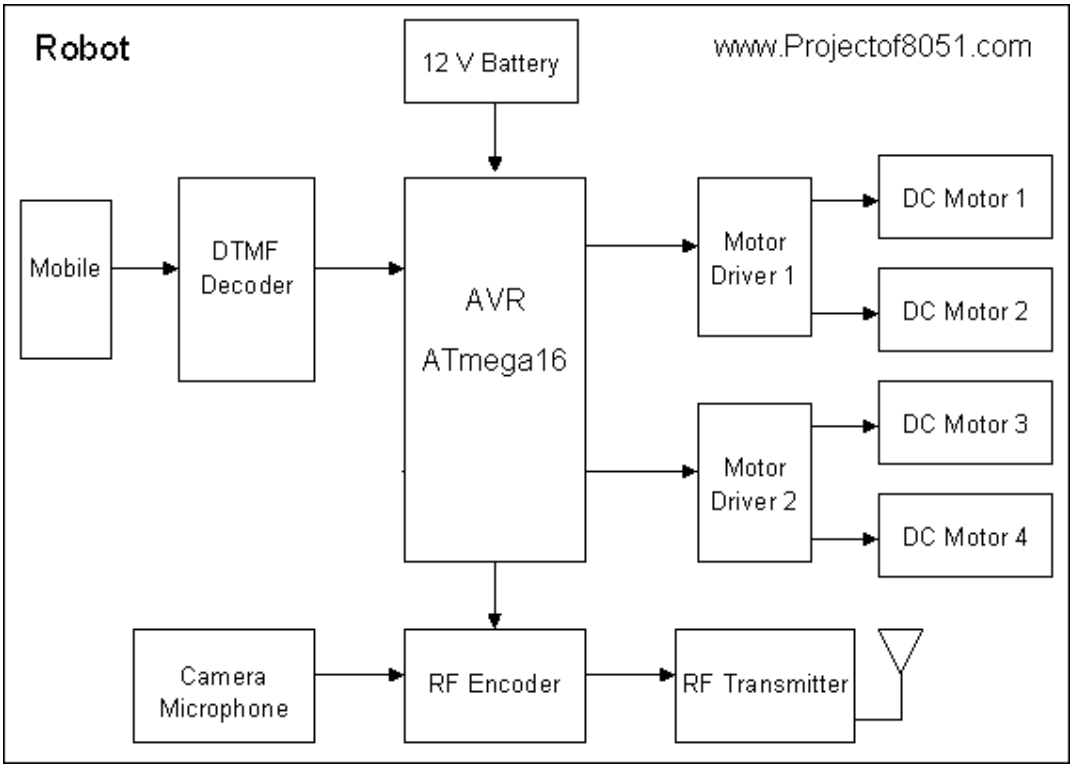
BLOCK DIAGRAM:



Chapter 7

Design and Implementation

Circuit diagram:



CHAPTER 8

APPLICATIONS:

Militery application

- Can be used to transport objects just on a click on button .
- To pull out casualties.
- Remote Surveillance of urban area.
- Remote Surveillance of urban area.
- It is use in battlefields for live footage.
- To find hostages , bombs , enemies etc.
- Application where human beings in risk search and rescue app.(radio active power plants, high voltage sites etc).
- In space applications.

Indutrial application

- Loading of objects.
- Serving security purpose.
- To find hostages , bombs , enemies etc
- Reaching places out of human reach.
- Monitoring radiation and toxic gases.
- Used in mines etc.
- Used to detect motion and happenings that takes place in high jacked environment.
- Used in nuclear power plants and other hazardous environments.

ADVANTEGES:

- Real time transmission of video footageaswell as data storing.
- Thermal camera or night vision camera is also installed.
- Different kinds of sensors are connected.
- ZigBeepromodule is used for wireless data transmission and high data rates.
- Simplicity in construction
- Wide acceptance
- No feedback components are needed
- They work in just about my environment
- Inherently more failsafe than servo motors
- The rotation angle of motor is proportional to input pulse.
- The motor has full torque at standstill
- Precise positioning and repeatability of movement since good stepper motors have an accuracy of 3-5%of a step and this error is non cumulative from one step to next.
- Excellent response to starting, stopping, reversing.

DISADVANTEGES:

- Limited battery life.
- Not compatible for every surface.
- video quality is good but not best.

CHAPTER 9

FUTURE DEVELOPMENTS:

- GPS can be installed for extended and exact ranges.
- Mechanical arms can be attach.
- Firearms and various weapons can be attach.
- Different kinds of tires and tracks can be used for different surfaces.
- Video quality can be increased further

FUTURE SCOPE:

There are a number of improvement and modification that can be designed and increase real world applicationpractically and functionally, they are:

By adopting the aeronautical mechanism in our surveillance robot, it can act as a flying robot. The robot uses RF communication for simpler task; tis should be changed by wireless communication using GSM technology. Further the communication between PC and the robot can be promoted by utilizing the principles of Wi-Fi.

Conclusion:

Video tracking is an important process intracking objects. It involves various imageprocessing concepts. In this work, the acquiredvideo has been separated into frames andsegmented by using contextual clustering method The features of the segmented image isfurther processed by the in featureproperties ofthe matlabthe in feature provides 24 properties In this work, two important properties are used topprocess the features of the segmented image forhighlighting the presence of the human.

CHAPTER 10

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For Paper Reference:

MANIAC: A Next Generation Neurally Based Autonomous Road Follower

- Todd M. Jochem, Dean A. Pomerleau and Charles E. Thorpe

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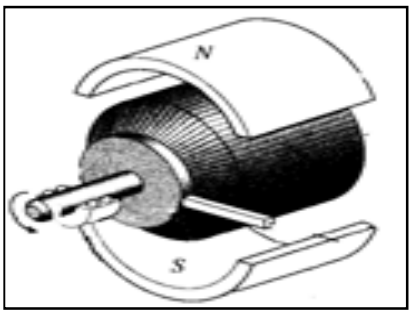
2. Programming Neural Network with Encog3 in java

http://www.amazon.com/Programming-Neural-Networks-Encog3-Java-ebook/dp/B005S0FNBS

APPENDIX A: Datasheets

1. DC MOTOR



5 RPM to 1500 RPM

Figure 18: DC Motor

- DC (direct current) motors
  - Convert electrical energy into mechanical energy
  - Small, cheap, reasonably efficient, easy to use
- Working
  - Electrical current through loops of wires mounted on a rotating shaft
  - When current is flowing, loops of wire generate a magnetic field, which reacts against the magnetic fields of permanent magnets positioned around the wire loops
  - These magnetic fields push against one another and the armature turns
- **Torque**: rotational force that a motor can deliver at a certain distance from the shaft
- Strength of magnetic field generated in loops of wire is directly **proportional** to amount of current flowing through them and thus the torque produced on motor's shaft
- The more current through a motor, the more torque at the motor's shaft

1.1 INTERFACING OF DC MOTOR

- A DC motor is electromechanical device that converts electrical energy into mechanical energy that can be used to do many useful works.
- As the MCUs PORT are not powerful enough to drive DC motors directly so we need some kind of drivers. A very easy and safe is to use popular L293D or L298D chips.

2. LCD DISPLAY

Figure 26: LCD Display

- LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications.
- A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits.
- These modules are preferred over seven segments and other multi segmentLEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.
- A **16x2 LCD** means it can display 16 characters per line and there are 2 such lines.
- In this LCD each character is displayed in 5x7 pixel matrix.
- This LCD has two registers, namely, Command and Data.
- The command register stores the command instructions given to the LCD.
- A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc.
- The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD.

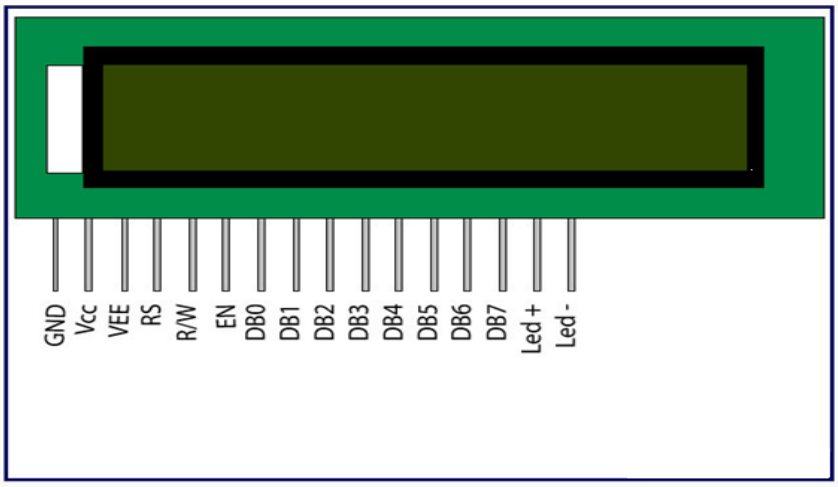


Figure 27: Pin Diagram of LCD Display

Pin N	Function	Name
1	Ground (0V)	Ground
2	Supply voltage; 5V (4.7V – 5.3V)	Vcc
3	Contrast adjustment; through a variable resistor	V_{EE}
4	Selects command register when low; and data register when high	Register Select
5	Low to write to the register; High to read from the register	Read/write
6	Sends data to data pins when a high to low pulse is given	Enable
7	8-bit data pins	DB0
8		DB1
9		DB2
10		DB3
11		DB4
12		DB5
13		DB6
14		DB7
15	Backlight V_{CC} (5V)	Led+
16	Backlight Ground (0V)	Led-

Table 7: Pin Description of LCD Display

7.1 LCD INTERFACING

Character LCDs use a standard 14-pin interface and those with backlights have 16 pins. The pin outs are as follows: These LCD modules are connected via two methods of interfacing, one is 8-bit & other is 4-bit, the two methods are implemented utterly, decided upon the pin constrains or logic complexity When logic design is to be made simple we use 8-bit data transfer method which is quite easy and straight-forward connections, while using 4-bit the data transfer the 8-bit data is divided into 2 nibbles and sent in two sessions .The 4-bit method increasingly uses logic and is mostly adapted to interfacing with MCU (micro controller unit),where pin-out from MCU is limited. LCD module has onboard RAM which can be read/write eliminating the need for reserving RAM for display memory

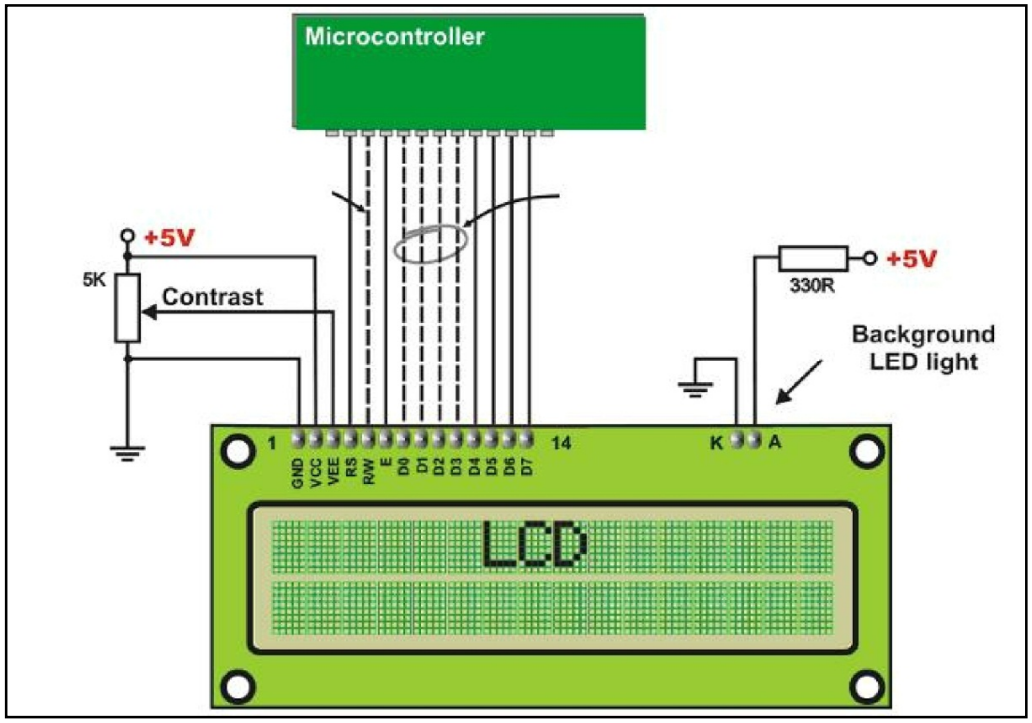


Figure 28: LCD Interfacing