SOLAR POWERED SEED SOWING MACHINE

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CHAPTER 1
INTRODUCTION

Agriculture Sector is the backbone of Indian Economy. There is a need for improvement in agriculture sector, which can be achieved by using advanced technological methods for farming processes like digging, sowing and irrigation etc. Mechanization reduces labour cost and improves the overall productivity without affecting the quality of soil. And also the population of people involved in agriculture is also getting reduced in recent years. Hence this project represents a machine which can carry out various farming activities simultaneously. As the population of India is rising, demand of food is also escalating which leads to higher crop production per hectare. So, to fix these problems farmers should use latest technological advancements for the various agricultural practices like digging, sowing, which are more efficient and less time consuming. The plantation of seeds is automatically done by using DC motor. The distance between the two seeds are controlled and varied by using Microcontroller. It is also possible to cultivate different kinds of seeds with different distance. When the Robot reaches the end of the field we can change the direction with the help of remote switches. The whole process is controlled by Microcontroller. Seed plantation is our day to day life is done by tractor in farms. The conventional method for seeding is the manual one. But it requires more time & the man power shortage is faced continuously. India is agrarian economies and most of rural populations depend on agriculture to earn their livelihood. Agriculture is the largest livelihood provided in India mostly in the rural areas. The farmers are in need of seeds for ploughing & cultivation. The seeds are available in packets & many industries deal in manufacture of such seed packets.

In the current generation most of the countries do not have sufficient skilled man power specially in agricultural sector and it affects the growth of developing countries. The main requirement of Automation is to reduce man power in our country; the buzzword in all industrial firms generally involves electrical,

electronic component as well as mechanical part. Automation saves a lot of tedious manual work and speeds up the production processes. So it is a time to automate the sector to overcome this problem. In India there are 70% people dependent on agriculture. Seed has been an important agricultural commodity since the first crop plant was domesticated by pre-historic man. In this model seed sowing process is automated to reduce the human effort and increase the yield. The plantation of seeds is automatically done by using DC motor. The distance between the two seeds are controlled and varied using Microcontroller. It is also possible to cultivate different kinds of seeds with different distance. When the system reaches the end of the field we can change the direction with the help of remote switches.

In current world, every process is getting automated and people are getting used to adopt smart techniques to get their work done. It can be seen that with flow of time, how seed sowing techniques and equipment's have kept on progressing. Proper seed sowing is very important part of agricultural process and for the same purpose hand operated seed sowing machine have been designed and developed. Despite agriculture being one of the most important fields for determining the growth of a country, it is lagging in terms of smart working. Contribution of agricultural growth to overall progress has been widespread. Increased productivity has helped to feed the poor, enhanced farm income and provided opportunities for both direct and indirect employment. The success of India's agriculture is attributed to a series of steps. For sowing in small areas dibbling i.e., making holes or slits by a stick or tool and dropping seeds by hand is practiced. Multi row traditional seeding devices with manual metering of seeds are quite popular with experienced farmers. In the current generation most of the countries do not have sufficient skilled man power specifically in agricultural sector and it affects the growth of developing countries. So it's a time to automate the sector to overcome this problem.

The major sources of agricultural growth during this period were the spread of modern crop varieties, intensification of input use and investments leading to expansion in the irrigated area. In areas where 'Green Revolution' technologies had major impact, growth has now slowed. New technologies are needed to push out yield frontiers, utilize inputs more efficiently and diversify to more sustainable and higher value cropping patterns". At the same time there is urgency to better exploit potential of rain fed and other less endowed areas. Given the wide range of agro ecological setting and producers, Indian agriculture is faced with a great diversity of needs, opportunities and prospects. Future growth needs to be more rapid, more widely distributed and better targeted. These challenges have profound implications for the way farmers' problems are conceived, researched and transferred to the farmers. "On the one hand agricultural research will increasingly be required to address location specific problems facing the communities on the other the systems will have to position themselves in an increasingly competitive environment to generate and adopt cutting edge technologies to bear upon the solutions facing a vast majority of resource poor farmers".

The robotic systems play an immense role in all sections of societies, organization and industrial units. The objective of the project is to develop a microcontroller based system at helps in on-farm operations like seeding and fertilizing at pre-designated distance and depths with all applicable One of the biggest irony is agriculture being the main occupation in many countries still it lags in using the smart techniques in this field. If technology is introduced in farming techniques there are chances that ever growing populating in the coming future might be fed adequately. To suffice such a large amount, agricultural yield must also be increased rapidly. Due to poor seed quality & inefficient farming practices, and lack of cold storage and harvest spoilage, nearly 30% of the farmer's produce is wasted.

These figures clearly shows that there is great need of introducing automation techniques in every small and big agricultural farming because, if appropriate measures are not taken at the right time, even though currently many countries has adequate stock of food to suffice its population, a time may come when same will not be able to feed its entire population. As a result of it the development of such countries will severely be affected and they may not be able to become a developed nation. Automation in seed sowing will help in proper use of available resources. To implement automation in the process of sowing seeds in agricultural farming, the machines that are already being used can be improved in design or new machines or attachments can be developed to do the necessary operations. But these machines or attachments should be cost effective and be affordable to the farmers. Hence a less expensive, distinct machine or attachment has to be designed and developed so that it can be used for different crops and in different seasons. It will help to increase output with same amount of input by sowing the seed at proper distance so that each seed gives best output as it is known that sowing of seed with proper gap is an important parameter in farming. The main work of sowing operation is to sow seeds at required depth with specific spacing between the two sowed seeds. Air and Noise Pollution are caused by the combustion of fossil fuels in IC Engines and External Combustion Engines. To negate these problems, this machine uses Solar Energy as an eco-friendly energy resource. Solar Panel is used to convert solar energy into electrical energy and a DC Motor converts this electrical energy into mechanical energy to rotate a cutter for digging operation. Seed Hopper and Water Tank are used for seed sowing and irrigation operations respectively. This machine maintains seed to seed spacing and row to row spacing. It also decreases the cost of sowing the seeds and requirement of labour.

This process starts with solar panel which absorbs the sunlight and convert it into electrical energy required for this operation. Battery is used to store the

charge from the solar panel. A 12V battery is used for this method. Microprocessor controls the overall operation of this system. Ultrasonic sensor is used to detect the obstacle in the path which is used to make turn when it reaches the end of the line. Seed sowing machine is used to put seed on the place. And motor is control to move the system. Two motors is used here. Motor consists of motor driver and motor chassis with itself. For the movement of this machine four wheels are attached with motor. Battery, ultrasonic sensor, Seeding machine and motor is connected to the microprocessor. This will give equal distance between all seeds. As it is using solar power this system is more eco-friendly. This method gives more efficiency in agriculture and reduces the time consumption for the seeding process.

CHAPTER 2

LITERATURE SURVEY

Ahuja Jayesh, Bhoite Aakash, Patil Mayur, Tinwala Ensiya, Kumar Sham: "An Innovative Model For Multipurpose Agricultural Use"

An innovative multipurpose machine for carrying out different farming activities efficiently with less effort and in less time. Different farming operations proposed to be carried out by this machine are seeding, digging and spraying. It is an ecofriendly device working on solar energy. For this purpose, we are using solar panel as power supplying device which convert solar energy into electrical energy. This electrical energy further converted into mechanical energy by motor.This model introduce term "Autonomous Agriculture" which means we can perform agricultural operations in required time and in required area which is prespecified by the operator. The advantages in agricultural production to increase productivity improve application accuracy and enhance handling safety.

Disadvantage

High cost and complex operation

Prof. Pranil V. Sawalakhe Amit Wandhare, Ashish Sontakke, Bhushan Patil, Rakesh Bawanwade & Saurabh Kurjekar: "solar powered seed sowing machine"

The paper discusses different aspects of seed sowing machine which will be helpful for the agriculture industry to move towards mechanization. This project is about moving a solar panel along with the direction of sunlight; it uses a stepper motor to control the position of the solar panel, which obtains its data from a microcontroller. The automated solar tracking system is design in order to optimize the efficiency of overall solar energy output. Light dependent resistor (LDR) is used for each degree of freedom. LDRs are basically photocells that are sensitive to light. Several applications of solar energy ranging from simple solar water heating tocomplex mega watt power generation systems are under

extensive investigation. Thefunction of the solar collector is to collect the radiation incident from the sun. To get maximum energy from the Sun, solar panel need to rotate according to movement of the Sun with the help of LDR.

Disadvantage

Less equality in distance between two seeds

R. Joshua, V. Vasu and P. Vincent: "Solar Sprayer - An Agriculture Implement"

"Energy - demand" is one the major thread for our country. Finding solutions, to meet the "Energy - demand" is the great challenge for Social Scientist, Engineers, Entrepreneurs and Industrialist of our Country. According to them, Applications of Non conventional energy is the only alternate solution for conventional energy demand. Now-a-days the Concept and Technology employing this Non-conventional energy becomes very popular for all kinds of development activities. One of the major area, which finds number applications are in Agriculture Sectors. Solar energy plays an important role in drying agriculture products and for irrigation purpose for pumping the well water in remote villages without electricity. This Technology on solar energy can be extended for spraying pesticides, Fungicides and Fertilizers etc., using Solar Sprayers. This paper deals how a 'Power Sprayer' which is already in use and works with fossil fuel can be converted into solar sprayers works without any fossil fuel.

Disadvantage

High production cost

Nithin P V, Shivaprakash S, "Multipurpose agricultural robot"

This paper is to develop a robot capable of performing operations like automatic seeding, irrigation, fertilization. It also provides manual as well as auto control. The main component here is the ARDUINO that supervises the entire process. At the present time, robots are increasingly being integrated into working tasks to replace humans especially to perform repetitive task. Seeding is one of the first steps in farming. During this process seeding is carried out in all the rows

of the farming plot. In irrigation process, the soil sensor used for monitoring the environmental condition. It checks this level and alerts the farmer, then slowly applies small amount of water to the planted seeds in all the rows of the farming plot. The fertilization process is same as irrigation process but some crops need fertilizers when the seed germinates and the plant begins to grow. The robot works on solar energy.

Disadvantage

More complex design

CHAPTER 3

EXISTING METHODS

High precision pneumatic planters have been developed for many verities of crops, for a wide range of seed sizes, resulting to uniform seeds distribution along the travel path, in seed spacing. The basic function of sowing operation is to sow the seed and fertilizer in rows at required depth and to maintain the distance between the seeds and provide proper compaction over the seed.

In this machine solar panel is used to capture solar energy and then it is converted into electrical energy which in turn is used to charge 12V battery, which then gives the necessary power to a shunt wound DC motor. This power is then transmitted to the DC motor to drive the wheels. And to further reduction of labor dependency, IR sensors are used to maneuver robot in the field. Here 4 post sensors are used to define the territory and robot senses the track length and pitch for movement from line to line.

In this work we replace complicated gear system by hall effect sensor for easier and costlier seed sowing and also reduce a need of labour. The Hall Effect sensor convert rotation into distance for which seed sowing at particular distance. Also, there is adjustable system for sowing at different distance. By using this machine, the sowing can be done row by row and distance will maintain.

In seed sowing machine system, they are used battery powered wheels and dc motor inbuilt in these wheels. When the seeds are empty it detects the level of storage seed and indicates the alarm. When any obstacle comes in the in-front of machine or divert path the seed sowing machine can detect this obstacle very easily. In each complete rotation of rotating wheel there is seeds falls from this seed drum and the seed plantation process can take place smoothly as well as without wastage of seeds. The end of system machine reached and it create alarm.

3.1 DISADVANTAGES OF EXISTING METHODS

Efficiency is low

High cost

Consume more time

Distance between two seeds is unequal

CHAPTER 4

PROPOSED METHOD

Agriculture is the backbone of our country. Improvement in agriculture methods are always encourage able. Hence this method uses the renewable energy for the improvement of agriculture works. Seed sowing is one the important process in farming. Distance between the seeds should get maintained uniformly. Here we are representing a solar energy based seed sowing machine. This will reduce the time consumption and also increase the efficiency is agricultural works. This uses microprocessor for the controlling all process, ultrasonic sensor for identifying the end in path, motor and seed sowing machine. The seed sowing machine puts seed in a regular interval of distance. Implementation of renewable energy is increasing in various domain.

4.1 BLOCK DIAGRAM

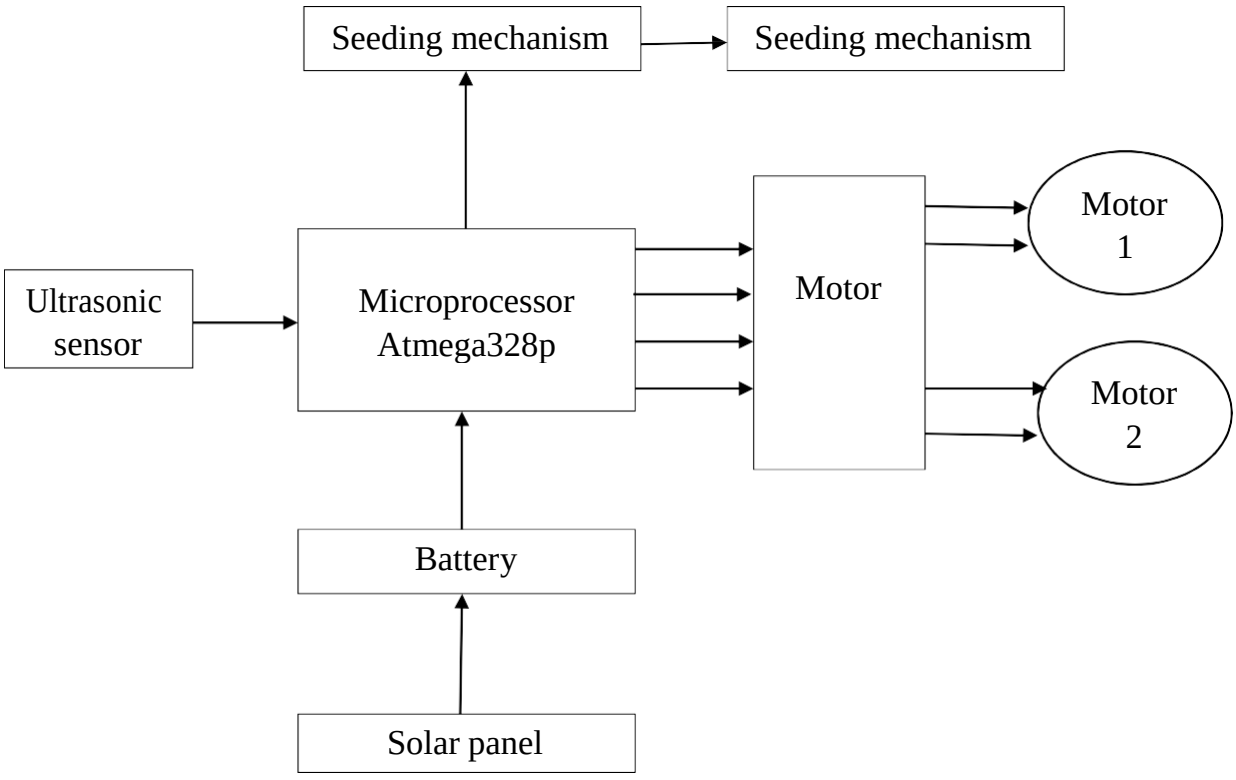

Fig 4.1 Block diagram

4.2 CIRCUIT DIAGRAM

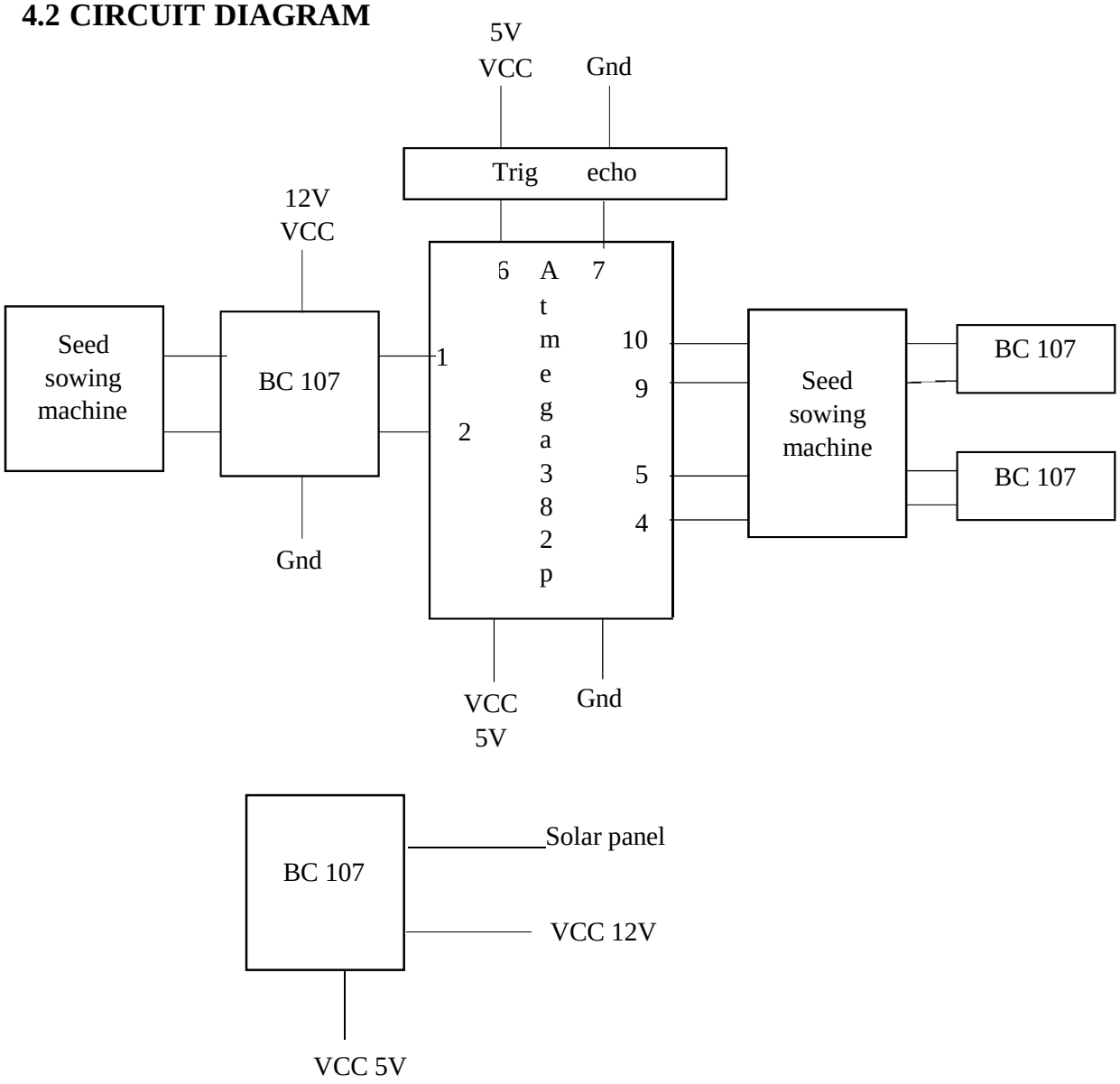

Fig 4.2 Circuit diagram

Solar panel converts the solar energy into the electrical energy which serves the power source of this system. Solar panel consists of solar cells or photovoltaic cells which does the conversion process. The converted solar energy get stored in the battery. 12 V battery is used for the overall process. Obtained solar power is in DC form so the battery will convert the DC power into usable AC power. And the excess power also get stored in the battery which can be used for further use.

Then ultrasonic sensor is used. Main purpose of the ultrasonic sensor is to detect the presence of obstacles in its path. Here we are using the ultrasonic sensor for finding the end of the path for the machine. On process of sowing seeds, the machine has to turn once it reaches the end of the seed sowing area. Hence the ultrasonic sensor will sense the environment alert the processor if there is any obstacles or end then the machine will turn and sow seeds on other path.

Seeding machine is the most important part of this system. It sow seeds on a regular interval of distance. Distance between the seeds are same. And the machine maintains the depth of the seed. Depth of the seed and distance between two seeds are very important for the agriculture. Hence this process maintain the efficiency at good rate. Motors are used for the displacement of the machine. There are two motors present in the machine. It also has motor mechanical chase and motor drive. The overall process will run on the agricultural land and sow seeds on a particular distance and depth with ultrasonic sensor for the obstacle finding.

CHAPTER 5
HARDWARE DESCRIPTION

5.1 SOLAR PANEL

Solar panels are those devices which are used to absorb the sun's rays and convert them into electricity or heat. A solar panel is actually a collection of solar (or photovoltaic) cells, which can be used to generate electricity through photovoltaic effect. These cells are arranged in a grid-like pattern on the surface of solar panels. Thus, it may also be described as a set of photovoltaic modules, mounted on a structure supporting it. A photovoltaic (PV) module is a packaged and connected assembly of 6×10 solar cells. Most solar panels are made up using crystalline silicon solar cells. Installation of solar panels helps in combating the harmful emissions of greenhouse gases and thus helps reduce global warming. Solar panels do not lead to any form of pollution and are clean. They also decrease our reliance on fossil fuels (which are limited) and traditional power sources. These days, solar panels are used in wide-ranging electronic equipment like calculators, which work as long as sunlight is available. However, the only major drawback of solar panels is that they are quite costly. Also, solar panels are installed outdoors as they need sunlight to get charged.

Fig 5.1 Solar panel

5.1.1 WORKING OF SOLAR CELL

Simply put, a solar panel works by allowing photons, or particles of light, to knock electrons free from atoms, generating a flow of electricity. Solar panels actually comprise many, smaller units called photovoltaic cells. (Photovoltaic simply means they convert sunlight into electricity.) Many cells linked together make up a solar panel.

Each photovoltaic cell is basically a sandwich made up of two slices of semi-conducting material, usually silicon the same stuff used in microelectronics. To work, photovoltaic cells need to establish an electric field. Much like a magnetic field, which occurs due to opposite poles, an electric field occurs when opposite charges are separated. To get this field, manufacturers "dope" silicon with other materials, giving each slice of the sandwich a positive or negative electrical charge.

Specifically, they seed phosphorous into the top layer of silicon, which adds extra electrons, with a negative charge, to that layer. Meanwhile, the bottom layer gets a dose of boron, which results in fewer electrons, or a positive charge. This all adds up to an electric field at the junction between the silicon layers. Then, when a photon of sunlight knocks an electron free, the electric field will push that electron out of the silicon junction.

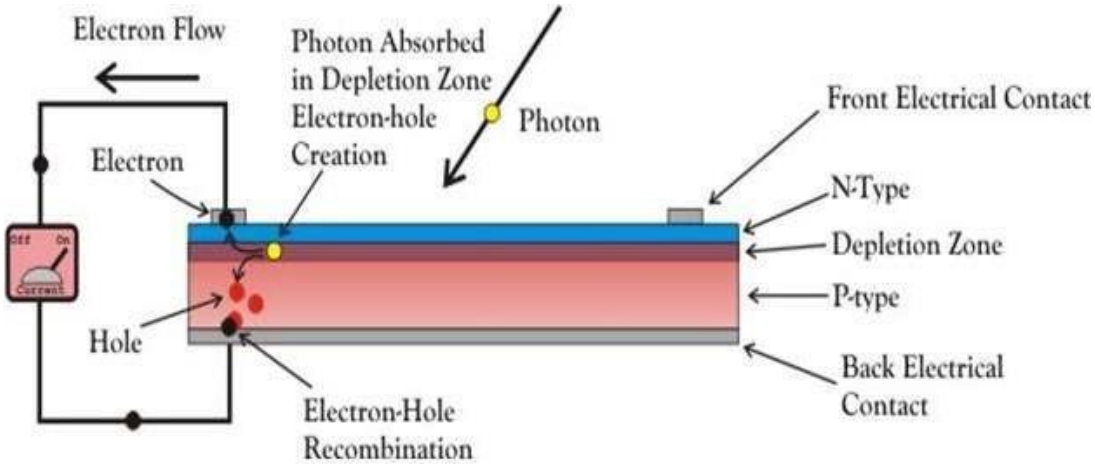

Fig 5.2 Working of Solar cell

A couple of other components of the cell turn these electrons into usable power. Metal conductive plates on the sides of the cell collect the electrons and transfer them to wires. At that point, the electrons can flow like any other source of electricity.

5.1.2 ADVANTAGE OF SOLAR CELL

It is a clean and non-polluting energy source.

It is renewable energy.

Solar cells do not produce noise for electricity generation.

It requires very little maintenance.

Long lifetime.

There are no fuel costs or fuel supply problems in this electrical energy production.

5.2 MICROPROCESSOR ATMEGA328P

The ATmega328 is a single-chip microcontroller created by Atmel in the megaAVR family (later Microchip Technology acquired Atmel in 2016). It has a modified Harvard architecture 8-bit RISC processor core. The 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 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts.

The device achieves throughput approaching 1 MIPS per MHz. ATMEGA328P is high performance, low power controller from Microchip. ATMEGA328P is an 8-bit microcontroller based on AVR RISC architecture. It is the most popular of all AVR controllers as it is used in ARDUINO boards.

ATmega 328 has 1KB Electrically Erasable Programmable Read Only Memory (EEPROM). This property shows if the electric supply supplied to the micro-controller is removed, even then it can store the data and can provide results after providing it with the electric supply. Moreover, ATmega-328 has 2KB Static Random Access Memory (SRAM). Other characteristics will be explained later. ATmega 328 has several different features which make it the most popular device in today's market.

Fig 5.3 Atmega328p

These features consist of advanced RISC architecture, good performance, low power consumption, real timer counter having separate oscillator, 6 PWM pins, programmable Serial USART, programming lock for software security, throughput up to 20 MIPS etc. ATmega-328 is mostly used in Arduino. The further details about ATmega 328 will be given later in this section.

Although we have many controllers ATMEGA328P is most popular of all because of its features and cost. ARDUINO boards are also developed on this controller because of its features.

With program memory of 32 Kbytes ATMEGA328P applications are many.

With various POWER SAVING modes it can work on MOBILE EMBEDDED SYSTEMS.

With Watchdog timer to reset under error it can be used on systems with minimal human interference.

With advanced RISC architecture, the controller executes programs quickly.

Also with in chip temperature sensor the controller can be used at extreme temperatures.

These all features add together promoting ATMEGA328P further.

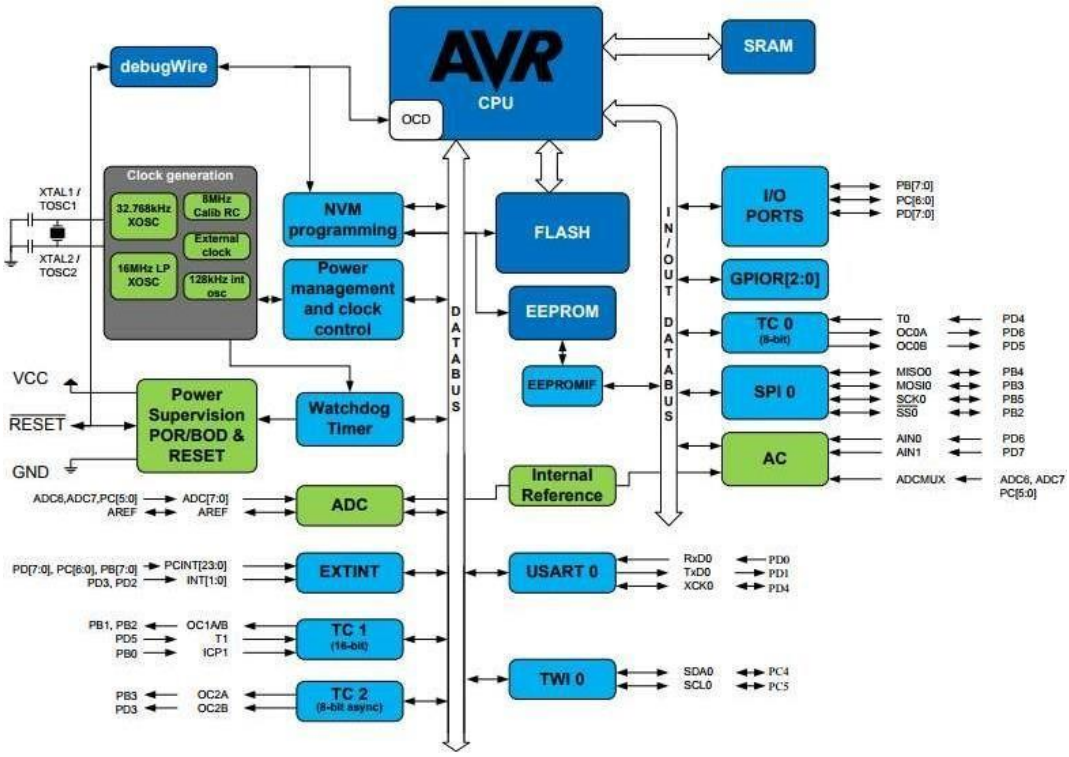

Fig 5.4 Block diagram of Atmega328p

5.2.1 ARCHITECTURE OF ATMEGA328P

Here Architecture is of Arduino or precisely the IC of Arduino (ATmega328p). The ATmega328/P is a low-power CMOS 8-bit microcontroller based on the **AVR** enhanced **RISC** (reduced instruction set computer) architecture. In Order to maximize performance and parallelism, the AVR uses **Harvard** architecture – with separate memories and buses for program and data. Instruction in the program memory are executed with a single level of pipelining. The clock is controlled by an external **16MHz Crystal Oscillator**.

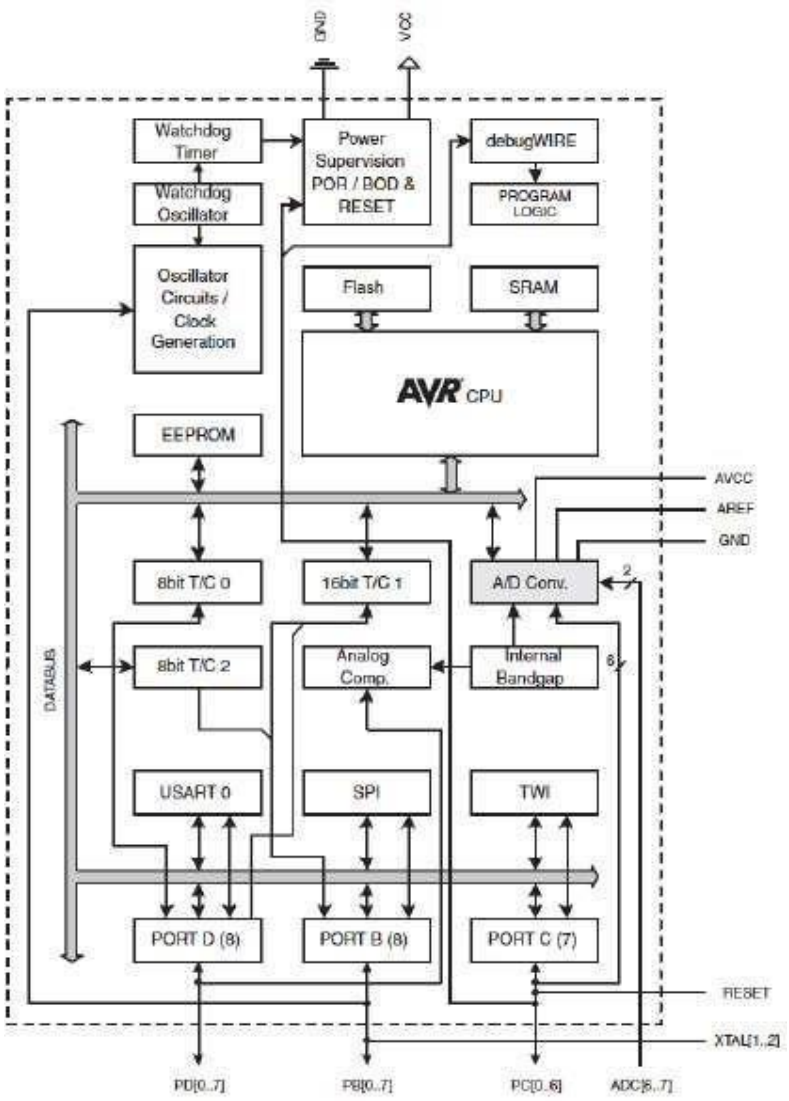

Fig 5.5 Architecture of Atmega328p

The basic working of CPU of ATmega328:-

1. The data is uploaded in serial via the port (being uploaded from the computer's Arduino IDE). The data is decoded and then the instructions are sent to **instruction register** and it decodes the instructions on the same clock pulse.

2. On the next clock pulse the next set of instructions are loaded in instruction register.

3. In general purpose registers the registers are of 8-bit but there are 3 16-bit registersalso.

a. 8-bit registers are used to store data for normal calculations and results.

b. 16-bit registers are used to store data of timer counter in 2 different register. Eg. X-low & X-high. They are fast, and are used to store specific hardware functions.

4. EEPROM stores data permanently even if the power is cut out. Programming inside a EEPROM is slow.

5. Interrupt Unit checks whether there is an interrupt for the execution of instruction to be executed in ISR (Interrupt Service Routine).

6. Serial Peripheral Interface (SPI) is an interface bus commonly used to send data between microcontrollers and small peripherals such as Camera, Display, SD cards, etc. It uses separate clock and data lines, along with a select line to choose the device you wish to talk to.

7.Watchdog timer is used to detect and recover from MCU malfunctioning.

8. Analog comparator compares the input values on the positive and negative pin, when the value of positive pin is higher the output is set.

9. Status and control is used to control the flow of execution of commands by checking other blocks inside the CPU at regular intervals.

10. ALU (Arithmetic and Logical unit) The high performance AVR ALU operates in direct connection with all the 32 general purpose working registers. Within a single clock cycle, arithmetic operations b/w general purpose registers are executed. The ALU operations are divided into 3 main categories – arithmetic, logical and bit-function.

11. I/O pins The digital inputs and outputs (digital I/O) on the Arduino are what allow you to connect the Arduino sensors, actuators, and other ICs. Learning how to use them will allow you to use the Arduino to do some really useful things, such as reading switch inputs, lighting indicators, and controlling relay outputs.

5.2.2 PIN DESCRIPTION

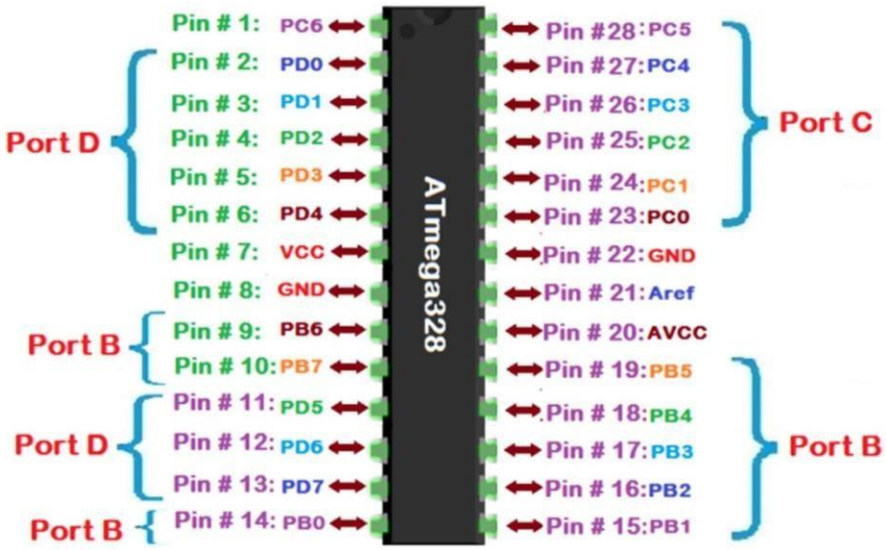

Fig 5.6 Pin diagram

VCC is a digital voltage supply.

AVCC is a supply voltage pin for analog to digital converter.

GND denotes Ground and it has a 0V.

Port A consists of the pins from **PA0** to **PA7.** These pins serve as analog input to analog to digital converters. If analog to digital converter is not used, **port A** acts as an eight (8) bit bidirectional input/output port.

Port B consists of the pins from **PB0** to **PB7.** This port is an 8 bit bidirectional port having an internal pull-up resistor.

Port C consists of the pins from **PC0** to **PC7.** The output buffers of **port C** has symmetrical drive characteristics with source capability as well high sink.

Port D consists of the pins from **PD0** to **PD7.** It is also an 8 bit input/output port having an internal pull-up resistor.

AREF is an analog reference pin for analog to digital converter.

5.3 ULTRASONIC SENSOR

As the name indicates, ultrasonic / level sensors measure distance by using ultrasonic waves. The sensor head emits an ultrasonic wave and receives the wave

reflected back from the target. ultrasonic / level sensors measure the distance to the target by measuring the time between the emission and reception. Ultrasonic sensors work by sending out a sound wave at a frequency above the range of human hearing. The transducer of the sensor acts as a microphone to receive and send the ultrasonic sound. Our ultrasonic sensors, like many others, use a single transducer to send a pulse and to receive the echo. The sensor determines the distance to a target by measuring time lapses between the sending and receiving of the ultrasonic pulse.

Fig 5.7 Ultrasonic sensor

The working principle of this module is simple. It sends an ultrasonic pulse out at 40kHz which travels through the air and if there is an obstacle or object, it will bounce back to the sensor. By calculating the travel time and the speed of sound, the distance can be calculated.

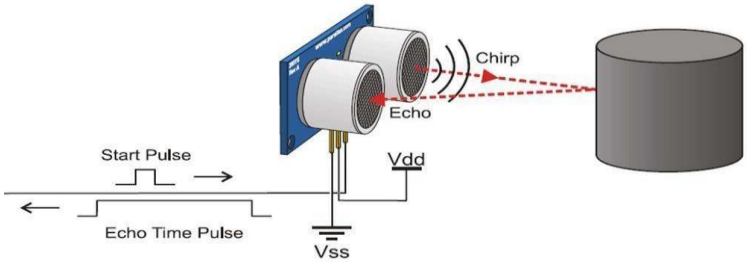

Fig 5.8 Working of ultrasonic sensor

Ultrasonic sensors work by emitting sound waves at a frequency too high for humans to hear. They then wait for the sound to be reflected back, calculating

distance based on the time required. This is similar to how radar measures the time it takes a radio wave to return after hitting an object. While some sensors use a separate sound emitter and receiver, it's also possible to combine these into one package device, having an ultrasonic element alternate between emitting and receiving signals. This type of sensor can be manufactured in a smaller package than with separate elements, which is convenient for applications where size is at a premium.

While radar and ultrasonic sensors can be used for some of the same purposes, sound-based sensors are readily available—they can be had for just a couple dollars in some cases and in certain situations, they may detect objects more effectively than radar. For instance, while radar, or even light-based sensors, have a difficult time correctly processing clear plastic, ultrasonic sensors have no problem with this. In fact, they're unaffected by the color of the material they are sensing. On the other hand, if an object is made out of a material that absorbs sound or is shaped in such a way that it reflects the sound waves away from the receiver, readings will be unreliable.

5.4 BATTERY

Solar panel systems have become one of the fastest-growing sources of energy in the United States. According to the Solar Energy Industries association, the solar market doubled in size in 2016. The popularity of solar power has led to the rise of another renewable technology: solar batteries that can store extra solar power for later use. Companies like Tesla & LG are developing batteries that can be installed with solar panels to create "solar-plus-storage" systems for your home.

The typical solar energy system includes solar panels, an inverter, equipment to mount the panels on your roof, and a performance monitoring system that tracks electricity production. The solar panels collect energy from the sun and turn it

into electricity, which is passed through the inverter and converted into a form that you can use.

Solar batteries work by converting the DC energy being produced by your solar panels and storing it as AC power for later use. In some cases, solar batteries have their own inverter and offer integrated energy conversion. The higher your battery's capacity, the larger the solar system it can charge.

When you install a solar battery as part of your solar panel system, you can store excess solar electricity at your home instead of sending it back to the grid. If your solar panels are producing more electricity than you need, the excess energy goes towards charging the battery. Later, when your solar panels aren't producing electricity, you can draw down the energy you stored earlier in your battery for night use.

You'll only send electricity back to the grid when your battery is fully charged, and you'll only draw electricity from the grid when your battery is depleted.

5.5 SEED SOWING MACHINE

A **seed sowing machine** is a device that sows the seeds for crops by positioning them in the soil and burying them to a specific depth. This ensures that seeds will be distributed evenly. The seed drill sows the seeds at the proper seeding rate and depth, ensuring that the seeds are covered by soil. This saves them from being eaten by birds and animals, or being dried up due to exposure to sun. With seed drill machines, seeds are distributed in rows, however the distance between seeds along the row cannot be adjusted by the user as in the case of vacuum precision planters. The distance between rows is typically set by the manufacturer. This allows plants to get sufficient sunlight, nutrients, and water from the soil.

Before the introduction of the seed drill, most seeds were planted by hand broadcasting, an imprecise and wasteful process with a poor distribution of seeds and low productivity. Use of a seed drill can improve the ratio of crop yield (seeds harvested per seed planted) by as much as nine time. The use of seed drill saves time and labor. Some machines for metering out seeds for planting are called planters. The concepts evolved from ancient Chinese practice and later evolved into mechanisms that pick up seeds from a bin and deposit them down a tube. The invention of the seed drill dramatically improved germination. The seed drill employed a series of runners spaced at the same distance as the plowed furrows. These runners, or drills, opened the furrow to a uniform depth before the seed was dropped. Behind the drills were a series of presses, metal discs which cut down the sides of the trench into which the seeds had been planted, covering them over.

This innovation permitted farmers to have precise control over the depth at which seeds were planted. This greater measure of control meant that fewer seeds germinated early or late and that seeds were able to take optimum advantage of available soil moisture in a prepared seedbed. The result was that farmers were able to use less seed and at the same time experience larger yields than under the broadcast methods.

5.6 MOTOR DRIVER L293D

L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D IC. Dual H-bridge *Motor Driver integrated circuit* (*IC*). The l293d can drive small and quiet big motors as well, check the Voltage Specification at the end of this page for more info.

It works on the concept of H-bridge. H-bridge is a circuit which allows the voltage to be flown in either direction. As you know voltage need to change its

direction for being able to rotate the motor in clockwise or anticlockwise direction, Hence H-bridge IC are ideal for driving a DC motor. In a single L293D chip there are two h-Bridge circuit inside the IC which can rotate two dc motor independently. Due its size it is very much used in robotic application for controlling DC motors. Given below is the pin diagram of a L293D motor controller. There are two Enable pins on l293d. Pin 1 and pin 9, for being able to drive the motor, the pin 1 and 9 need to be high. For driving the motor with left H-bridge you need to enable pin 1 to high. And for right H-Bridge you need to make the pin 9 to high. If anyone of the either pin1 or pin9 goes low then the motor in the corresponding section will suspend working. It's like a switch.

5.6.1 PIN DIAGRAM

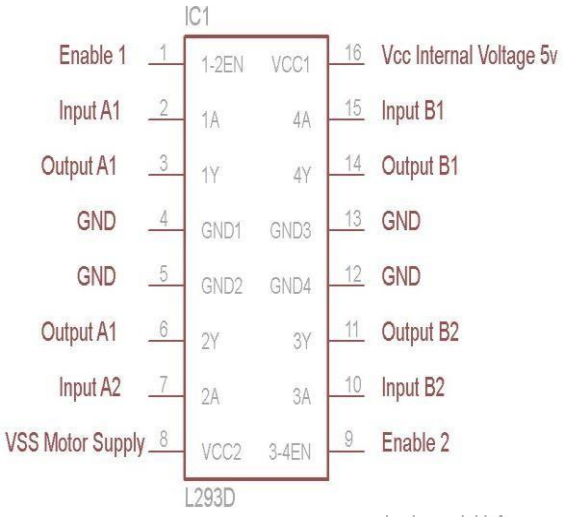

Fig 5.9 Pin diagram of L293D

5.7 ELECTRIC MOTOR

An **electric motor** is an electrical machine that converts electrical energy into mechanical energy. Most electric motors operate through the interaction between the motor's magnetic field and electric current in a wire winding to generate force in the form of torque applied on the motor's shaft. Electric motors can be powered by direct current (DC) sources, such as from batteries, motor vehicles or rectifiers, or by alternating current (AC) sources, such

as a power grid, inverters or electrical generators. An electric generator is mechanically identical to an electric motor, but operates with a reversed flow of power, converting mechanical energy into electrical energy.

Electric motors may be classified by considerations such as power source type, internal construction, application and type of motion output. In addition to AC versus DC types, motors may be brushed or brushless, may be of various phase (see single-phase, two-phase, or three-phase), and may be either air-cooled or liquid-cooled. General-purpose motors with standard dimensions and characteristics provide convenient mechanical power for industrial use. The largest electric motors are used for ship propulsion, pipeline compression and pumped-storage applications with ratings reaching 100 megawatts. Electric motors are found in industrial fans, blowers and pumps, machine tools, household appliances, power tools and disk drives. Small motors may be found in electric watches.

Fig 5.10 Motor

In certain applications, such as in regenerative braking with traction motors, electric motors can be used in reverse as generators to recover energy that might otherwise be lost as heat and friction. Electric motors produce linear or rotary force (torque) intended to propel some external mechanism, such as a fan or an elevator. An electric motor is generally designed for continuous rotation, or

for linear movement over a significant distance compared to its size. Magnetic solenoids produce significant mechanical force, but over an operating distance comparable to their size. Transducers such as loudspeakers and microphones convert between electrical current and mechanical force to reproduce signals such as speech. When compared with common internal combustion engines (ICEs), electric motors are lightweight, physically smaller, provide more power output, are mechanically simpler and cheaper to build, while providing instant and consistent torque at any speed, with more responsiveness, higher overall efficiency and lower heat generation. However, electric motors are not as convenient or common as ICEs in mobile applications (i.e. cars and buses) as they require a large and expensive battery, while ICEs require a relatively small fuel tank.

Fig 5.11 Wheels

CHAPTER 6

SOFTWARE DESCRIPTION

6.1 ARDUINO IDE

The Arduino Integrated Development Environment (IDE) is a cross-platform application (for Windows, macOS, Linux) that is written in functions from C and C++. It is used to write and upload programs to Arduino compatible boards, but also, with the help of 3rd party cores, other vendor development boards. The source code for the IDE is released under the GNU General Public License, version 2. The Arduino IDE supports the languages C and C++ using special rules of code structuring.

The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub main() into an executable cyclic executive program with the GNU toolchain, also included with the IDE distribution. The Arduino IDE employs the program avrdude to convert the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.

Over the years Arduino has been the brain of thousands of projects, from everyday objects to complex scientific instruments. A worldwide community of makers - students, hobbyists, artists, programmers, and professionals - has

gathered around this open-source platform, their contributions have added up to an incredible amount of accessible knowledge that can be of great help to novices and experts alike.

Arduino was born at the Ivrea Interaction Design Institute as an easy tool for fast prototyping, aimed at students without a background in electronics and programming. As soon as it reached a wider community, the Arduino board started changing to adapt to new needs and challenges, differentiating its offer from simple 8-bit boards to products for IoT applications, wearable, 3D printing, and embedded environments. All Arduino boards are completely open-source, empowering users to build them independently and eventually adapt them to their particular needs. The software, too, is open-source, and it is growing through the contributions of users worldwide.

After arranging all the components, the machine can be implemented its work of seed sowing which is shown in figure 7.1. Since it is a solar powered machine, there is issues with power. It will generate its own charge even in the time of working. Size of this machine is compact so that it is easy to carry.
Wheel and motor the convenient movement of this machine.

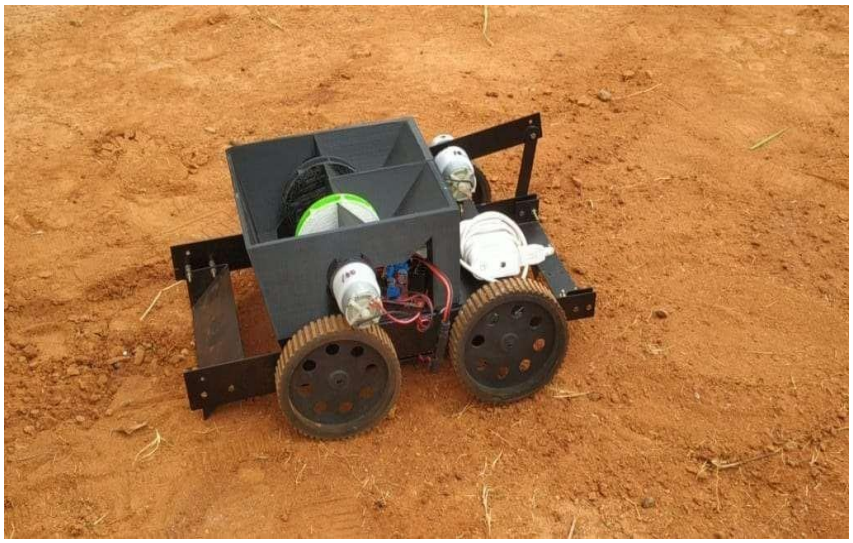

Fig Output