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Smart Agriculture with IoT and Cloud Computing

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Abstract - *In India, approximately 70% people are agriculture dependent. So,the agriculture methods in India want to be superior to scale back the efforts of farmers. Enormous number of operations are performed in the agricultural field. Very essential and considerable operation is seeding. But the present techniques of seeding are problematic. The equipment used for sowing seeds is very tedious and not a convenient task. So, there may be a requirement to develop device which can lessen the efforts of farmers. This method introduces an effective mechanism which goals to drop seeds at specific area with positive distance between seeds and features whilst sowing. The drawbacks of the prevailing device are going to be removed efficiently in the course of this automated system. IOT based sun powered agribot that automates irrigation challenge and allows faraway farm monitoring.*

***Key Words*: IOT, Cloud computing, Agriculture Monitoring, Seed Sowing, Solar panel.**

1. INTRODUCTION

In olden days, technology wasn't that advanced. So, they have been seeding, ploughing and cutting the plants manually. But nowadays, technology is developed. So, it's not essential to do seeding in sunlight. By the use of robotic technology, you may sit in a cool area and do seeding by tracking the robot motion. In today's agriculture field urges new ways of agricultural operation to increase overall performance and efficiency. Farmers face various problems in operations like seed sowing, ploughing, waste plant reducing and weeding [1]. Also, the equipment used by them are difficult to carry and operate. Due to the migration of people from villages to cities leads to problems. Nowadays robotics technology performs substantial role in fields of medicine, industries and other organizations. Robots are used to carry out different operations within the agricultural fields. We can make use of this robotics technology within our farming system to reduce efforts of farmers and also to save time, energy and required cost.

1.1 Problem statement

Traditionally, farmers manually monitor the crops and the conditions, this is a tedious and time taking process. In order to solve this problem, modern technologies like IOT and cloud computing together can be used to make this task easier. We can make use of robotics technology within the farming to lessen the efforts of farmers and also to save time, required cost and energy. By the usage of robot system one can take a seat in a cool area and can do seeding by tracking the robot motion.

1.2 Literature Survey

The studies shown in this paper presents a seed robot for purpose of seed planter robot design, elements affecting seed emergence and some other mechanisms. The primary objective of sowing operation is placing the seed and fertilizer at desired depth and seed to seed spacing in rows. This explains how mechanical factors affect the seed germination like uniformity of intensity of placement of seed, uniformity of distribution of seed along sides [2].

2. CLOUD COMPUTING

Cloud computing is related to new paradigm for the provision of computing infrastructure and big information processing technique for various resources. The main purpose of cloud computing is to pass the huge amount of power computation through the accumulation of resources and to produce a single system view. Cloud computing has a robust design to carry out sophisticated computing, large scale and has revolutionized the means that the computing infrastructure is abstracted and practiced. In addition, an important aim of those methods is to deliver computing as an answer for tackling huge information which includes large-scale, multi-media and high dimensional information sets[6].

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3. METHODOLOGY FOR PROPOSED MODEL

Nowadays seed sowing is done both manually or with the help of tractors and it's a very hectic task. Some of the manual methods involves seed broadcasting by hands. Sometimes technique of dibbling is used i.e creating holes and seeds are dropped by hands.

Fig 3.Method of dibbling. Source:gardencentre.com/seed-sowing

Also a pair of bullocks is employed to carry the significant instrumentation of levelling and seed dropping, inorder to overcome those issues we have developing a best system. Additionally with seed sowing useful operations like Plugging and Levelling are also required. However several problems are faced by farmers throughout seed sowing operations such as correct adjustment of distance between two crops, distance between two rows. Seed sowing is incredibly basic operation within the agricultural field. The farming system like tilling, cultivating, harvesting, weeding etc is that the various methods. All the methods are forwarded which modifies the mechanism in farming that works mechanically while not the person power requirement[7].The small machine would be assembled from existing mass made elements without the necessity of specialised design and tooling. Also energy needed to this machine may be a smaller amount as compared with tractors or with any other agricultural equipments. Since seeding preparation is our day to day life we have tendency to make use of tractor in farms. However, it needs longer time and so the person shortage is faced endlessly.

A prototype module are going to be developed for the project. It includes sensors to feed data into ESP8266. ESP8266 is used for sending information to robot machine and solar energy is used to power the robot unit. As per the guidance given by the user the robot moves in forward, backward, right and left direction inorder to drop the seeds at a specific position and for the flexible movement of robot four wheels are connected at the bottom. Water pump is controlled by the microcontroller through the DC motor. Every information is stored in the cloud for further process.

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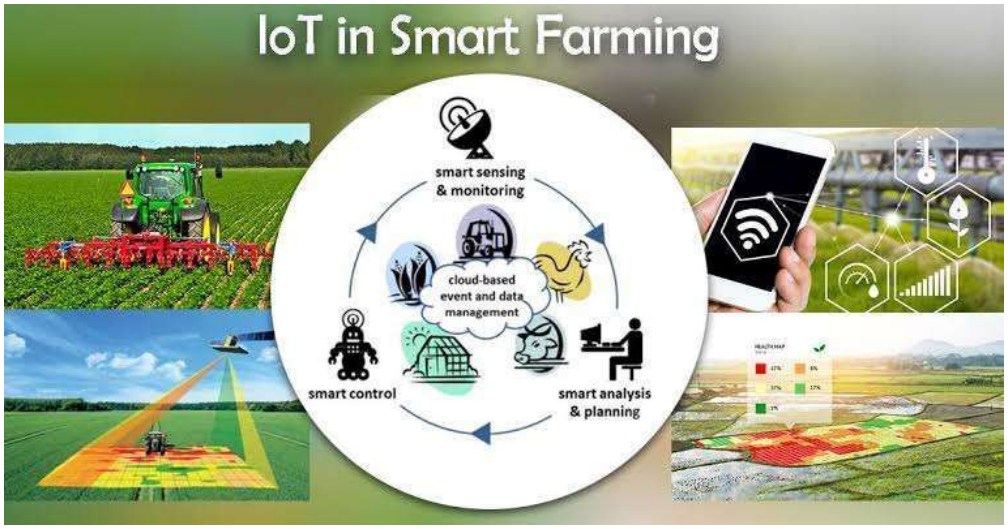

Fig 4. Smart farming using Iot. Source: tomsonelectronics

3.1 Advantages:

•Planting efficiency is improved.
•Cropping reliability and crop yield are increased.
• There's rise in cropping frequency and seed planting.
• Seed robots sows the seeds uniformly at proper distance and correct depths.
• It sows the seeds in regular rows.
• Sowing by employing a tractor joined with seed drill saves time and labour.
• The mode of operation is very simple.
• Reduces labour problem.
• The robot will be completely wireless, which makes it easy to be controlled from a distant location.
• The robot would be cost effective, allowing farmers have multiple of them serving one farm.
• Important parameters like soil moisture and temperature would be sent to the cloud, useful for researchers to do analysis on the data and make farming more efficient.
• Modular system helps farmers to add-on additional equipment/sensors on the robot.

3.2 Disadvantages:

•Mechanical features of end product is not implemented within the prototype unit. And usually initial investments are more.
• Low germination share leads to wastage of seeds.
•Because of non-germination of seeds creation of gap occurs .
• Declination of total yield.
• Deficiency of labour, hard to please high wages.
The system is very much useful to the farmers for the essential seed sowing operation. This unit will be connected to the trackers to try and do automation. This method is terribly helpful in garden, road side etc. This mechanism is also helpful in sports stadium.

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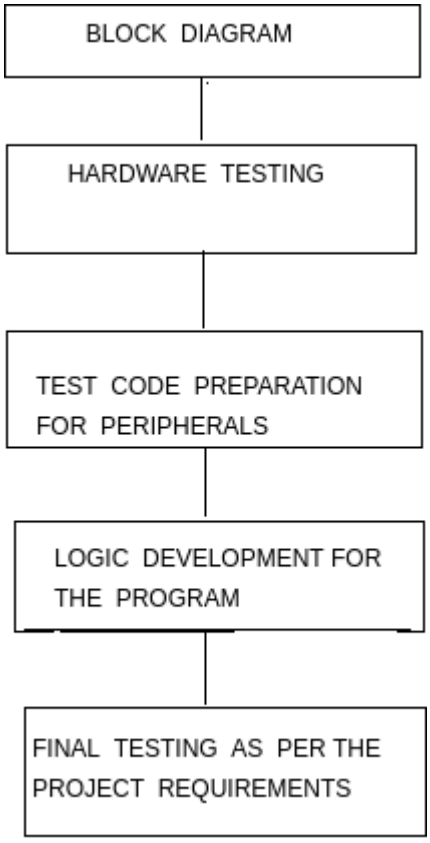
4. SYSTEM ARCHITECTURE



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4.1 HARDWARE AND SOFTWARE REQUIREMENTS

Sowing is that the simplest (and often the smallest amount expensive) thanks to bring introduce new plants into the garden. Seeds can be sown directly into the garden or in fields where they are grown to a size for transplanting into the targeted area.

• The platform offers production-ready POCs that saves time and all of them are reusable.

• Data Integration – Loopback feature.

4.1.1 Hardware Requirements

- Renesas 64 bit microcontroller , LCD , GSM/GPRS , Relay , L293 , 4 wheel Robot , Water pump , Solar panel.

4.1.2. Software Requirements

-Amazon Web Services

-Renesas Flash Programmer

-Renesas Cube suite+

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5. BLOCK DIAGRAM

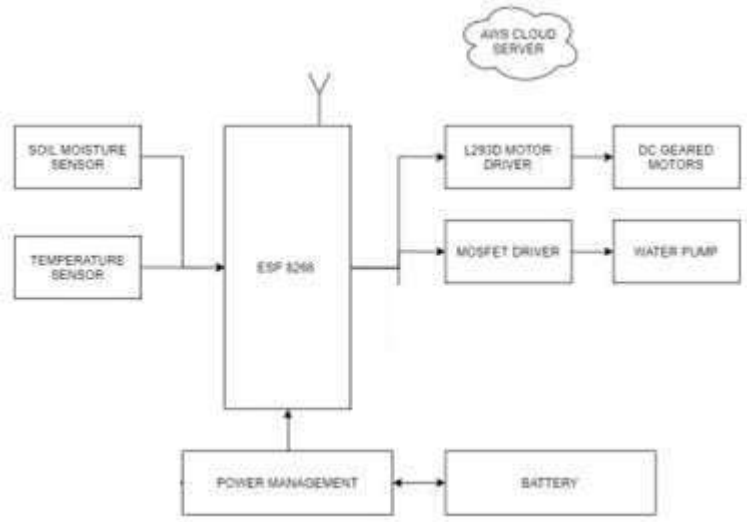

Fig 6.Block diagram for proposed project

Soil moisture sensor: measures the volumetric water content in soil. Microwave radiation reflected from the soil moisture is employed for remote sensing in hydrology and agriculture.

Temperature sensor: a thermocouple or RTD, providing for temperature measurement through an electrical signal. A thermocouple (T/C) is formed from two unlike metals generating an electrical voltage directly proportional to changes in temperature.

ESP8266: low-cost Wi-Fi microchip, with a full TCP/IP stack and microcontroller ability.

AWS cloud server: a secured cloud service platform, offering calculated power, database storage, content delivery and other requirements assisting businesses build.

L293D motor driver: a Motor driver which allows DC motor to drive on either direction. L293D is a 16-pin IC controlling a group of two DC motors simultaneously in any direction.

MOSFET driver: type of power amplifier accepting a low-power input from a controller IC thereby producing a high-current drive input for the gate of a high-power transistor. MOSFET drivers decreases the switching time between the gate ON/OFF stages which results in increased MOSFET power and thermal efficiency.

DC geared motor: defined as an extension of DC motor which already had its inner details exposed. A geared DC Motor consists of a gear assembly attached to the motor, where the gears reduces the speed of the vehicle but increase its torque as gear reduction.

Water pump: mechanical device designed to transmit coolant through water-cooled engines. Although not all water-cooled engines use pumps, these are the basic components of nearly all modern water cooling machines.

Power management: There are two main sources of power. These are solar panel and external battery. The solar and battery provide the necessary power, which is utilized by the model.

The sensors that are being used are soil moisture sensor and temperature sensor. These sensors are connected to ESP8266. This microcontroller chip is capable of connecting to the wifi. This in turn connects to the various devices that we are using for construction of our model. The various devices that forms our model are: L293D motor driver, MOSFET driver, seed sowing mechanism. The cloud services that we are using in the implementation of our model is AWS.

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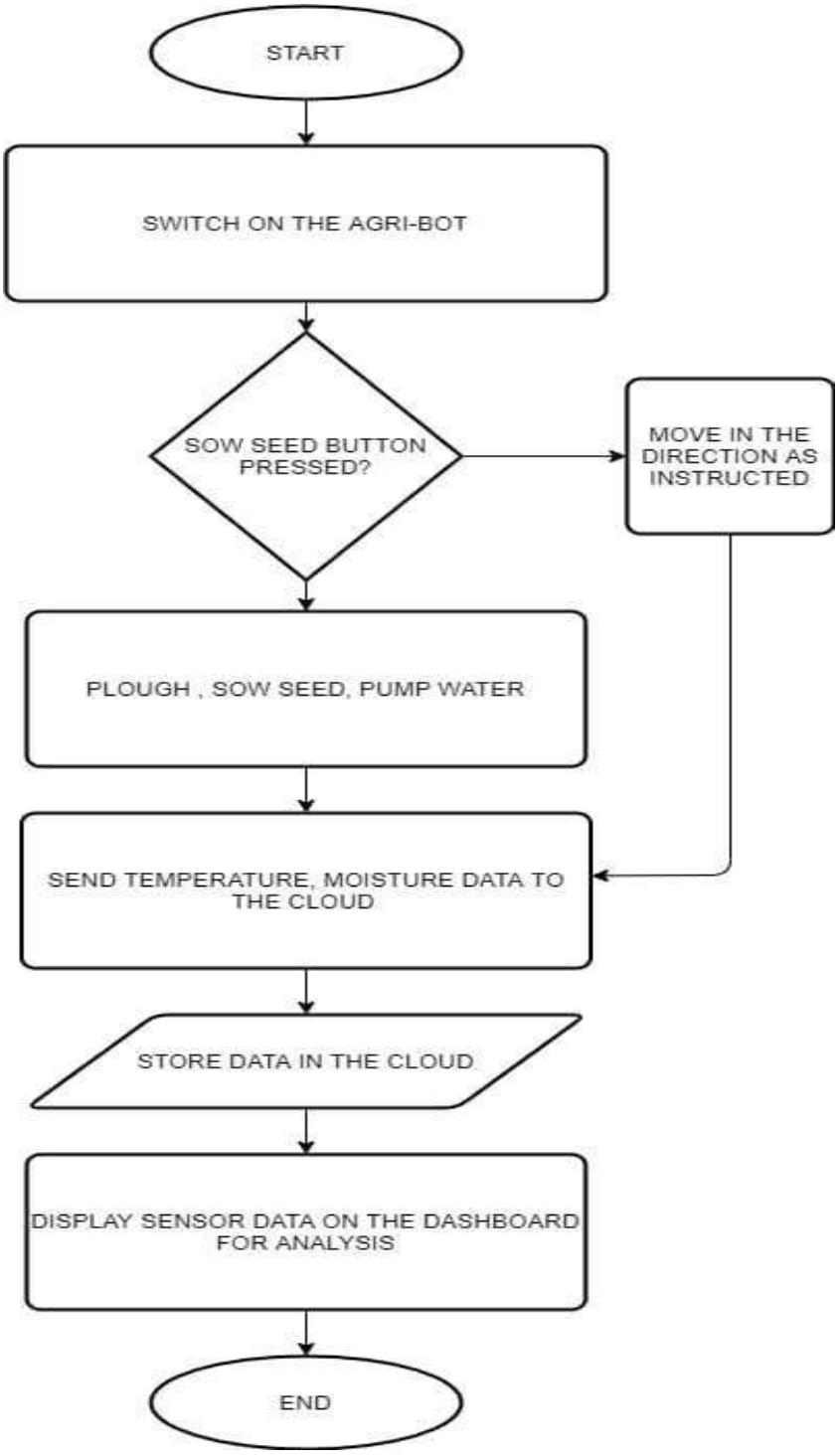
6. FLOW DIAGRAM



7. FUTURE SCOPE

For project demonstration, a prototype is developed for the module. In future, the project undertaken are often categorised to merchandise level. Effective price and compactness should be taken care to make the project user friendly. Thus, reducing the dimensions of the model, the units are often fixed firmly along the side of the controller bounded with the change in technology.

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8. CONCLUSIONS

The paper is to match conventional sowing methods and modern methods. The required row to row spacing, seed rate, seed to seed spacing are often achieved by proposed machine. The machine reduces the human efforts. The conventional seed-sowing machine is less efficient and also time consuming. In order to produce desired results, this model uses an architectural format. Using certain modifications, it is often accomplished as a true design with certain mitigation. Going further, most of the units are often manufactured along side the microcontroller, making the system compact thus, making the existing system simpler . Greater range must be implemented for real time components to make the model relevant.

Sr. No.	Parame Ter	Traditio nal	Tractor	Robo tic
I	Speed	Slow	High	Very high
II	Man power	More	Moderate	Less
III	Time required	More	Less	Less
IV	Sowing technique	Manuall y	Manually	Automatic ally
V	Required energy	High	Very high	Less
VI	Yield of crop	Low	Moderate	High

Table 1 Comparison between traditional and modern method

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