

A Peer Reviewed Open Access International Journal

Fabrication of Wall Climbing Robot

K.Siddartha

Student. Dept of Mechanical Engineering, Dept of Mechanical Engineering, VITS College of Engineering, Sontyam, Anandapuram, Vizag.

P.Vinod Kumar Student.

VITS College of Engineering, Sontyam, Anandapuram, Vizag.

AIM OF THE PROJECT:

The study and production of robots for domestic application is a relatively recent in research field. This kind of robot is actually in continuous development. Huge surface cleaning, and even glass windows or building walls is on study in industrial fields with very different characteristics and innovations. Our target is to build a wall-climbing robot for window cleaning application. The Wall Climbing Robot (WCR) having capability that it can stick on a vertical as well as inclined surface and can easily move over the surface.

BLOWERS:

Blowers produce high pressure air by intake of air with low pressure and velocity. The blowers are classified into three types:

- 1) High pressure blowers.
- 2) Medium pressure blowers.



Fig; Blower

MOTORS:

A DC motor relies on the fact that like magnet poles repels and unlike magnetic poles attracts each other.

P.Sanjeev Kumar Student,

VITS College of Engineering, Sontyam, Anandapuram, Vizag.

Mr. P.Syam Kumar

Assistant Professor, Dept of Mechanical Engineering, Dept of Mechanical Engineering, VITS College of Engineering, Sontyam, Anandapuram, Vizag.

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 magnet 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°

BATTERIES:

A battery is a device consisting of one or more that convert stored chemical energy into electrical energy because it has an alkaline electrolyte of potassium hydroxide, as opposed to the acidic electrolyte of the zinc-carbon batteries which are offered in the same nominal voltages and physical size.

- Higher Energy density
- Longer Shelf Life
- Prone to leaking

Lead Acid:

Lead Acid is the oldest type of rechargeable battery. Despite having the second lowest energy-to-weight ratio (next to the nickel- iron battery) and a correspondingly low energy-to-volume ratio, their ability to supply high surge currents means that the cells maintain a relatively large power-to-weight ratio.

Features;

- High Current Surges
- Good Power / Weight ratio
- Low Energy to Weight
- Low Cost



Volume No: 2 (2015), Issue No: 7 (July) www.ijmetmr.com



A Peer Reviewed Open Access International Journal

MICRO CONTROLLERS:

Microcontroller, as the name suggests, are small controllers. They are like single chip computers that are often embedded into other systems to function as processing/controlling unit. For example, the remote control you are using probably has microcontrollers inside that do decoding and other controlling functions. They are also used in automobiles, washing machines, microwave ovens, toys ... etc, where automation is needed. The key features of microcontrollers include:

» Integration of Functionality

» Microcontrollers sometimes are called single-chip computers because they have on-chip memory and I/O circuitry and other circuitries that enable them to function as small standalone computers without other supporting circuitry.



Fig; Micro Controller Field Programmability, Flexibility :

Microcontrollers often use EEPROM or EPROM as their storage device to allow field programmability so they are flexible to use. Once the program is tested to be correct. Then large quantities of microcontrollers can be programmed to be used in embedded systems.

RELAY:

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid state relays. Relays are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers: they repeated the signal coming in from one circuit and retransmitted it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations.



Fig:Operation of relay.

ARDUINO:

Any microcontroller based board which follows the standard Arduino schematic and is flashed with the Arduino boot loader can be called an Arduino board. The Arduino is referred to as open source hardware, since the standard schematic is open to everyone and anybody can make their own version of Arduino board following the standard schematic.

Specifications of Atmega:

The high-performance Atmel 8-bit AVR RISC-based microcontroller combines 32 KB ISP flash memory with read-while-write capabilities, 1 KB EEPROM, 2 KB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented. The device operates between 1.8-5.5 volts.

WORKING PROCEDURE:

The Wall Climbing Robot (WCR) having capability that it can stick on a vertical as well as inclined surface and can easily move over the surface. The targeted capability to stick with surface can be achieved by high pressure blower. The high pressure blower is used in reverse action to create a vacuum pressure in order to stick with vertical or inclined surface. A pair of fabricated wheels is attached to the robot (WCR) for its movement. These wheels are linked with high torque motors in order to overcome the gravitational pull acting on the robot during its movement over the vertical surface. Its function is controlled according to the directions given as by the operator by the use of RF controller.

Volume No: 2 (2015), Issue No: 7 (July) www.ijmetmr.com



A Peer Reviewed Open Access International Journal

A pulley attachment is made at the top of the robot i.e. near the controller board in order to give an additional strength to the robot during its movement. These pulleys help in load distribution and reduce the overall load impact acting on the wheels and make the robot balanced during its movement. It can be moved in any direction within a range of speed with a viper attachment at front of the robot for the cleaning purpose. By the use of this robot there will be lot of time saved and the quality of cleaning obtained by the use of this robot is better than the manual cleaning method which is in use in the present days. Motors convert electrical energy (from a battery or voltage source) into mechanical energy (used to cause rotation). This is accomplished by forcing current through a coil and producing a magnetic field that spins the motor. DC motors are fairly simple to understand. They are also simple to make and only require a battery or dc supply to make them runA large quantity of microcontrollers can be programmed to be used in embedded systems.

. The development package of microcontrollers often includes an assembler, a simulator, a programmer to "burn" the chip and demonstration board. Some packages include a high level language compiler such as a C compiler and more sophisticated libraries. Arduino is a single board microcontroller, intended to make the application of interactive objects or environments more accessible. The hardware consists of an open source hardware board designed around an 8-bit Atmel AVR microcontroller, or a 32-bit Atmel ARM. Preprogrammed into the on-board microcontroller chip is a boot-loader that allows uploading programs into the microcontroller memory without needing a chip / device programmer. Programmable Logic Controllers (PLCs) have replaced banks of relays for automation needs. Relays are still used in small applications where a PLC would be overkill. They come in several varieties to suit a wide range of applications.

When a current flows through the coil, the resulting magnetic field attracts an armature that is mechanically linked to a moving contact. The movement either makes or breaks a connection with a fixed contact. When the current to the coil is switched off, the armature is returned by a force approximately half as strong as the magnetic force to its relaxed position. Usually this is a spring, but gravity is also used commonly in industrial motor starters. Most relays are manufactured to operate quickly. In a low voltage application, this is to reduce noise. In a high voltage or high current application, this is to reduce arcing.IR Sensor is a distance measuring sensor unit, composed of an integrated combination of PSD (position sensitive detector), IRED (infrared emitting diode) and signal processing circuit. The variety of the reflectivity of the object, the environmental temperature and the operating duration are not influenced easily to the distance detection because of adopting the triangulation method. This device outputs the voltage corresponding to the detection distance. So this sensor can also be used as a proximity sensor.

Some customized window cleaning machines have already been installed into the practical use in the field of building maintenance. However, almost of them are mounted on the building from the beginning and they needs very expensive costs. Therefore, requirements for small, lightweight and portable window cleaning robot are also growing in the field of building maintenance. As the results of surveying the requirements for the window cleaning robot, the following points are necessary for providing the window cleaning robot for practical use. It should be small size and lightweight for portability. Automatic operation during moving. A wall climbing robot should be light and allow a large payload, reducing excessive adhesion forces and carrying instrumentations during navigation.



Fig; Wall climbing robot.

REFERENCE:

» Jump up^A Paromtchik, Igor; Laugier, Christian (1996). "Autonomous Parallel Parking of a Nonholonomic Vehicle", Proceedings of the IEEE Intelligent Vehicles Symposium, Tokyo, Japan, September 1996, pp. 13-18.

» Jump up[^] "Four Wheels On Jacks Park Car", Popular Science, September 1934.



A Peer Reviewed Open Access International Journal

» Jump up^A Paromtchik, Igor; Laugier, Christian (1998). "Automatic Parallel Parking and Returning to Traffic", Video Proceedings of the IEEE International Conference on Robotics and Automation, Belgium, May 1998.

» Jump up^ Paromtchik, Igor (2003). "Planning Control Commands to Assist in Car Maneuvers", Proceedings of the 11th IEEE International Conference on Advanced Robotics, Coimbra, Portugal, June-July 2003, pp. 1308-1313.

» Jump up[^] Pauline Abreu, How Self Parking Cars Work, April 2008.

» Jump up^ Toyota unveils car that parks itself, September 2003.

» Jump up^A 2012 Family Cars With Self-Parking Technology, SUZANNE KANE, October 2011.

» Explosive atmospheres – Part 29-4: Gas detectors – Performance requirements of open-path detectors for flammable gases; IEC 60079-29-4Explosive atmospheres. Gas detectors. Performance requirements of open-path detectors for flammable gases; EN 60079-29-4:2010

BIBILOGRAPHY:

1-Automobile Engineering by Kirpal Singh.

2-Basic Electronics by V.K Mehta.

3-Micro Electro Mechanical System Design by J. Allen.

4-Industrial Robotics by M.P. Groover.8051 Microcontroller-Internals, Instructions, Programming & Interfacing by Subrata Ghoshal.