**Electric Circuit Design**

This section examines the overall structure of the sensors and the control system. The laptop is the control center for the robot, and is the platform needed to control the robot. The laptops have Bluetooth connectivity.

The robot sensors and motors are interfaced using arduino nano. This allows commands to be sent to the sensor controller or motor controller through the standard serial port software interface. The motor control and sensors are resided on I2C.

* Arduino Board

Arduino UNO is an open source microcontroller board based on Microchip ATmega328P and developed by Arduino. The board is equipped with a set of analog and digital input and output pins that may be interfaced to various expansion boards and other circuits. The board has 14 digital input output pins, 6 analog input output pins, and is programmable with the arduino IDE.

|  |  |
| --- | --- |
| Developer | Arduino |
| Manufacturer | Many |
| Type | Single Board Microcontroller |
| Operating System | None |
| Memory | SRAM |
| CPU | Microchip AVR(8-bit) |
| Storage | Flash, EEPROM |



* DC Motor

HC-05 bluetooth module. DC motor is controlled by DC voltage and moves in forward, backward, left, right, direction according to the priority of voltage applied. Mostly all mechanical movements which robot performs is accomplished by an electric motor. Electric machines are means of converting energy into mechanical energy. Electric motor is used to power devices. An example of small motor application such as motors used in automobiles, robot and power tools.

The power of dc motor is given below

* 12volt
* 100 Rpm



* L293D Motor Driver

Microcontroller cannot supply the current required to run DC motor. So satisfy this requirement IC’s are used to drive the motor. The L293 and L293D are quadruple high-current half –H drivers. The L293D provides bidirectional drive currents of up to 1A at voltage from 4.5V to 36V. The L293D is designed to provide bidirectional drive currents of up to 600-MA at voltages from 4.5V to 36V. Both devices are designed to drive inductive loads such as relays, solenoids, dc and bipolar stepping motors, as well as other high-current/high voltage loads in positive-supply applications. On the L293D, external high-speed output clamp diodes should be used for inductive transient suppression.

* **HC-05 Bluetooth module**

This module is capable of communicating with pc, mobile phone or any other Bluetooth enabled device. It is interfaced with the microcontroller over the serial UART port of micro-controller. Bluetooth is a wireless communications protocol running at 2.4 GHz, with client-server architecture, suitable for forming personal area networks. Bluetooth is an extremely integral feature designed for low power devices. Bluetooth is a standardized feature or specification that is available in all Smartphone running on android, laptops and computers.

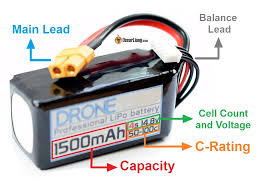
HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. Serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband. HC-05 module work on 3.0V low power operation and 3.0 to 4.2V I/O controls. It has integrated antenna, edge connector and UART interface with programmable baud rate.

* Lipo battery

Lipo Battery, its full name is lithium polymer battery, people also called Li-po battery, or more correctly lithium-ion polymer battery (abbreviated as LiPo, LIP, Li-poly and others). Lipo is a rechargeable battery of lithium-ion technology using a polymer electrolyte instead of a liquid one. High conductivity semisolid polymers form this electrolyte. These lipo batteries provide a higher specific energy than other lithium-battery types. It is  a newer type of battery now used in many consumer electronics devices.

Battery configuration:24 volt

Battery capacity:The 1300mAh on the picture means the capacity of the lipo battery. Capacity is used to measure how much power a battery can hold.and the unit of capacity is milliamp hours (mAh), which means 1300mAh can be put on the battery to discharge it in one hour.



* MQ2 Gas Sensor

The MQ2 gas sensor is useful for gas leakage detection.It is suitable for detecting H2,LPG,CH4,CO,Alcahol Smoke or propane.Due to its high sensitivity and fast response time, measurements can be tken as soon as possible.The sensitivity of the sensor can be adjusted by potentiometer.

|  |  |
| --- | --- |
| MQ2 | Combustible gas,smoke |
| MQ3 | Alcahol vapor |
| MQ5 | LPG,Natural gas,Town Gas |
| MQ9 | Carbon monoxide,Coal gas,Liquefied gas |

**Interfacing gas sensor with arduino**

The voltage that the sensor outputs changes accordingly to the smoke/gas level that exists in the atmosphere. The sensor outputs a voltage that is proportional to the concentration of smoke/gas.

In other words, the relationship between voltage and gas concentration is the following:

* The greaterthe gas concentration,the greaterthe output voltage
* The lowerthe gas concentration,the lowerthe output voltage

The output can be an analog signal (A0) that can be read with an analog input of the Arduino or a digital output (D0) that can be read with a digital input of the Arduino.

**Programming Digital I/O pins of Arduino Board**

Each pin is controlled by three commands associated with it which are designated as:

1. pinMode()
2. digitalWrite()
3. digitalRead()

pinMode()

This configures the specified pin to behave either as an input or an output.

Syntax:

pinMode(pin, mode)

Parameters:

pin: the number of the pin whose mode you wish to set

mode: INPUT, OUTPUT.

Returns

None

* Web Camara

A web camara is a video camara that streams an image or video in real time to or through a computr to a computer network.Web camaras are typically small camara that sit on a desk,attached to user’s monitor. Video streaming over the interent requires a lot of bandwidth,such as streams usually use compressed formats.The maximum resolution of a web cam is also lower than most handheld video camaras, as higher resolution would be reduced during transmission.

* I2C Communication

The I2C communication bus is very popular and broadly used by many electronic devices because it can be easily implemented in many electronic designs which require communication between a master and multiple slaves devices or even multiple master devices. The easy implementation is comes with the fact that only two wires are required for communication between up to almost 128 devices when using 7 bit addressing and up to almost 1024 devices when using 10 bit addressing.

* Buck Converter

A buck converter is a DC-to-DC power converter which steps down voltage from its input to its output. It is a class of switched-mode power supply(SMPS) typically contained at least two semiconductors and atleast one energy storage element, a capacitor, inductor or the two in combination.To reduce voltage ripple, filters made of capacitors are normally are added to such a converter’s output and input.

Buck converters provide much greater power efficiencyas DC-to-DC converters than linear regulators, which are simpler circuit that lower voltages by dissipating power as heat, but do not step up output current.

Buck converters can be highly efficient making them useful for tasks such as converting a computer’s main supply voltage down to lower voltages needed by USB, DRAM and then CPU.