"Solar powered remote controlled seed sowing machine with sprayer"

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CERTIFICATE

This is to certify that Mr. AbhijeetBhimraoPatil, Mr. PrathameshPrashant kolekar, PrathameshTanajiPatil, Mr. Rohan TanajiVanare, From Rajarambapu Institute Of Technology, Rajaramnagar having Enrolment No.1817400023, 1817400073, 1817400172, 1817400034 has completed capstone project execution report having title "Solar powered remote controlled seed sowing machine with sprayer " in a group consisting of 4 Candidates under the guidance of the faculty guide.
Name and Signature of Guide…………………………………………….
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Place:

ACKNOWLEDGMENT

ABSTRACT:-

Today's era is marching towards the rapid growth of all sectors including the agricultural sector. To meet the future food demands, the farmers have to implement the new techniques which will not affect the soil texture but will increase the overall crop production. The aim of this project is to design and develop a solar powered remote controlled seed sowing machine with sprayer. The seed sewing machine is a key component of agricultural field. The various technique used in India for seed sowing and fertilizer placement are manual, ox and tractor operator. The manual and ox operator technique are time consuming and productivity is low. Tractor is running on fossil fuel which emits carbon dioxide and other pollution every second. This evident has led to widespread air, water and noise pollution and most importantly has led to a realistic energy crisis in the near future, in order to make the development of our farmer as well as nation sustainable and cause less harm to our environment. Now the approach of this project is to develop the seed sowing machine which is to minimize the working cost and the time for digging and fertilizing as well as operate on clean energy.
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. Seed sowing and digging robot will move on different ground contours and performs digging, sow the seed and water the ground after closing.

I. CHAPTER 1: INTRODUCTION
1.1 Introduction :-

Agriculture has been the backbone of the Indian economy and it will continue to remain so for a long time. It has to support almost 17 percent of world population from 2.3 percent of world geographical area and 4.2 percent of world's water resources. The present cropping intensity of 137 percent has registered an increase of only 26 percent since 1950-51. The net sown area is 142 Mha. The basic objective of sowing operation is to put the seed and fertilizer in rows at desired depth and spacing, cover the seeds with soil and provide proper compaction Over the seed. The recommended row to row spacing, seed rate, seed to seed spacing and depth of seed placement vary from crop to crop and for different agricultural and climatic conditions to achieve optimum yields and an efficient sowing machine should attempt to fulfill these requirements. In addition, saving in cost of operation time, labor and energy are other advantages to be derived from use of improved machinery for such operations. A traditional method of seed sowing has many disadvantages. This paper is about the different types of methods of seed sowing and fertilizer placement in the soil And developing a multifunctional seed sowing machine which can perform simultaneous operations. For a long time, it has been thought that atomic energy would be a solution for the growing energy problem, but in recent times solar energy has proved to be an efficient, more secure and safe way of providing energy. Concepts related to the solar energy have constantly been under heavy research and development. The basic objective is to optimize the energy produced from photovoltaic cells, by making the overall systems more efficient and cost effective. Most solar panels are statically aligned; they have a fixed position at a certain angle towards the sky. Therefore, the time and intensity of direct sunlight falling upon the solar panel is greatly reduced, resulting in low power output from the photovoltaic (PV) cells. Solar tracking system is the solution to this issue as it plays a major role in overall solar energy optimization. In order to ensure maximum power output from PV cells, the sunlight's angle of incidence needs to be constantly perpendicular to the solar panel. This requires constant tracking of the sun's apparent daytime motion, and hence develops an automated sun tracking system which carries the solar panel and position it in such away that direct sunlight is always focused on PV cells. Seed sowing machine is a device which helps in the sowing of seeds in a desired position hence assisting the farmers in saving time and money. The basic objective of sowing operation is to put the seed and fertilizer in rows at desired depth and seed to seed spacing, cover the seeds with soil and provide proper compaction over the seed. The paper discusses different aspects of seed sowing machine which will be helpful for the agriculture industry to move towards mechanization. The agricultural industry has always been the backbone of India's sustained growth. As the population of India continues to grow, the demand for produce grows as well. Hence, there is a greater need for multiple cropping on the farms and this in turn requires efficient and high-capacity machines. Mechanization of the Agricultural industry in India is still in a stage of infancy due to the lack of knowledge and the unavailability of advanced tools and machinery. In traditional methods seed sowing is done by broadcasting manually, opening furrows by a plough and dropping seeds by hand. 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.

II. CHAPTER 2: LITERATURE REVIEW
2.1 LiteratureReview:-

Singh (1971)[4] revealed that by using a seed drill for wheat crop there was an increase in yield by 13.025 percent when compared with the conventional method, it also revealed that by using a seed drill for wheat crop, a saving of 69.96 per cent in man-hours and 55.17 percent in huliock

hours was achieved when compared, with the conventional method.

Umed Ali Soomro at al. [4] in Pakistan has evaluated three sowing methods and seed rate in a four replicated RCBD method and concluded that drilling method of sowing at seed rate 125 kg/ha is optimal for yield and quality of wheat grains, because the said sowing method and seed rate distribute seed uniformly and desired depth which provide appropriate depth for seed germination and crop establishment.

The main goal of M.A. Asoodaranother agricultural researcher determined the effects of different seeding technique and machines and also different rates of oilseed rape application on seeding emergence plant establishment and final grain yield.

TruptiA.Shinde. et.al 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.

Kunal A. Dhande. Et.al 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. [7] This research paper presents design modification in multipurpose sowing machine. In this they present that for sowing purpose we import the machinery which are bulk in size having more cost. To prevent this they design multipurpose sowing machine which consists of hopper, seed metering mechanism, ground wheel, power transmission system, seed distributor, and tiller. In this they design model on PRO-E software. Actually the working is very simple as the tiller rotates it directly transmit motion to ground wheel which directly connected through main shaft. A main shaft has a disc with scoops inside the hopper. When the ground wheel rotates the main shaft also rotates with the help of power transmission system. The scoops collect the seed from hopper and leave it inside the seed distributor. The tiller is having very good contact with ground.

Mahesh R. Pundkar et al (2018) [1]: The researcher stated that the seed sowing machine is a key component of agriculture field. 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.

Nivash et al (2018) [2]: The researcher states that the agriculture plays an important role in the life of economy. It is the backbone of our economy system. Sowing is one of the basic and best operations needed to get better revenue from agriculture. In Manual sowing has the problem of not giving acceptable spacing between row to row and plant to plant. It also leading to less population of crops than recommended by the agriculture. In this project work they focused on seed sowing processes and tried to solve the problem. In seed sowing machine system they are used wheels.

SwapnilThorat et al. (2017)[4]: The researchers made sowing machine which is operated manually but reduces the efforts of farmers thus increasing the efficiency of planting also reduces the problem encountered in manual planting. For this machine a farmer can plant different types and different sizes of seeds also we can vary the space between two seeds while planting. This also increased the planting efficiency and accuracy.

D Ramesh et al. [6]: This research paper present "Agriculture Seed Sowing Equipment: A Review". The present review provides brief information about the various types of innovations done in seed sowing equipment. The basic objective of sowing operation is to put the seed and fertilizer in rows at desired depth and seed to seed spacing, cover the seeds with soil and provide proper compaction over the seed. In this multipurpose seeding machine equipment consists of cylindrical shape container in which the seeds can fill. The container is attached on the four wheeled carrier assembly. It consists of metering plate bevel gear mechanism and two holes at the bottom depending on seed size. The working as plate will rotate in container when the bottom holes of container and meter plate hole coincide seeds will flow through pipe to soil. Here the metering plate gets rotating motion by bevel gear assembly and the bevel gears get the motion by rear wheels with the help chain and sprocket assembly.

Kannan A et al. [7]: This research paper presents design modification in multipurpose sowing machine. In this they present that for sowing purpose we import the machinery which are bulk in size having more cost. To prevent this they design multipurpose sowing machine which consists of hopper, seed metering mechanism, ground wheel, power transmission system, seed distributor, and tiller. In this they design model on PRO-E software. Actually the working is very simple as the tiller rotates it directly transmit motion to ground wheel which directly connected through main shaft. A main shaft has a disc with scoops inside the hopper. When the ground wheel rotates the main shaft also rotates with the help of power transmission system. The scoops collect the seed from hopper and leave it inside the seed distributor. The tiller is having very good contact with ground.

Marode A et al. [8]: This research paper represents "Design & Implementation of Multi Seed Sowing Machine" .In this paper gives types sowing machine. The following are the three different types of seed sowing are broadcasting: A field is initially prepared with a plough to a series of linear cuts known as furrows. The field is then seeded by throwing the seeds over the field, a method known as manual broadcasting. The result was a field planted roughly in rows, but having a large number of plants. When the seeds are scattered randomly with the help of hand on the soil, the method is called broadcasting. Dribbling: Drill sowing and dribbling (making small holes in the ground for seeds) are better method of sowing the seeds. Once the seeds are put in the holes, they are then covered with the soil. This saves time and labour and prevents the damage of seeds by birds. Another method of sowing the seeds is with the help of a simple device consisting of bamboo tube with a funnel on it attached to a plough. As the plough moves over the field the tube attached to it leaves the seeds kept in the funnel at proper spacing and depth. The plough keeps making furrows in the soil in which the seeds are dropped by the seed drill.

Shivprasad B et al. [10]: This research paper presents information about modern globalization; many technologies are to update a new development based on automation which works very rigidly, high effectively and within short time period. The aim of designed system is to seeding fertilizing and soil ph, temperature, moisture, humidity checking. The robot and remote system are connected through internet system. DC motors are used for navigation of the robot. The speed of DC motor is controlled useing controller. The solenoid is used to control seeding fertilizing. This paper gives idea about the automation and use of motor for movement of belt conveyor.

Rohokale A et al [11]: Agriculture is demographically the broadest economic sector and plays a significant role in the overall economy of India. For the growth of Indian economy, mechanization is necessary. The main purpose of mechanization in the agriculture is to improve the overall productivity and production. Planning is conventionally done manually which involves humans and draught animals, this result in higher cost of cultivation and delay in planting. The purpose of this paper is to compare conventional sowing methods and modern methods. The required row to row spacing , seed rate ,seed to seed spacing can be achieved by proposed machine.

III. CHAPTER 3: PROPOSED METHODOLOGY

3.1 Proposed Methodology :-

1) In this machine a solar panel is used to consume solar Energy and this energy is converted into electrical Energy. The electrical energy is stored inside a 12V Battery of capacity 9 Amp Hour, which then gives the Necessary power to a DC motor. This power is then Transmitted to the Arduino.

2) The basic objective of sowing operation is to put the Seeds in rows at desired depth, to maintain seed to seed Spacing and to cover the seeds with soil and provide Proper compaction over the seed. The recommended row to row spacing, seed rate, seed to seed spacing and depth of seed placement can vary from crop to crop and for different agro-climatic conditions to achieve optimum yields. Typical application of seed sowing of Cereal's including ground nut, all types of dal's, oil seed crop's etc. [6]

3) To put the soil back on the seeds, an adjuster is used which puts soil back on seeds.

4) After adjusting the soil, water is sprayed from the pipe for cultivation. Water Tank- Tap arrangement is used for irrigation purpose.

5) Tires of the machine are rotated with the help of app which gives command to L298D driver with help of blutooth.

6)The sprayer is attached to spray water or fertilizer at the time of seed sowing process or after the seed sowingprocess. The sprayer also going to work with help of app which gives command to Arduino

and Arduino gives command to relay which turn on/off the sprayer.

IV. CHAPTER 4: DESIGN

➢ **Solar panel:**

A solar panel, or photo-voltaic (PV) module, is an assembly of photo-voltaic cellsmounted in a framework for installation. Solar panels use sunlight as a source of energy to generate direct current electricity. A collection of PV modules is called a PV panel, and a system of panels is an array. Arrays of a photovoltaic system supply solar electricity to electrical equipment.

Fig.1

Solar panels collect clean renewable energy in the form of sunlight and convert that light into electricity which can then be used to provide power for electrical loads. Solar panels are comprised of several individual solar cells which are themselves composed of layers of silicon, phosphorous (which provides the negative charge), and boron (which provides the positive charge). Solar panels absorb the photons and in doing so initiate an electric current. The resulting energy generated from photons striking the surface of the solar panel allows electrons to be knocked out of their atomic orbits and released into the electric field generated by the solar cells which then pull these free electrons into a directional current. This entire process is known as the Photovoltaic Effect. An average home has more than enough roof area for the necessary number of solar panels to produce enough solar electricrity to supply all of its power needs excess electricity generated goes onto the main power grid, paying off in electricity use at night.

In a well-balanced grid-connected configuration, a solar array generates power during the day that is then used in the home at night. Net metering programs allow solar generator owners to get paid if their system produces more power than what is needed in the home. In off-grid solar applications, a battery bank, charge controller, and in most cases, an inverter are necessary components. The solar array sends direct current (DC) electricity through the charge controller to the battery bank. The power is then drawn from the battery bank to the inverter, which converts the DC current into alternating current (AC) that can be used for non-DC appliances. Assisted by an inverter, solar panel arrays can be sized to meet the most demanding electrical load requirements. The AC current can be used to power loads in homes or commercial buildings, recreational vehicles and boats, remote cabins, cottages, or homes, remote traffic controls, telecommunications equipment, oil and gas flow monitoring, RTU, SCADA, and much more

➢ **12v Battery:**

Fig.2

A twelve-volt battery has six single cells in series producing a fully charged output voltage of 12.6 volts. A battery cell consists of two lead plates a positive plate covered with a paste of lead dioxide and a negative made of sponge lead, with an insulating material (separator) in between.

Primary (single-use or "disposable") batteries are used once and discarded, as the electrode materials are irreversibly changed during discharge; a common example is the alkaline battery used for flashlights and a multitude of portable electronic devices. Secondary (rechargeable) batteries can be discharged and recharged multiple times using an applied electric current; the original composition of the electrodes can be restored by reverse current. Examples include the lead-acid batteries used in vehicles and lithium-ion batteries used for portable electronics such as laptops and mobile phones.

Batteries come in many shapes and sizes, from miniature cells used to power hearing aids and wristwatches to small, thin cells used in smartphones, to large lead acid batteries or lithium-ion batteries in vehicles, and at the largest extreme, huge battery banks the size of rooms that provide standby or emergency power for telephone exchanges and computer data centers.

Batteries have much lower specific energy (energy per unit mass) than common fuels such as gasoline. In automobiles, this is somewhat offset by the higher efficiency of electric motors in converting chemical energy to mechanical work, compared to combustion engines.

In most car batteries you have six cells, and therefore a 12-volt battery. The plates are submerged in sulphuric acid that triggers a reaction between the two plates. … The result is a chemical reaction that produces electrons. The electrons race around the plates and generate electricity.

A fully charged battery will typically display a voltmeter reading of about 12.6 to 12.8 volts. If your voltmeter is showing a voltage anywhere between 12.4 and 12.8, that means your battery is in good shape. Any voltage above 12.9 volts is a good indicator that your battery has excessive voltage.

Batteries take time to recharge. It could take hours. A 12-volt battery could take up to 12-24 hours to charge fully. When recharging your battery, remember that if it gets too hot while you're charging it, you need to stop charging.

➢ **Charge controller:**

Fig.3

A charge controller, charge regulator or battery regulator limits the rate at which electric current is added to or drawn from electric batteries.It prevents overcharging and may protect against overvoltage, which can reduce battery performance or lifespan and may pose a safety risk. It may also prevent completely draining ("deep discharging") a battery, or perform controlled discharges, depending on the battery technology, to protect battery life. The terms "charge controller" or "charge regulator" may refer to either a stand-alone device, or to control circuitry integrated within a battery pack, battery-powered device, or battery charger.

Charge controllers are sold to consumers as separate devices, often in conjunction with solar or wind power generators, for uses such as RV, boat, and off-the-grid home battery storage systems.[1] In solar applications, charge controllers may also be called solar regulators. Some charge controllers / solar regulators have additional features, such as a low voltage disconnect (LVD), a separate circuit which powers down the load when the batteries become overly discharged (some battery chemistries are such that over-discharge can ruin the battery).[5]

A series charge controller or series regulator disables further current flow into batteries when they are full. A shunt charge controller or shunt regulator diverts excess electricity to an auxiliary or "shunt" load, such as an electric water heater, when batteries are full.[6]

Simple charge controllers stop charging a battery when they exceed a set high voltage level, and re-enable charging when battery voltage drops back below that level. Pulse width modulation (PWM) and maximum power point tracker (MPPT) technologies are more electronically sophisticated, adjusting charging rates depending on the battery's level, to allow charging closer to its maximum capacity.[citation needed]

A charge controller with MPPT capability frees the system designer from closely matching available PV voltage to battery voltage. Considerable efficiency gains can be achieved, particularly when the PV array is located at some distance from the battery. By way of example, a 150 volt PV array connected to an MPPT charge controller can be used to charge a 24 or 48 volt battery. Higher array voltage means lower array current, so the savings in wiring costs can more than pay for the controller.[citation needed]

Charge controllers may also monitor battery temperature to prevent overheating. Some charge controller systems also display data, transmit data to remote displays, and data logging to track electric flow over time.

Circuitry that functions as a charge regulator controller may consist of several electrical components, or may be encapsulated in a single microchip, an integrated circuit (IC) usually called a charge controller IC or charge control IC.

Charge controller circuits are used for rechargeable electronic devices such as cell phones, laptop computers, portable audio players, and uninterruptible power supplies, as well as for larger battery systems found in electric vehicles and orbiting space satellites

➢ **Arduino:**
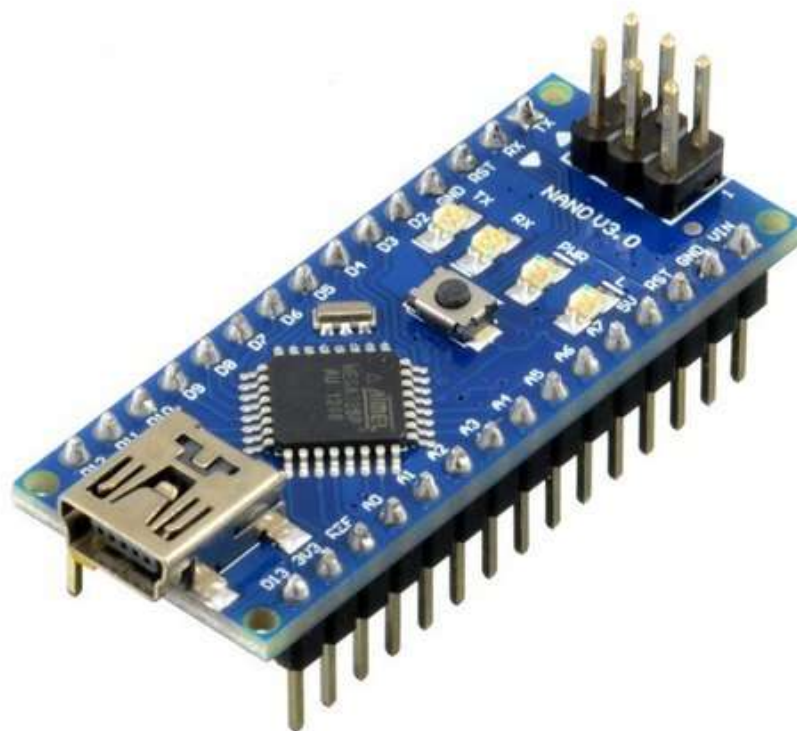
Fig.4

The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328P released in 2008. It offers the same connectivity and specs of the Arduino Uno board in a smaller form factor.

The Arduino Nano has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega328 provide UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An FTDI FT232RL on the board channels this serial communication over USB and the FTDI drivers (included with the Arduino software) provide a virtual com port to software on the computer. The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board. The RX and TX LEDs on the board will flash when data is being transmitted via the FTDI chip and USB connection to the computer (but not for serial communication on pins 0 and 1). A SoftwareSerial library allows for serial communication on any of the Nano's digital pins. The ATmega328 also support I2C (TWI) and SPI communication. The Arduino software includes a Wire library to simplify use of the I2C bus. [5]

The Arduino Nano is equipped with 30 male I/O headers, in a dip-30 like configuration, which can be programmed using the Arduino Software integrated development environment (IDE), which is common to all Arduino boards and

running both online and offline. The board can be powered through a type-b micro-USB cable, or through a 9V battery.In 2019, Arduino released the Arduino Nano Every, a pin-equivalent evolution of the Nano. It features a more powerful ATmega4809 processor, and twice the RAM.
Microcontroller: Microchip ATmega328P
Operating Voltage: 5 Volts

Input Voltage: 6 to 20 Volts
Digital I/O Pins: 14 (plus 6 can PWM output pins)
Analog Input Pins: 8
DC Current per I/O Pin: 40 mA
DC Current for 3.3V Pin: 50 mA
Flash Memory: 32 KB of which 0.5 KB used by bootloader

➤ **Driver (L298N) :**
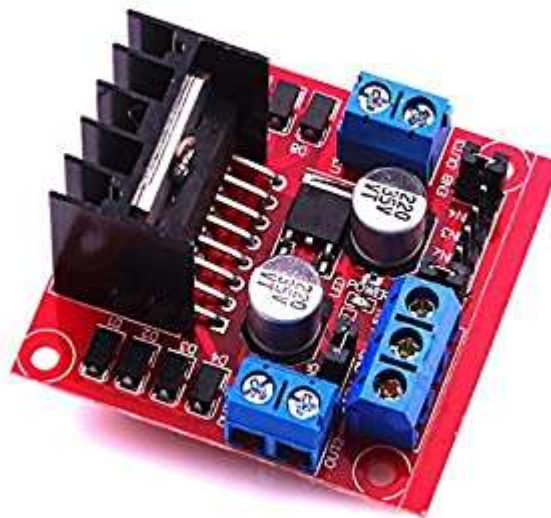
Fig.5

This L298N Motor Driver Module is a high power motor driver module for driving DC and Stepper Motors. This module consists of an L298 motor driver IC and a 78M05 5V regulator. L298N Module can control up to 4 DC motors, or 2 DC motors with directional and speed control.

The L298N Motor Driver module consists of an L298 Motor Driver IC, 78M05 Voltage Regulator, resistors, capacitor, Power LED, 5V jumper in an integrated circuit.

78M05 Voltage regulator will be enabled only when the jumper is placed. When the power supply is less than or equal to 12V, then the internal circuitry will be powered by the voltage regulator and the 5V pin can be used as an output pin to power the microcontroller. The jumper should not be placed when the power supply is greater than 12V and separate 5V should be given through 5V terminal to power the internal circuitry.

ENA & ENB pins are speed control pins for Motor A and Motor B while IN1& IN2 and IN3 & IN4 are direction control pins for Motor A and Motor B.
Applications of L298N Module:
Drive DC motors.
Drive stepping motors
In Robotics

➢ **Servo motor:**

Fig.6

A servo motor is a rotary actuator or a motor that allows for a precise control in terms of the angular position, acceleration, and velocity. Basically it has certain capabilities that a regular motor does not have. Consequently it makes use of a regular motor and pairs it with a sensor for position.

Servo motor works on the PWM (Pulse Width Modulation) principle, which means its angle of rotation is controlled by the duration of pulse applied to its control PIN. Basically servo motor is made up of DC motor which is controlled by a variable resistor (potentiometer) and some gears. Basically a servo motor is a closed-loop servomechanism that uses position feedback to control its motion and final position. Moreover the input to its control is a signal (either analogue or digital) representing the position commanded for the output shaft .

The motor is incorporates some type of encoder to provide position and speed feedback. In the simplest case, we measure only the position. Then the measured position of the output is compared with the command position, the external input to controller. Now If the output position differs from that of the expected output, an error signal generates. Which then causes the motor to rotate in either direction, as per need to bring the output shaft to the appropriate position. As the position approaches, the error signal reduces to zero. Finally the motor stops.

The very simple servomotors can position only sensing via a potentiometer and bang-bang control of their motor. Further the motor always rotates at full speed. Though this type of servomotor doesn't have many uses in industrial motion control, however it forms the basis of simple and cheap servo used for radio control models. Servomotors also find uses in optical rotary encoders to measure the speed of output shaft and a variable-speed drive to control the motor speed. Now this, when combined with a PID control algorithm further allows the servomotor to be in its command position more quickly and more precisely with less overshooting . Servo motors control position and speed very precisely.

Now a potentiometer can sense the mechanical position of the shaft. Hence it couples with the motor shaft through gears. The current position of the shaft is converted into electrical signal by potentiometer, and is compared with the command input signal. In modern servo motors, electronic encoders or sensors sense the position of the shaft . We give command input according to the position of shaft . If the feedback signal differs from the given input, an error signal alerts the user. We amplify this error signal and apply as the input to the motor, hence the motor rotates. And when the shaft reaches to the require position , error signal become zero , and hence the motor stays standstill holding the position. The command input is in form of electrical pulses . As the actual input

to the motor is the difference between feedback signal (current position) and required signal, hence speed of the motor is proportional to the difference between the current position and required position . The amount of power require by the motor is proportional to the distance it needs to trave.

➤ **60 rpm DC motor:**

Fig.7

An electric motor is a device used to convert electrical energy to mechanical energy. Electric motors are extremely important in modern-day life. The basic principle on which motors operate is Ampere's law. This law states that a wire carrying an electric current produces a magnetic field around itself.

A DC motor is any of a class of rotary electrical motors that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current in part of the motor.

DC motors were the first form of motor widely used, as they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances. The universal motor can operate on direct current but is a lightweight brushed motor used for portable power tools and appliances. Larger DC motors are currently used in propulsion of electric vehicles, elevator and hoists, and in drives for steel rolling mills. The advent of power electronics has made replacement of DC motors with AC motors possible in many applications.

60RPM DC Motor is high quality low cost DC geared motor. It has steel gears and pinions to ensure longer life and better wear and tear properties. The gears are fixed on hardened steel spindles polished to a mirror finish. The output shaft rotates in a plastic bushing. The whole assembly is covered with a plastic ring. Gearbox is sealed and lubricated with lithium grease and require no maintenance. The motor is screwed to the gear box from inside.

Although motor gives 60 RPM at 12V but motor runs smoothly from 4V to 12V and gives wide range of RPM, and torque. Tables below gives fairly good idea of the motor's performance in terms of RPM and no load current as a function of voltage and stall torque, stall current as a function of voltage.

For compatible wheels refer to Wheels and Accessories product category.

You can also mount this motor on the chassis using Motor Mount for Centre Shaft Economy Series DC Motor

For adding Position Encoder, refer to Encoder Kit for Centre Shaft Economy Series DC Motor Specifications
DC supply: 4 to 12V
RPM: 60 at 12V
Total length: 46mm
Motor diameter: 36mm
Motor length: 25mm

Brush type: Precious metal
Gear head diameter: 37mm
Gear head length: 21mm
Output shaft: Centred
Shaft diameter: 6mm
Shaft length: 22mm
Gear assembly: Spur
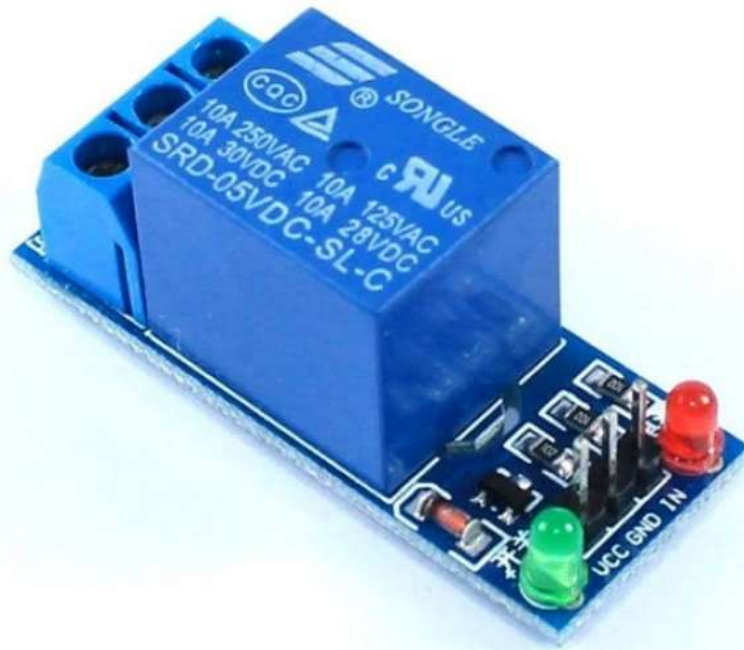Motor weight: 100gms

➢ **Relay:**

Fig.8

A relay is an electrically operated switch. It consists of a set of input terminals for a single or multiple control signals, and a set of operating contact terminals. The switch may have any number of contacts in multiple contact forms, such as make contacts, break contacts, or combinations thereof.

Relays are used where it is necessary to control a circuit by an independent low-power signal, or where several circuits must be controlled by one signal. Relays were first used in long-distance telegraph circuits as signal repeaters: they refresh the signal coming in from one circuit by transmitting it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations.

The traditional form of a relay uses an electromagnet to close or open the contacts, but other operating principles have been invented, such as in solid-state relays which use semiconductor properties for control without relying on moving parts. Relays with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload or faults; in modern electric power systems these functions are performed by digital instruments still called protective relays.

Latching relays require only a single pulse of control power to operate the switch persistently. Another pulse applied to a second set of control terminals, or a pulse with opposite polarity, resets the switch, while repeated pulses of the same kind have no effects. Magnetic latching relays are useful in applications when interrupted power should not affect the circuits that the relay is controlling.

The use of relays for the logical control of complex switching systems like telephone

exchanges was studied by Claude Shannon, who formalized the application of Boolean algebra to relay circuit design in A Symbolic Analysis of Relay and Switching Circuits. Relays can perform the basic operations of Boolean combinatorial logic. For example, the boolean AND function is realised by connecting normally open relay contacts in series, the OR function by connecting normally open contacts in parallel. Inversion of a logical input can be done with a normally closed contact. Relays were used for control of automated systems for machine tools and production lines. The Ladder programming language is often used for designing relay logic networks.

10. HC05 bluetooth module –
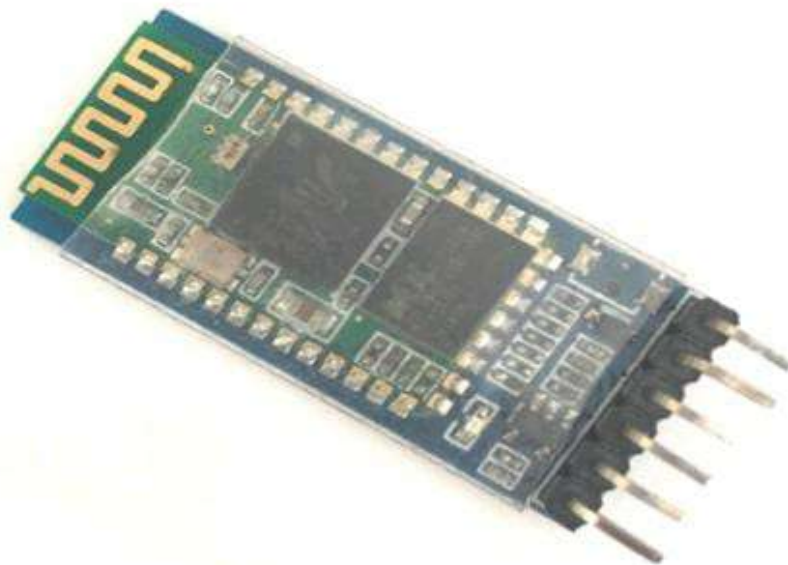
The HC-05 is a very cool module which can add two-way (full-duplex) wireless functionality to your projects. You can use this module to communicate between two microcontrollers like Arduino or communicate with any device with Bluetooth functionality like a Phone or Laptop. There are many android applications that are already available which makes this process a lot easier. The module communicates with the help of USART at 9600 baud rate hence it is easy to interface with any microcontroller that supports USART. We can also configure the default values of the module by using the command mode. So if you looking for a Wireless module that could transfer data from your computer or mobile phone to microcontroller or vice versa then this module might be the right choice for you. However do not expect this module to transfer multimedia like photos or songs; you might have to look into the CSR8645 module for that.

The HC-05 has two operating modes, one is the Data mode in which it can send and receive data from other Bluetooth devices and the other is the AT Command mode where the default device settings can be changed. We can operate the device in either of these two modes by using the key pin as explained in the pin description.

It is very easy to pair the HC-05 module with microcontrollers because it operates using the Serial Port Protocol (SPP). Simply power the module with +5V and connect the Rx pin of the module to the Tx of MCU and Tx pin of module to Rx of MCU as shown in the figure below

During power up the key pin can be grounded to enter into Command mode, if left free it will by default enter into the data mode. As soon as the module is powered you should be able to discover the Bluetooth device as "HC-05" then connect with it using the default password 1234 and start communicating with it. The name

password and other default parameters can be changed by entering into the

HC-05 Default Settings
Default Bluetooth Name: "HC-05"

Default Password: 1234 or 0000
Default Communication: Slave
Default Mode: Data Mode
Data Mode Baud Rate: 9600, 8, N, 1
Command Mode Baud Rate: 38400, 8, N, 1
Default firmware: LINVOR

➢ **Wheels:**

A wheel is a disc or circle-shaped mechanical device. Its main purpose is to allow things to roll; in other words, the wheel spins, and object on the wheels moves more easily along the ground. It is a simple machine.

Most land vehicles roll on wheels. Wheels are often used in pairs, connected by a rod of wood or metal known as an axle. Many machines have wheels with teeth, known as gears. The principle behind the wheel is that of mechanical advantage.

Four disc wheels with 50mm diameter are used for movement purpose. The movement of machine is dependent on the movement of wheels. Wheels will rotate with rotation of motor in forward position. Hence the motor will also move in forward direction

4.2Construction:-
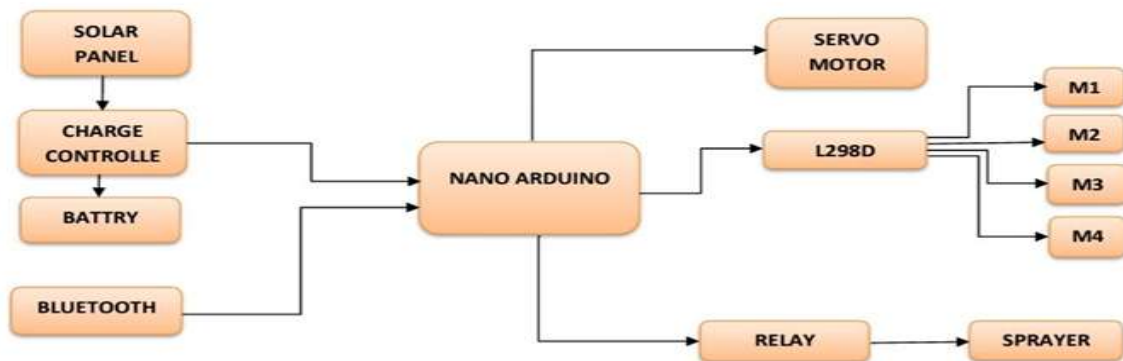
4.3   Working:

Solar powered remote controlled seed sowing machine is device which works on solar energy with the help of remote. When farmer going to sow the seed he can do it by ourself without any man power. Solar panel is the main component of this device. Solar energy takes and store's all the solar energy and after convet it into Electrical energy and converts it to battery thus farmer/person doesn't need to worry about the charging of battery. And in addition to this we set the program in nano Arduino. So now the whole device going to work on remote/mobile app with the help of blutooth. Sprayer is going to work like a fertilizing machine when it's needed so farmer can spray the fertilizer or water during seed sowing or after seed sowing.

V. CHAPTER5 :RESULT AND APPLICATION

5.1 Advantages Of   solar powered remote control seed sowing machine with sprayer:

- This machine is going to run on solar energy i.e., solar panel will capture the solar energy and going to convert it itntoelectrical energy.
- Reduces the human efforts in the field.
- Reduces the cost of work.
- Seed get fertilized at the same time of sowing.
- Seed gets sowed at proper depth.

5.2 Disadvantages Of solar powered remote control seed sowing machine with sprayer:

- Needs prepared soil at the correct temperature .
- Tiny seedlings are often bait for snails, mice and other munching creatures.
- Small seeds often get sowed too thickly and need to be thinned.
- Autumn sowing can be damaged by overwinter wet and cold.

5.3 Application Of solar powered remote controlled seed sowing machine with sprayer:
• Farming

6.4 Results:

Fig.11

Fig.12

VI. CHAPTER 6: CONCLUSION AND FUTURE SCOPE

6.1 Conclusion:

6.2 Future scope:

We can introduce a cutter in place of drill which can be used as head cutter equipment.

Addition of multi-hopper can be attached side by side for sowing of large farm.

This machine can be added with other sensors as soil pH sensor and temperature and humidity sensor.

Also addition of the moisture sensors which can be used to check moisture

Action plan:-

Sr. No	Phases Expected	Date
Phase I	Problem Identification	July 2020
Phase II	Literature Survey	July-August 2020
Phase III	Proposed Methodology	August-September 2020
Phase IV	Report Writing	September-October 2020
Phase V	Design	December 2020
Phase VI	Construction and Working	January 2021
PhaseVII	Result and Conclusion	February-March 2021

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