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Solar Powered Street Sweeping Mechanism for Clean India

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Abstract- "Cleanliness is next to Godliness"- A proverb which points the most aspect of cleanliness in every proper civilization. For the last two decades, an increase in awareness towards environmental degradation due to pollution in various forms through dust particles, runoff water, improper sanitation , waste products such as plastic products etc., In order to enhance the cleanliness of surroundings , a design of electric vehicle that can both maintain operational efficiency and stick to its task. A multi operational task of sweeping mechanism, vacuum cleaning mechanism, pick and place mechanism is being adopted to ensure the work conventionally done with different a novel method which harnessing renewable energy sources, a sweeper machine which operates in solar that could be used for Industrial sectors and for public. A prototype setup is being arranged to do the specified task and corresponding time periods are noted down for each module which ensures the environment clean.

Index terms: Brushless DC motor (BLDC), Motor Circuit (MC), Sweeper circuit(SC), Vacuum circuit(VC), Pick and Place Mechanism (PPM)

I. INTRODUCTION

Renewable energy sources such as solar energy and wind energy have been deemed clean, inexhaustible, unlimited, and environmental friendly [1]. Such characteristics have attracted the energy sector to use renewable energy sources on a larger scale. However, all renewable energy sources have drawbacks. The one that is common to wind and solar sources is their dependence on unpredictable factors such as weather and climatic conditions [2-5]. Fortunately, due to both sources' complementary nature, some of these problems can be addressed by overcoming the weaknesses of one with the strengths of the other. This brings us to the hybrid solar-wind power plant concept [6-7]. A system that brings together two sources of energy is called a hybrid system. The concept of having hybrid power stations is not new, but has gained popularity in recent years. Hybrid energy stations have proven to be advantageous for decreasing the depletion rate of fossil fuels, as well as supplying energy to remote rural areas, without harming the environment. [8-10]

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Thus, a solar-wind power system that take complementary characteristics would seem to be a viable idea. However, the difficulty brought about by combining two different energy sources makes the hybrid system more difficult to analyze.

For this reason, there is a rich literature dedicated to modeling and designing hybrid energy sources such as wind/solar power plants.[11-13]In our concept both energies are collected and regulated that energy is stored in the battery for our utilization. In case if both energy is not available or not sufficient to drive the load. Battery tends to take a charge to drive the load. EB supply is nothing but to charge the battery for extra support.

II. PROPOSED SYSTEM

The proposed system consists of three energy sources namely

1. Solar Power
2. Wind Power.
3. Battery Source

We know solar and wind is not steadily available but any one of the source is steadily available for utilization. In case if the absence of both energy sources the battery will be charged through the grid supply if the energy is not sufficiently collected from renewable sources [14-15] but it is optional only. Voltage level is sensed by using PIC16F877A controller and the data will be displayed on LCD unit with energy fraction of changes.

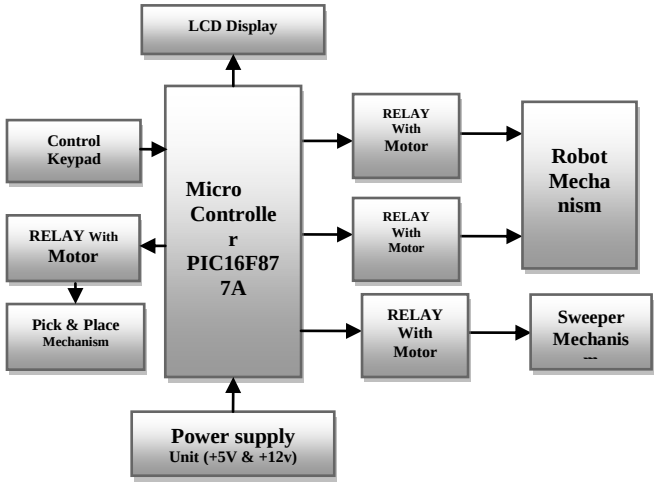

Fig.1 Block Representation

Microcontrollers are destined to play an increasingly important role in revolutionizing various industries and influencing our day to day life more. spread in all conceivable directions, making it ubiquitous.

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As a consequence, it has generate a great deal ute education need for imparting the knowledge of microcontroller based system design and development.

III. DESIGN AND IMPLEMENTAION

Complex machines from internal combustion engines to helicopters and machine tools contain many mechanisms. However, it might not be as obvious that mechanisms can be found in consumer goods from toys and cameras to computer drives and printers. In fact, many common hand tools such as scissors, screwdrivers, wrenches, jacks, and hammers are actually true mechanisms. Moreover, the hands and feet, arms, legs, and jaws of humans qualify as functioning mechanisms as do the paws and legs, flippers, wings, and tails of animals.

There is a difference between a machine and a mechanism: All machines transform energy to do work, but only some mechanisms are capable of performing work. The term machinery means an assembly that includes both machines and mechanisms.

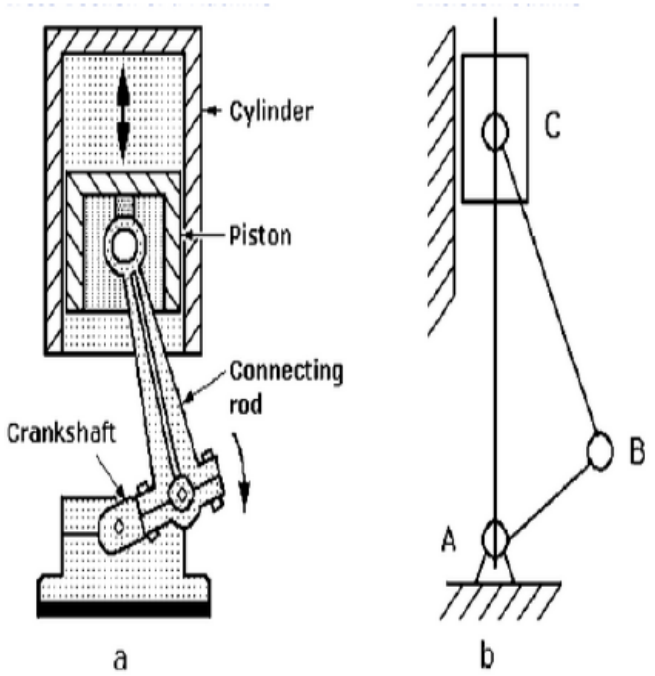

Fig.2 Robot Mechanism

Robot structure consists basically of the robot body that includes arms and wheels. Some force such as electricity is required to make the arms and wheels turn under command. One of the most interesting aspects of robot in general is its behavior, which requires a form of intelligence.

Gears and chains**.** Gears and chains are mechanical parts that provide a mechanism to transmit rotational motion from one place to another with a possibly of changing it along the way. The speed change between two gears depends on the number of teeth on each gear. Pulleys and belts. Pulleys and belts, two other simple machines used in robots, work the same way as gears and chains. Pulleys are wheels with a groove around the edge, and belts are the rubber loops that fit in that groove.

A gearbox operates on the same principles as the gear and chain, without the chain. Examples of gearboxes are found on the transmission in a car and the paper-feed of a printer.

Sensors- Robots operate according to a basic measurement, requiring different kinds of sensors. A sense of time is usually built-in through perceptual hardware and software, which updates quickly. Sensors interact with external environment and transforms the energy associated with what is being measured (sound, light, pressure, temperature, etc.) into another form of energy. Common sensors used in robotics include light sensors, touch sensors, sound sensors, and acceleration sensor.

A sound sensor is installed at the ear position of the robot in order to detect the voice of a subject. An acceleration sensor is installed in the body to detect shaking. A touch sensor is installed in the forehead of the robot to detect touch

Vacuum Cleaners- A vacuum is a space entirely devoid of matter (“absolute vacuum”). In practice we talk about a vacuum when the air pressure in a space lies below atmospheric pressure.

Components for vacuum generation, Vacuum ejectors, Displacement vacuum pumps Kinetic vacuum pumps.

These function according to the venturi principle, i.e. they are driven purely pneumatically and have a much simpler design compared with other vacuum generators.

Air flowing into a space is mechanically shut off, compressed and ejected. This allows a very high vacuum to be achieved at a very low flow rate.

Air is forced to flow in the delivery direction through the application of additional mechanical force. This method achieves only a relatively low vacuum level despite a high suction rate.

The most important components are the jet nozzle (venturi nozzle) and at least one receiver nozzle. Accelerated compressed air generates a suction effect between both nozzles (vacuum). There are different design principles, single-stage and multi- stage ejectors.

Depending on the principle, air is either carried away in a flow by a rotating impeller on the suction side or compressed using vanned chambers. The pump types available include vacuum blowers and vacuum compressors.

To generate compressed air from atmospheric air, you need to reckon on approx. € 0.02 per m^3 volume at 7 bar pressure when calculating the costs involved When a vacuum suction gripper cannot fully seal the system against atmospheric air, we talk about leaking systems. This might be caused, for example, by rough and uneven workpiece surfaces or air-permeable workpiece materials. A classic ejector consists of a jet nozzle (venturi nozzle) and, depending on the design principle, at least one receiver nozzle.

Compressed air enters the ejector. The narrowing of the jet nozzle (venture nozzle) accelerates the air to up to 5 times the speed of sound as it flows through the jet nozzle.

There is a short gap between the exit from the jet nozzle and the entry in the receiver nozzle. The expand compressed air from the jet nozzle creates a suction effect at the gap to the receiver nozzle, which in turn creates a vacuum at the output (vacuum port).

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A. Pick And Place Mechanism

Now a day's robots are very useful in various industrial and domestic operations using different mechanisms such as hydraulic, kinematic chain etc. I have made a functional robot that can be used in pick and place operation such as loading and unloading machines, placing components on circuit boards, moving parts off conveyor belts etc. using stud mechanism which is very simple, cheap and easy to manufacture. Use of this mechanism can replace other costly and complex mechanisms.

End Effector **-** This is the gripper to whose operation is to grip and outgrip the objects to be lifted or moved. The gripper is connected to the horizontal rotating servo motor.

Wrist- This is the joint that links to the end effectors as shown in fig 2. The wrist has one degree of freedom, which is actuated by a servo motor. It can rotate to about 1800 about the horizontal axis.

Shoulder **-** This is the joint between links C and the base and has 1 degree of freedom which is actuated by a Dc motor (servo motor). It can also rotate to about 180o by link C. A gearing system is also used to actuate the motion.

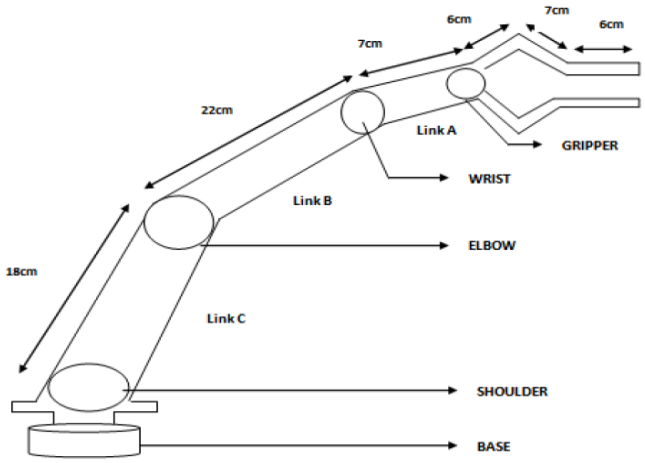

Fig.3 Pick and Place Mechanism

Elbow- This is the joint between links B and C and it has one degree of freedom actuated by a rc servo motor. It can rotate to about 1800 (by design) by link A. The motion about the elbow is actuated by a set of gear brains connected to the links and the Dc motor**s.**

Base- This is the joint between the robotic arm and the vehicle; it has 1 degree of freedom which is actuated by a Dc connected to the gear in the link C. The Dc motor is similar to that used in the shoulder but a different gearing arrangement. The base rotates to about 1800. The base is the platform on which the arm stands and it carries the weight of the arm which in turns determine maximum load the robotic are can lift. The circuit board wiring and other attachments are fixed to the base.

B. Power Supply Description

We are using solar power charging based battery voltage. A regulator circuit removes the ripples and also remains the same dc value even if the input dc voltage varies, or the load connected to the output dc voltage changes. This voltage regulation is usually obtained using one of the popular voltage regulator IC units.

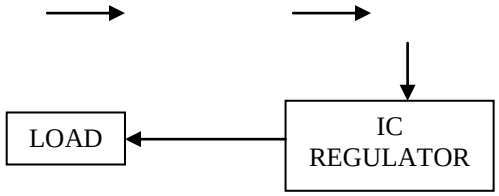

Fig.4 Power Supply Diagram

Power Supply Unit- The size of the battery bank required will depend on the storage capacity required, the maximum discharge rate, the maximum charge rate, and the minimum temperature at which the batteries will be used. When designing a power system, all of these factors are looked at, and the one requiring the largest capacity will dictate battery size. Our System Sizing work forms take many of these factors into account.

One of the biggest mistakes made by those just starting out is not understanding the relationship between amps and amp-hour requirements of 120 volt AC items versus the effects on their DC low voltage batteries.

However, in order to determine the true drain on your batteries you have to divide your nominal battery voltage into the voltage of the load , and then multiply this times your amp hours. The easiest way to quickly determine the total battery amp hours required is to first determine total watt-hours required by all loads, and then divide by the nominal DC system voltage.

This resulting number will indicate the amount of amp hours needed to operate all loads for a given period. However, additional amp hour capacity would typically be added for more "reserve" capacity or to prevent complete discharge. There are other factors for determining the full extent of the battery drain, such as temperature, start-up factors, etc., but this should help you get a more complete picture on how to size your low DC voltage batteries when powering 120/240 volt loads using an inverter. Our System Sizing work forms take many of these factors into account.

IV. RESULTS AND DISCUSSIONS

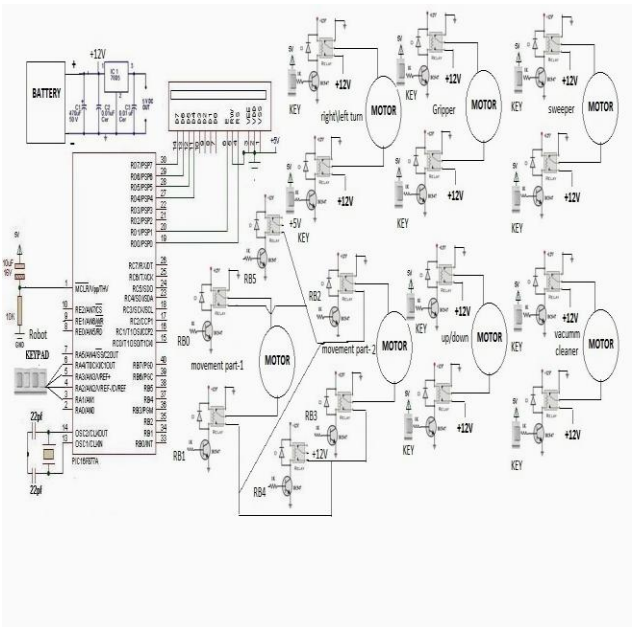

Fig.5 Circuit Diagram

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Fig.6 (a) Prototype Presentation

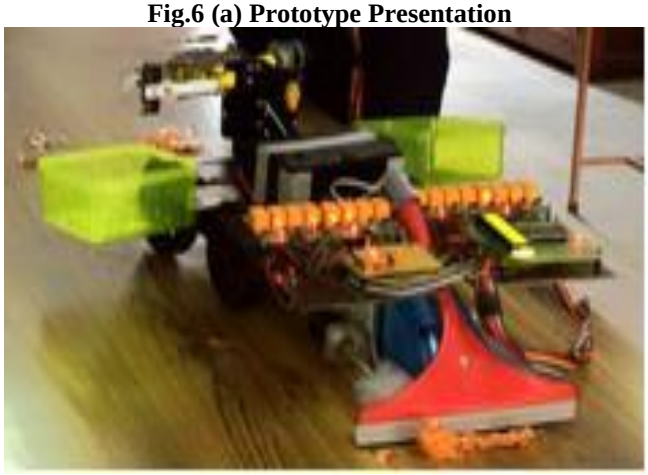

Fig.6 (b) Solar Powered Street Sweeper

A. Result in tabular column

Area of the room: 200 sq.ft

Time for solar panel charging (in mins)	Time taken by pick and place mechanism (in secs)	Time taken by sweeping mechanism (in secs)	Time taken by vacuum cleaning mechanism (in secs)	Total time taken by overall system (in secs)
180	4	7	8	19

V. CONCLUSION

The progress in science & technology is a non-stop process. New things and new technology are being invented. As the technology grows day by day, we can imagine about the future in which thing we may occupy every place. The proposed system based on PIC microcontroller is found to be more compact, user friendly and less complex, which can readily be used in order to perform. Several tedious and repetitive tasks. Though it is designed keeping in mind about the need for industry, it can extended for other purposes such as commercial & research applications. Due to the probability of high technology (PIC microcontroller) used this "SOLAR POWERED STREET SWEEPING MECHANISM FOR CLEAN INDIA" system is fully software controlled with less hardware circuit. The feature makes this system is the base for future systems. The principle of the development of science is that "nothing is impossible". So we shall look forward to a bright & sophisticated world.

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