

Solar Powered Platform Cleaning Robot

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Abstract— *The significance of this ROBOTIC MODEL, is to clean the platform's such as Railways, Airports, Hospitals, etc., by integrating the floor cleaning robot (vacuum cleaning) and pick and place robot (arm based). And also the further more significant of this model is solar power (natural energy). The whole model will be powered by the natural energy.*

Keywords— *floor cleaning, pick and place, robotic vehicle, solar panel, battery.*

I. INTRODUCTION

Cleaning is an art. Every citizen of the world has the duty of keeping the environment clean. Many disease spread from the unhealthy environment. In ancient world, the cleaning is considered as a holy work. The ancient peoples put lot of effort in cleaning their living places and surroundings to keep clean. Today with the help science and technology, cleaning process has become very much easy. Robots are the only available option to reduce man power in the world. Nowadays with recent trends in technology many robots are built for the luxurious and beneficial life of human. Vacuum cleaner is a latest update for the use of cleaning purpose. Vacuum cleaner will be semi-automatic system for some extent. After the invention of vacuum cleaners the man power in the duty of cleaning the environment was reduced. There are many types of floors available in the environment. Each floor must be cleaned with special care despite of type of floor. Vacuum cleaners are mainly used in indoor environment, where the cleaning process is needed at quite often. Usually pick and place robots are widely used in industries that too mainly in sorting and placing the objects. With a little innovation step vacuum cleaner is automated with small sensors and motors in order to move automatically and also pick and place technology is integrated with it and powered by solar energy. The market prices of such robot are costly and also not effective in cleaning process. Future research related to cleaning is converting the semi-automated vacuum cleaners to fully automated cleaning system. Current development in this topic is vacuum cleaner robot which is used to clean the entire floors and environment. This robotic model will tend to move automatically without man power and also manually by

controlling. Solar power is a natural energy and it plays a significant role in this model.

II. HISTORY

A. Vacuum Cleaner

A vacuum cleaner is a device that uses an air pump a centrifugal fan in all but some of the very oldest models, to create a partial vacuum to suck up dust and dirt, usually from floors, and from other surfaces such as upholstery and draperies. The dirt is collected by either a dust bag or a cyclone for later disposal. Vacuum cleaners, which are used in homes as well as in industry, exist in a variety of sizes and models small battery powered hand held devices, wheeled canister models for home use, domestic central vacuum cleaners, huge stationary industrial appliances that can handle several hundred liter of dust before being emptied, and self-propelled vacuum trucks for recovery of large spills or removal of contaminated soil. Specialized shop vacuums can be used to suck up both dust and liquids. The vacuum cleaner evolved from the carpet sweeper via manual vacuum cleaners. The first manual models, using bellows, were developed in the 1860s, and the first motorized designs appeared at the turn of the 20th century, with the first decade being the boom decade. The next improvement came in 1898, when John S. Thurman of St. Louis, Missouri, submitted a patent for a "pneumatic carpet renovator". This was a gasoline powered cleaner although the dust was blown into a receptacle rather than being sucked in, as in the machine now used. In a newspaper advertisement from the St. Louis Dispatch, Thurman offered his invention of the horse-drawn motorized cleaning system in St. Louis.

B. Robot

Robot is a word that is both a coinage by an individual person and a borrowing. It has been in English since 1923 when the Czech writer Karel Capek's play R.U.R. was translated into English and presented in London and New York. R.U.R., published in 1921, is an abbreviation of Rossum's Universal Robots, robot itself comes from Czech robota, "servitude, forced labor," from rab, "slave." The Slavic root behind robota is orb-, from the Indo-European root orbh, referring to separation from one's group or passing out of one

sphere of ownership into another. Czech robota is also similar to another German derivative of this root, namely Arbeit, "work". Arbeit may be descended from a word that meant "slave labor," and later generalized to just "labor."

C. Solar Power

In 1954, D.M. Chapin, C.S. Fuller and G.L. Pearson, of Bell Laboratory, patented a way of making electricity directly from sunlight using silicon-based solar cells. The next year, the Hoffman Electronics-Semiconductor Division announced the first commercial photovoltaic product that was 2 percent efficient, priced at \$25 per cell, at 14 mill watts each, or \$1,785 per watt (in 1955 dollars). In 1978, Congress passed the Public Utility Regulatory Policy Act or PURPA. It established the right for independent power producers to interconnect with the local utility distribution system. PURPA allowed large utility scale applications of PV and other solar electricity systems. Among other things, this federal legislation required utilities to buy electric power from private "qualifying facilities," at an avoided cost rate. This avoided cost rate is equivalent to what it would have otherwise cost the utility to generate or purchase that power themselves. Utilities must further provide customers who choose to self-generate a reasonably priced back-up supply of electricity. For small systems, such as a residential rooftop PV system, however, these protocols did not help the growth of small systems. In 1979, ARCO Solar began construction of the world's largest PV manufacturing facility in Camarillo, California. ARCO Solar was the first company to produce more than 1 megawatt (MW) of PV modules in one year. Four years later, ARCO Solar dedicated a 6 megawatt PV facility in central California in the Carissa Plain. The 120-acre unmanned facility supplied the Pacific Gas and Electric Company utility grid with enough power for about 2,500 homes. ARCO Solar built a 1 MW PV power plant with modules on over 108 double-axis trackers in Hesperia, California. In 1993, Pacific Gas and Electric Company installed the first grid-supported photovoltaic system in Kerman, California. The 500-kilowatt system was considered the first "distributed power" PV installation. In 1996, the U.S. Department of Energy and an industry consortium begin operating Solar Two - an upgrade of the Solar One concentrating solar power tower. Until the project's end in 1999, Solar Two demonstrated how solar energy can be stored efficiently and economically so power is produced even when the sun isn't shining; it also spurred commercial interest in power towers. Another and more important event also occurred in 1996. Assembly Bill 1890 (Statutes of 1996, Chapter 854, Brulte) was passed by the Legislature and signed by Governor Pete Wilson. This bill deregulated the state's investor-owned electric utilities and created incentives for grid-tied PV systems under the California Energy Commission's Renewable Energy Program. The following year, Senate Bill 90 (Statutes of 1997, Chapter 905, Sher) implemented the provisions of AB 1890 and directed the

activities of the Energy Commission relating to renewable energy.

III. EXISTING METHODOLOGY

A fundamental structure of a modern autonomous floor-cleaning robot is complicated, could be illustrated by US6883201, which is also a successful product of commercialization today by iRobot Corporation, comprises a housing infrastructure, a motive system with wheels, a bumper, a self-adjusting cleaning head subsystem with brushes and vacuum assembly, a removable dust cartridge, a sensor system to detect obstacles, and a control system for autonomous actions.

Organized suitable search queries and obtained interested patents, an overview of US granted patents in cleaning robots since 2000. It shows a tendency of increasing, and matches the market prediction in 2004 by Science News. It has not been published in whole year of 2013 on search date, more than 150 granted patents is a reasonable prediction in 2013.

Vacuum cleaning and pick and place technology were used separately and gets power from power supply.



A). Railway platforms cleaned by labors.



B). Manual cleaning

IV. PROPOSED METHODOLOGY

The vacuum robot and the pick and place robot are combine to do the operations on a single format, the whole

robot will get powered by the solar energy. The monitoring and controlling of that robot is much easier.

A. Solar Robot

The robots are used more commonly in all the fields. Because of its accuracy and toughness. As the battery used for charging in the robots is carried by the human, its power supplying unit is being a drawback to its reliability. Even though there is a system available for the automatic recharging of batteries with the solar panels, it's not practically used in the robots which do another function. The, solar Robotic systems are often used for many years. However, when there is scarcity of sunlight the batteries cannot be recharged when depleted. Photovoltaic are used for the conversion of sunlight into electricity. Photovoltaic were initially used to power small and medium applications, that are powered by a single solar cell to off grid homes powered by a photovoltaic array. Today increasing efficiency of solar energy technology has given rise to use it in practical applications like powering personal devices. Solar-generated energy provides abundant and Pollution free energy.

B. Intergrating floor cleaning and pick and place

- Floor cleaning robots are used with the help of vacuum cleaner for cleaning the floors of house, indoor stadiums etc.,
- Pick and place robot will be normally used in industries for manufacturing products. Ex: car manufacturing.
- Pick and place robot can also be used to pick the waste objects in an area. By this it also has cleaning principle.
- So, here the floor cleaning robot and pick & place robot was combined.

C. Automatic and manual switching

- Two switching modes are used(automatic and manual)
- In automatic mode, the robot will do its automatically.
- In manual mode, the robot will be controlled by manual operation.

V. FLOW CHART

The fig.5.1 shows the flow chart of the proposed methodology of platform cleaning robot.

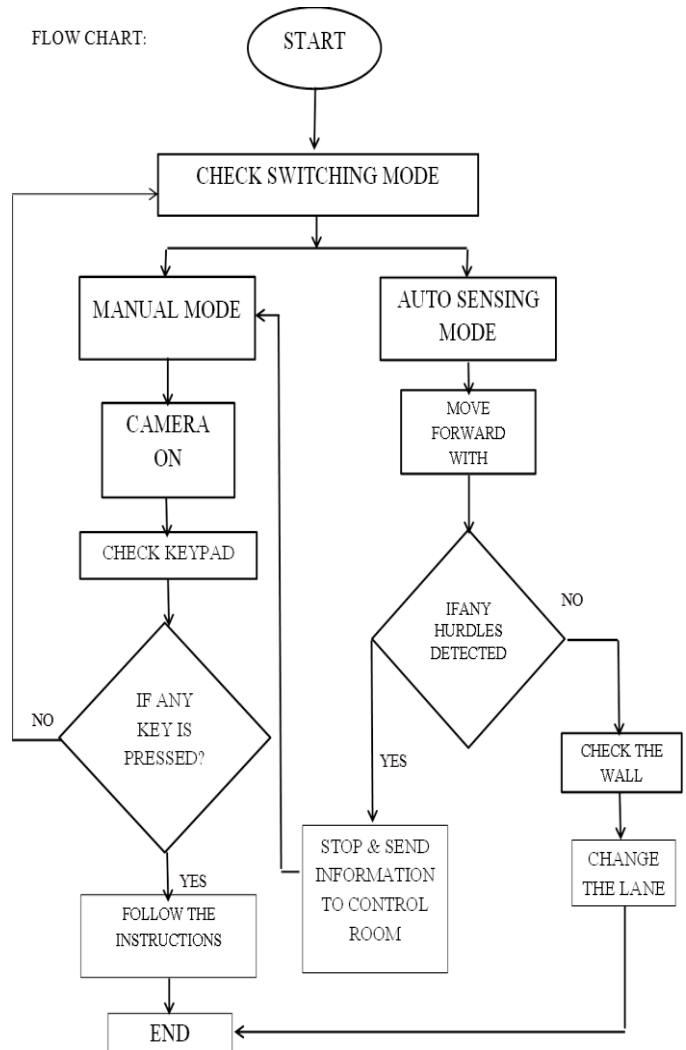


Fig.5.1 Flow chart

VI. BLOCK DIAGRAM

I. Control Room



Fig.6.1 block diagram of control room

II. Robot

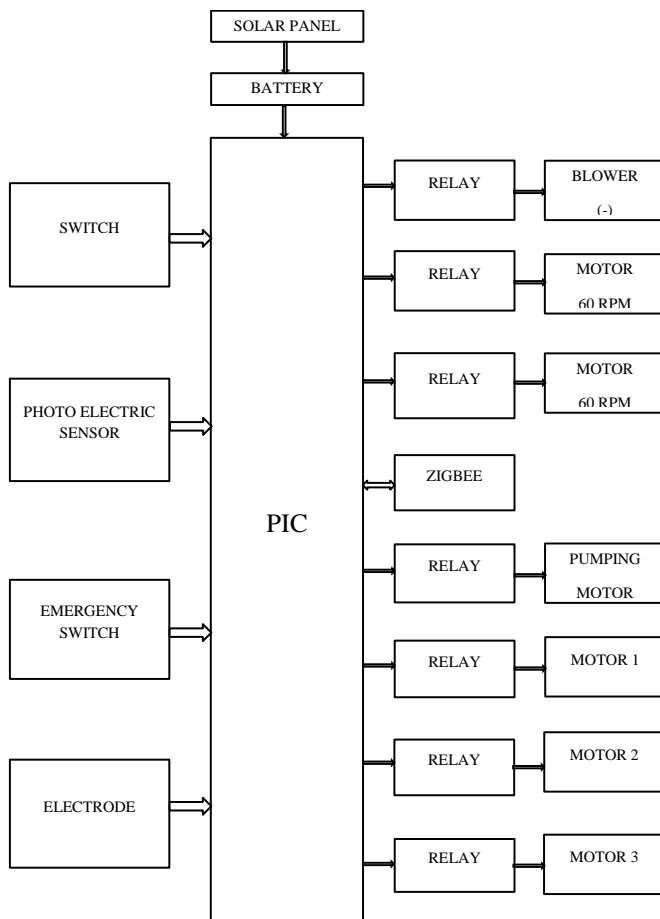


Fig.6.2 block diagram of robotic model

VII. DESCRIPTION

The block diagram of robotic model consists of solar panel that converts the solar energy into electrical energy. Then the converted energy will be stored in the battery. In this there are two batteries one will be charged on the same time, and simultaneously another battery will discharge the power that required for the robotic vehicle. On the input side of the microcontroller consists of switch, photo electric sensor, and electrode. The output of the microcontroller is relays which are connected to the corresponding motors. The blower (-) is a vacuum cleaner that used to suck the dust particles.

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