DESIGN AND FABRICATION OF SOLAR POWER VACUUM CLEANER

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Abstract: Since the non-renewable resources we now use are going to run out soon, renewable energy is crucial for the modern world. Saving these non renewable energy sources is one step closer with the solar-powered vacuum cleaner. We are more aware of and affected by the effects of climate change now than ever before. The technology that can support us in both our everyday lives and in preserving the environment. We present the Smart Solar dust collection as one workable option that can perfectly alter our way of life, if only slightly. A solar vacuum cleaner can aid in reducing pollution. To capture solar radiation, offer an improved surface for collecting dust, which benefits the environment.

I.   INTRODUCTION

One of the most essential need for human survival on Earth is energy. To meet our needs, we must rely on energy in one way or another. One kind of this type of energy is fossil fuel energy. Humans need energy to run cars, generate electricity, and do other things. The main disadvantages of these fossil fuels, however, are their lack of environmental friendliness and exhaustibility. To solve these problems with fossil fuels, we need to take renewable energy sources into consideration. We have created a solar-powered dust collector in accordance with this concept. Previously, we handled the cleaning by hand. In the future, we'll solely utilize electrically powered vacuum cleaners for personal and business use. For cleaning of bigger area, the diesel operated dust collectors are used, but unfortunately this more costly and they create pollution due to (diesel, petrol etc.). This helps to increase global warming. To reduce this drawback, we use solar operated vacuum cleaner. We have pleasure in introducing our new project "SOLAR VACUUM CLEANER", which is equipped by micro controller, motor driving and battery. The mechanism power stored in the battery is used to drive the DC motor that causes the movement to Vehicle. This is an era of automation where it is broadly defined as replacement of manual effort Robots are intelligent machines with built-in brains that are fed computer logic to accomplish tasks in accordance with predetermined algorithms. The logic controller is designed to guide the vehicle's autonomous movement. Robots are essential in all facets of life. It is employed in institutes, homes, and industries. These days, robot intelligence is almost matching that of humans. In his daily existence, the average human uses two to three robots. Actuators are employed to operate a mechanism that in turn manages a specific component of the apparatus. Sensing devices known as sensors are those that send out signals and receives the signal and accordingly used to accumulate the various environment information which is ultimately fed to microcontroller for deciding the working of machines. Microcontroller is the brain of robot where program is written and sensors are connected as input and actuators as output. The controlling of the robot is governed by various algorithms like fuzzy controller, machine learning based practices and artificial neural network-based algorithms. Depending upon the environment value received to the controller it eliminates the error and transits from one state to another.

II. PROBLEM STATEMENT

Cleaning can occasionally be physically difficult, but it's necessary to perform daily household duties like sweeping and dusting repeatedly to preserve cleanliness.The hundreds to thousands of watts of electricity used by vacuum cleaners on the market drives up electricity bills. Dusting involves the inhalation of specific particles, which can aggravate a person's respiratory system and result in further health problems. To guarantee a clean home, a number of devices on the market use particular mechanical and electrical systems. There are vacuums that don't come with a reusable rubbish bag. Because these machines require one to be present for mobility, they make life more difficult and cleaning tasks more challenging. To reduce such efforts for cleaning our project aims to create a device that is low cost, utilizing local resources to design which serves the purpose of sweeping and dusting from a place.

III. LITERTURE REVIEW

Traditionally floor is cleaned with the help of dry mop or wet mop using the hand as a potential tool. They have to 11 scrub hard on the surface. By the help of machines also we can get huge efficiency because there is no chance of human error there. The aim of this project work is to design and develop process for cleaning the floor having wet and dry surfaces. It is very useful for cleaning the wet as well as dry floors. This floor 4 cleaning machine consisted of moisture cotton mop, swiping brushes, wipers and vacuum cleaner for reducing the cleaning time. The study comprehends of automated vacuum cleaner which having components to DC motor operated wheels, roller brush, cleaning mop, the garbage container and obstacle avoidance sensor. A 12V rechargeable battery is used as power supply.

[1] 2023 JETIR Volume 9, Issue 6, April 2022. Traditionally, a dry or wet mop is used to clean floors, requiring the operator to scrape the surface very hard. But because there is no chance of human error when using machines, we can also reach a high level of efficiency. Creating a procedure for cleaning floors with both wet and dry surfaces is the aim of this project. It works wonders for cleaning four floors—both wet and dry. The automated vacuum cleaner under investigation includes parts for its roller brush, cleaning mop, trash can, obstacle avoidance sensor, and DC motor-operated wheels. As a power source, a rechargeable 12V battery is employed.

[2] Volume 11, Issue 6, June 2020, ISSN 2229-5518, International Journal of Scientific & Engineering Research. Despite the fact that some machines have been constructed successfully. Many urban issues, such as blockages and flooding, are solvable. A sustainable device that runs on green energy has to be created. In these situations, developing labor can be extremely risky and time-consuming. Indoor GPS is currently developing, using first-run path determination and unsupervised learning. Indoor navigation is still a problem as of right moment. Complex artificial intelligence algorithms such as ANT algorithm, Swarm Optimization, Unsupervised and Supervised Learning, and Natural Heuristic Search are also being used extensively in the design of control systems for most mobile robots these days.

[3] The IEEE publication ASSIC (Advancements in Smart, Secure, and Intelligence) International Conference 2022 3. The robot was built with the intention of simplifying everyday cleaning tasks. The two dry cleaning procedures are combined using a 16 vacuum cleaner. The robot is operated with a radio-frequency remote. The user uses the remote to deliver movement commands to themselves. An RF receiver circuitry powers the robot's motors and receives movement commands to accomplish the necessary movement. The robot runs on a battery that is continuously replenished by sunlight while being depleted by the motors. When it's exposed to sunlight, this prolongs the battery life.

IV. METHOLOGY

the idea of producing using pollution-free, renewable solar energy. the choice of elements to produce the desired outcome. Designing the program and loading into microcontroller for our mobile operation then fabrication takes place by connecting components. testing is conducted if any errors then error rectification takes place.

V.   WORKING

With the aid of photons, a solar panel—a 12 by 13-inch, 12 volt, 5-watt panel—transforms heat into power. We use polycrystal material for our panels. and the energy is kept in a 12 V, 5 A battery. A booster converter is utilized to raise the voltage levels needed for the load between the battery and solar panel. All of the components are receiving power from the battery. The robot begins its task of cleaning the floor by flipping a simple switch. When robot is switched ON the mopping or sucking mechanism takes place. Circuit consists of a GSM module, Microcontroller, 5 relays, five motors 4 for robot movement another one for rotation of brush. Using GSM technology robot movement will be controlled by Bluetooth. Clock wise or anti clockwise movement. The vacuum cleaner and additional components receive their primary power from the electrical board. DC electricity is provided to the vacuum cleaner while it is operating. The vacuum cleaner has a battery attached, and it plays a crucial part in the cleaning process. Robot motion will be managed via GSM technology. A microprocessor and Bluetooth connection enable human control of the directions. Here, the robot's movement is controlled by four relays, while the brush is controlled by a single relay. There are five dc motors in use: four for robot movement and one for brush movement.
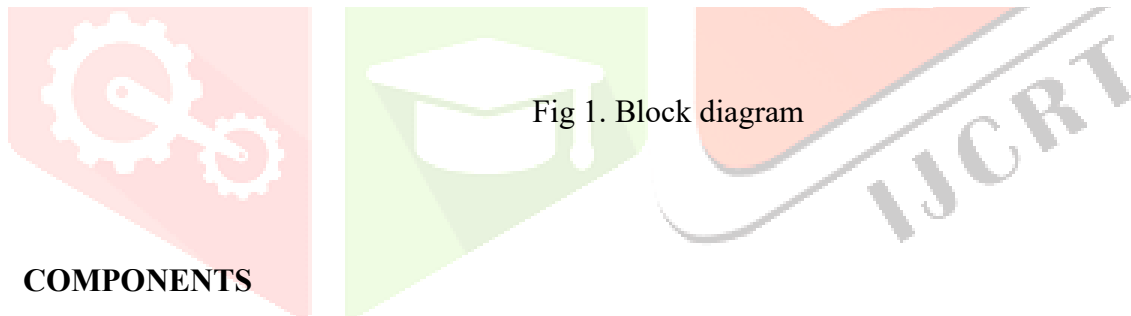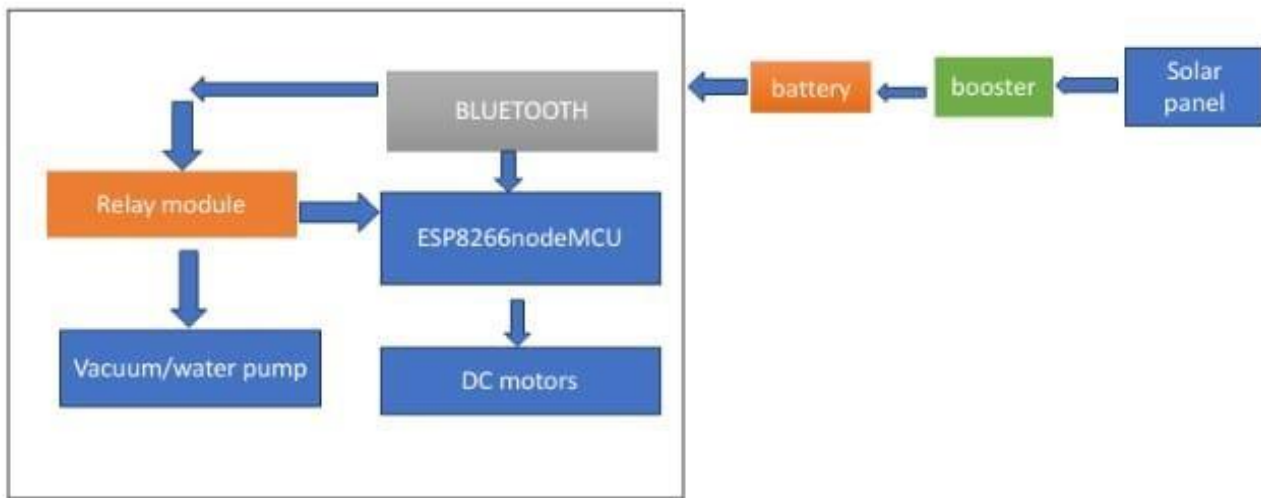

Fig 1. Block diagram

VI.   COMPONENTS

1.solar panel: Solar energy emanates from the sun. Solar panels, also known as "PV panels," transform the sun's light, which is composed of energy particles called "photons," into electricity that may be used to power electrical loads. Apart from generating electricity for residences and commercial establishments, solar panels can be employed for an extensive array of other uses, including remote power systems for cabins, telecommunication apparatus, and remote sensing.

Fig.2 solar panel

2.Relay: The load linked across the relay is driven by this electromagnetic device, and the relay's output can be connected to a controller and load for additional processing.

Fig 3. relay

3.DC motor: The idea that unlike and like magnetic poles are attracted to one another drives a DC motor. A wire coil with current flowing through it produces an electromagnetic field directed toward the center of the coil. A coil can be rotated 180 degrees to alter the direction of the magnetic field it produces, or it can be turned on or off by adjusting the current passing through it.

Fig 4. DC motor

4.Vaccume pump: The process of vacuum generation begins with the expansion of the sealed chamber. From there, the vacuum pulls the fluid through the intake valve and into the chamber.

Fig 5. vacuum pump

5.**Esp8266 NodeMCU:** Node MCU is a microcontroller development board with wi-fi capability. It uses an ESP8266 microcontroller chip. Whereas Arduino UNO uses an ATMega328P microcontroller. Besides the chip, it contains other elements such as crystal oscillator, voltage regulator, etc.

Fig 6. ESP8266 MC

6.Battery: As long as the vacuum cleaner is made to function within that voltage and current range, using a 12V 2A adaptor for it should be okay. It's crucial to review the vacuum cleaner's specs to make sure the adapter's output satisfies the needs of the apparatus.
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Fig.7 battery

7.Booster circuit: To step-up an input voltage to some higher level, required by a load.This unique capability is achevied by storing energy in an inductor and releasing it to the load at a higher volatge.
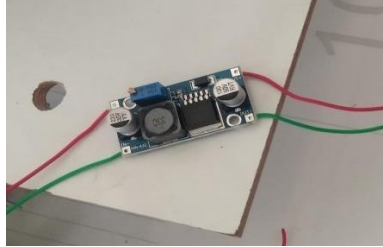

Fig 8. Booster circuit

8.GSM :GSM is the most extensively used cell phone technology in the world. Cell phones look for cell phone towers in the vicinity and use the GSM network of a mobile phone service provider.

9.Embedded C Consumer electronics, such as mobile phones, medical equipment, aerospace and defense systems, and even everyday home appliances like dishwashing machines, televisions, washing machines, and video recorders, frequently use embedded CPUs. Because the majority of embedded applications are subject to strict budgetary limitations, low-cost processors such as the 8051 family of chips discussed in this book are typically used. These widely used processors have very little RAM; the majority of these devices contain 256 bytes, not gigabytes. as it compared to a desktop processor, the available processor power is roughly 1000 times lower. Consequently, creating embedded software has noteworthy novel difficulties, even for proficient desktop programmers.. If you have any prior expertise with programming in C, C++, or Java, this book and its companion CD will help you transition as quickly and painlessly as possible into the embedded realm.

ADVANTAGES
- To control & clean house hold appliances
- In industries and factories for remote sensing & cleaning ☐ Long distance remote sensing.
- Cleans without Human Interference.
- Eco friendly towards environment

VIII. APPLICATION

- It used in domestic and industrial cleaning.
- Smart cleaning.

IX. RESULT

X. CONCLUSION

We have had a fantastic opportunity to put our limited knowledge and skills to use through our project work. We gained a lot of knowledge about planning, purchasing, computers, and machining while working on this project. We think that working on projects is a great approach to connect institutions and industries. The solar vacuum cleaner will function under satisfactory conditions. We are able to recognize the difficulties in maintaining the norm. To the best of our talents and expertise, we have made the most use of the facilities. Let's add a few more phrases to the project's closing statements about our impression project effort. The application of mechanical, electrical, and computer-based systems to manage and regulate production is known as automation. With the full use of the available resources—money, materials, and machinery—this project may be developed. Additionally, we carefully studied the study of time motion and used the resources at hand to make our project inexpensive and effective. This system was successfully designed, manufactured, and tested. It functions adequately. We expect that even in the future, this will be among the most adaptable and swappable.

XII. REFERENCES

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