International Journal of Engineering Innovations in Advanced Technology
ISSN: 2582-1431 (Online), Volume-4 Issue-2, June 2022

SOLAR BASED AGRICULTURE ROBOT

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Abstract: **In excess of 40 percent of the population on the planet picks agribusiness as the essential occupation. Lately, expanded interest has been developed for the development of the self-ruling vehicles like robots in the agribusiness. In traditional strategy for farming works, the types of equipment used to perform various activities are costly and badly designed to deal with. In this way, farmers need advanced equipment to perform farming procedures. The proposed work aimsto build up the robot which can perform activities like ploughing, seed sowing, grass cutting and water sprinkling. The proposed robot gets power supply from solar photovoltaic (pv) panels, so itneedn't bother with any outer power supply. The entire framework is constrained by android application utilizing Bluetooth interfacing with PIC18F4520 which imparts the signs to the robotfor required operations. The ploughing of firm and sowing of seeds is consequently done by utilizing dc motors. Steady separation is kept up for planting of seed. Sprinkler with rotating nozzles is utilized to sprinkle the water on crop. The grass cutting instrument comprises of rotating blades having a sharpened knife edge on both sides to cut the waste grass effectively. This mechanical vehicle will limit the work cost, speed up and increase the exactness of the work. It incorporates various tasks, so it is financially savvy. Vitality required for this machine isless as contrasted to tractors or other farming instruments like electric pumps.**

I INTRODUCTION

In India there are 70 percentage of population chooses agriculture as a primary occupation. In the current generation we do not have sufficient skilled man power specifically in agricultural sector. A manual farming consumes more time & leads to more pollution. The main purpose for developing Automation in Agricultural field is decreasing labor and decreasing time required to perform the processes on crops so that human efforts will get reduce up to 90 percent. Automation is required for safety and health of workers especially when worker have to perform harmful duties.

Manuscript received May 29, 2022; Revised June 05, 2022; Accepted June 15, 2022

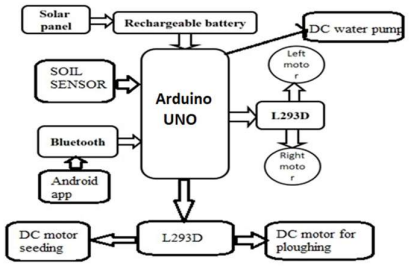
Some of the previously developed robotics applications are Crop Seeding it involves autonomousprecision seeding combines robotics with geomapping. Crop Monitoring and Analysis is provided by drone companies like Precision Hawk offers farmer combined packages which include robotic hardware and analysis software.

system uses basic components like Solar panel, DC motor, Battery, Relay, Motor driver, Relaydriver, Bluetooth Module and PIC18F4520 controller. The whole process is controlled by microcontroller. The solar panel is used to charge the battery. This battery used to power vehicle movement as well as to the motor that is used for grass cutting. The ploughing of field and plantation of seed is done by using DC motor. Distance between the two seeds are controlled and varied by using microcontroller. When the robot reaches the end of the field, we can change the direction with the help of Bluetooth command.

The advantage of this solar powered multi-function Agri-robot is that it does not require any fuelor petrol to work, as it works on the solar energy. The circuit model is less complex and compact due the use of nodemcu controller.

However, slabs have a number of drawbacks. Because it causes an increase in the size of all the other structural components, such as beams, columns, and footings, the high weight-to-strength ratio is the most critical concern.

II OBJECTIVE OF THE PROJECT



III EMBEDDED SYSTEMS

An embedded system is a computer system designed to perform one or a few dedicated functions often with real-time computing constraints. It is embedded as part of a complete device often including hardware and mechanical parts. By contrast, a general-purpose computer, such as a personal computer (PC), is designed to be flexible and to meet a wide rangeof end-user needs. Embedded systems control many devices in common use today.

Embedded systems are controlled by one or more main processing cores that are typically either microcontrollers or digital signal processors (DSP). The key characteristic, however, is being dedicated to handle a particular task, which may require very powerful processors. For example, air traffic control systems may usefully be viewed as embedded, even though they involve mainframe computers and dedicated regional and national networks between airports and radar sites. (Each radar probably includes one or more embedded systems of its own.)

Since the embedded system is dedicated to specific tasks, design engineers can optimize it to reduce the size and cost of the product and increase the reliability and performance. Some embedded systems are mass-produced, benefiting from economies of scale.

Physically embedded systems range from portable devices such as digital watches and MP3 players, to large stationary installations like traffic lights, factory controllers, or the systems controlling nuclear power plants. Complexity varies from low, with a single microcontroller chip, to very high with multiple units, peripherals and networks mounted inside a large chassis or enclosure.

In general, "embedded system" is not a strictly definable term, as most systemshave some element of extensibility or programmability. For example, handheld computers share some elements with embedded systems such as the operating systems and microprocessors which power them, but they allow different applications to be loaded and peripherals to be connected. Moreover, even systems which don't expose programmability as a primary feature generally need to support software updates. On a continuum from

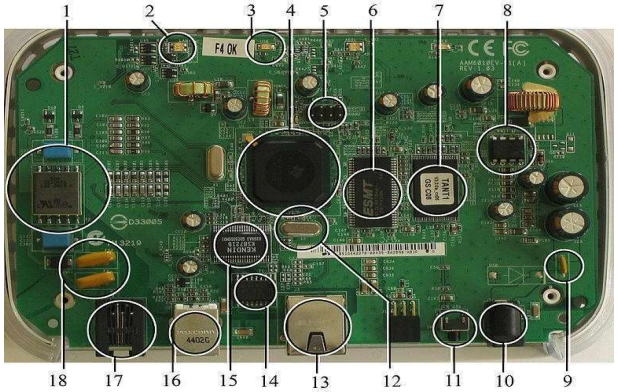


Fig 1. A modern example of embedded system

"general purpose" to "embedded", large application systems will have subcomponents at most points even if the system as a whole is "designed to perform one or a few dedicated functions", and is thus appropriate to call "embedded". A modern example of embedded system is shown in fig:1.

A. Need for Embedded Systems

The uses of embedded systems are virtually limitless, because every day new products are introduced to the market that utilizes embedded computers in novel ways. In recent years, hardware such as microprocessors, microcontrollers, and FPGA chips have become much cheaper. So when implementing a new form of control, it's wiser to just buy the generic chip and write your own custom software for it. Producing a custom-made chip to handle a particular task or set of tasks costs far more time and money. Many embedded computers even come with

extensive libraries, so that "writing your own software" becomes a very trivial task indeed. From an implementation viewpoint, there is a major difference between a computer and an embedded system. Embedded systems are often required to provide Real-Time response. The main elements that make embedded systems unique are its reliability and ease in debugging.

IV HARDWARE COMPONENT

A. SOLAR PANEL

Renewable energy is critical to our fight against climate change. We simply must shift our worldto a low-carbon economy and away from oil and coal.

Experts agree we need a substantial reduction in CO2 over the next 40-50 years and this meanswe need renewable energy to replace fossil fuels now.

Presently, most of the energy what we are using is from non-renewable sources like petrol, coal etc.., which are very limited.

Apart from the non-renewable energy sources, renewable energy sources like wind energy, solarenergy etc.., are used then we can save non-renewable sources for longer time.

A solar cell (also called photovoltaic cell) is a solid state device that converts the energy of sunlight directly into electricity by the photovoltaic effect.

Assemblies of cells are used to make solar modules, also known as solar panels.
The energy generated from these solar modules, referred to as solar power, is an example of solarenergy

Fig 2. Solar panel

B. Regulated power supply

All digital circuits require regulated power supply. In this article we are going to learn how to geta regulated positive supply from the mains supply.

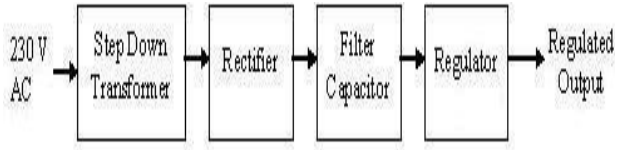


Fig 3 shows the basic block diagram of a fixed regulated power supply.

Let us go througheach block.

C. Transformer

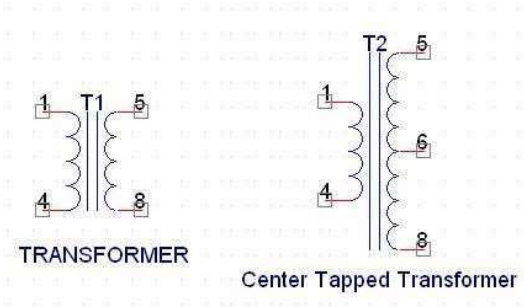


Fig 4. Transformer

A transformer consists of two coils also called as "WINDINGS" namely PRIMARY &SECONDARY.
They are linked together through inductively coupled electrical conductors also called as CORE. A changing current in the primary causes a change in the Magnetic Field in the core & this in turninduces an alternating voltage in the secondary coil. If load is applied to the secondary then an alternating current will flow through the load. If we consider an ideal condition then all the energy from the primary circuit will be transferred to the secondary circuit through the magnetic field.

D. Rectifier

A rectifier is a device that converts an AC signal into DC signal. For rectification purpose we usea diode, a diode is a device that allows current to pass only in one direction i.e. when the anodeof the diode is positive with respect to the cathode also called as forward biased condition & blocks current in the reversed biased condition.

E. Filter capacitor

Even though half wave & full wave rectifier give DC output, none of them provides a constant output voltage. For this we require to smoothen the waveform received from the rectifier. This can be done by using a capacitor at the output of the rectifier this capacitor is also called as "FILTER CAPACITOR" or "SMOOTHING CAPACITOR" or "RESERVOIR CAPACITOR".
Even after using this capacitor a small amount of ripple will remain.

We place the Filter Capacitor at the output of the rectifier the capacitor will charge to the peak voltage during each half cycle then will discharge its stored energy slowly through the load while the rectified voltage dropsto zero, thus trying to keep the voltage as constant as possible.

F. Circuit diagram

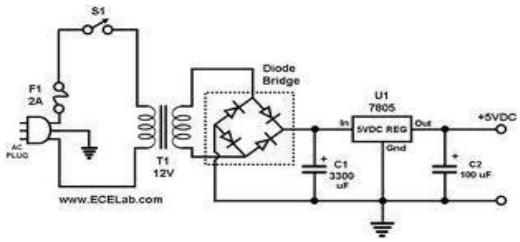


Fig 5. Circuit Diagram of power supply

G. IC 7805

7805 is an integrated three-terminal positive fixed linear voltage regulator. It supports an input voltage of 10 volts to 35 volts and output voltage of 5 volts. It has a current rating of 1 amp althoughlower current models are available. Its output voltage is fixed at 5.0V. The 7805 also has a built-in current limiter as a safety feature. 7805 is manufactured by many companies, including NationalSemiconductors and Fairchild Semiconductors. The 7805 will automatically reduce output current if it gets too hot.The last two digits represent the voltage; for instance, the 7812 is a 12-volt regulator. The 78xx series of regulators is designed to work in complement with the 79xx series of negative voltage regulators in systems that provide both positive and negative regulated voltages, since the 78xx series can't regulate negative voltages in such a system.

The 7805 & 78 is one of the most common and well-known of the 78xx series regulators, as it's small component count and medium-power regulated 5V make it useful for powering TTL devices.

Table 1. Specifications of IC7805

SPECIFICATIONS	IC 7805
V_{out}	5V
V_{in} - V_{out} Difference	5V - 20V
Operation Ambient Temp	0 - 125°C
Output I_{max}	1A

H. ARDUINOUNO (Micro controller)

Arduino/Genuino Uno is a microcontroller board based on the ATmega328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.. You can tinker with your UNO without worring too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.
"Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE)

1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards.

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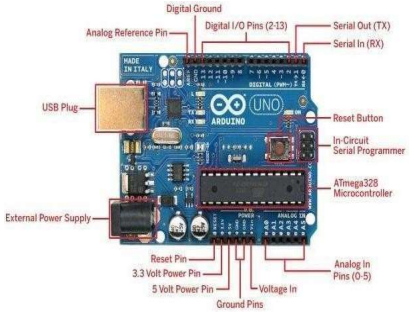

Fig 6. Aurdino board

I. Pin diagram

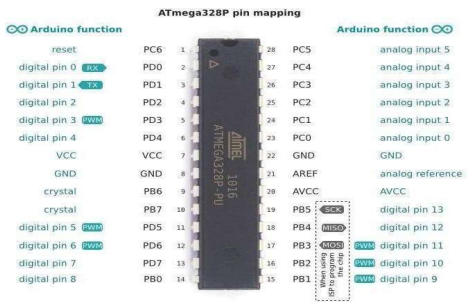

Fig 7. Pin Diagram

J. Bluetooth

Bluetooth is a short-range radio link intended to replace the calble(s) connecting portable and/or fixed electronic devices. Key features are robustness, low complexity, low power and low cost. There are already similar standards in this market, such as IrDA, HomeRF and IEEE 802.11 family. Bluetooth is designed to offer some unique advantages that none of the others can provide.

For example, IrDA uses infrared as medium, so its range is limited to around 1 meter, and it requires a line-of-sight communication. In comparison, Bluetooth can operate at a range up to 10 meters, or even 100 meters with enhanced transmitters. RF signals goes through walls, so a Bluetooth network can span several rooms.

Compared with HomeRF and IEEE 802.11 family, Bluetooth has much lower data rate and transmission range (10 meter). While HomeRF supports 1.6 ~ 10 Mbps data rate and IEEE 802.11a/b supports 54/11 Mbps, Bluetooth supports only 780 Kbps, which can be used for 721 kbps downstream and 57.6 kbps upstream asymmetric data transfer, or 432.6 kbps symmetric data transfer. Both HomeRF and IEEE 802.11 operates at 100 meter range, while Bluetooth operates at up to 10 meter.

However, as a result of the lower data rate and transmission range, Bluetooth offers much lower cost per node (approximately 5 ~ 10% of HomeRF and IEEE 802.11). So it is more suitable for applications involving low data rate (data and voice), small number of devices (8 at maximum), low power consumption and short range (up to 10 meter), such as PC-to-peripheral networking.

Fig 8. Bluetooth

V CONCLUSIONS

An autonomous multipurpose agricultural robot is designed to perform the complex farming tasks like seed sowing, grass cutting and pesticide spraying. This work is designed to perform sowing of two different sized seeds. The benefits of robot are reduced human intervention and efficient resources utilization. Instructions are passed to the system using bluetooth which ensures no direct contact with human and thus safety of operator is ensured. The robot is solar powered hence it is renewable energy source. The operations are performed using android app. Innovative seed sowing, grass cutting and pesticide sprayer equipment has significant

influence in agriculture. By using this advanced work, farmer can save more time and also reduce lot of labour cost

REFERENCES

1. [Online].Available:http://www.fao.com/india/faoin-india/india-at-a-glance/en/ [Accessed Nov 2019].
2. [Online].Available: http://blog.robotiq.com/top10-robotic-application-in-agriculturalindustry. [Accessed December 2019].
3. [Online].Available:https://components101.com/wireless/hc-05-bluetoothmodule. [Accessed Nov 2019].
4. S. Umarkar and A. Karwankar, "Automated Seed Sowing Agribot using Arduino", IEEE Conference on Communication and Signal Processing, April 2016, pp.1379-1383.
5. M.D.I. Sujon, R. Nasir, M.M.I. Habib, M.I. Nomaan J. Baidya and M.R. Islam "Agribot: Arduino Controlled Autonomous Multipurpose Farm Machinery Robot for Small to medium scale cultivation", IEEE conference on intelligent autonomous systems,March 2018, pp.155-159.
6. P.V.S. Jayakrisna, M.S. Reddy, N.J. Sai, N. Susheel and K.P. Peeyush, "Autonomous Seed Sowing Agricultural Robot", in IEEE Conference on advances in computing, communications andinformatics (ICACCI),2018.
7. S. Kareemulla, E. Prajwal, B. Sujeshkumar, B. Mahesh, and V Reddy, "GPS based Autonomous Agriculture Robot", IEEE International conference on design innovations for 3Cs compute communicate control, 2018, pp.100-105.
8. Ranjitha B., Nikhitha M. N. and Aruna K, "Solar Powered Autonomous Multipurpose Agricultural Robot Using Bluetooth/Android App", IEEE Conference on Electronics Communication and Aerospace Technology [ICECA], June 2019, pp.872-877.
9. B. S. Shivprasad, M. N. Ravishankara, B. N. Shoba, "Design and Implementation of Seeding and Fertilizing Agricultural Robot", International Journal of Application or Innovation Engineering and Management (IJAIEM), Volume 3, Issue6, June 2014.

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