# Automated Agricultural System for Multipurpose Activities of Farmers

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**ABSTRACT**: Agriculture plays vital role in the development of country. In India about 70% of population depends upon farming and one third of the nation's capital comes from farming. Issues concerning agriculture have been always hindering the development of the country. The only solution to this problem is smart agriculture by modernizing the current traditional methods of agriculture. Agricultural tasks automation is significant in recent days to reduce the labor work and increase the yield of crop, efficiency and profit.

The project aims on the design, development & the fabrication of the agricultural system which can plough the land, sow the seeds, water spray, pesticides spray, monitor the crops and soil, cut the cultivated crops, separate the grains from the crops, cut the grass. It also aims on upgrading of existing marketing methods. The whole agricultural system works with battery and controlled through Bluetooth technology. Various operations are performed in the agriculture field like seeding, weeding, waste plant cutting, plowing etc. Very basic operation is seeding, plowing & crop cutting. But the present method of seeding, plowing & crop cutting are problematic. The equipments used for seed sowing are very difficult and inconvenient to handle. The machine can be advanced for sowing seeds in farm with particular distance between seed is adjusted. In this project system direction is provided by using Software programming. The current warehouse management system fails to preserve the quality of the stored products overtime, monitor the temperature, humidity, theft and fire attacks in the warehouse. The project also includes smart warehouse management system which includes temperature and moisture maintenance, theft and fire detection in the warehouse and delivers the real time notifications through GSM without human intervention.

*Key words: Agricultural, Embedded System, sowing machine, Bluetooth Technology*

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## I.    INTRODUCTION

Agriculture is considered as the basis of life for the human species as it is the main source of food grains and other raw materials. It plays vital role in the growth of country's economy. It also provides large ample employment opportunities to the people. Growth in agricultural sector is necessary for the development of economic condition of the country. Unfortunately, many farmers still use the traditional methods of farming which results in low yielding of crops and fruits. But wherever automation had been implemented and human beings had been replaced by automatic machineries, the yield has been improved. Hence there is need to implement modern science and technology in the agriculture sector for increasing the yield.

The machine can be advanced for sowing seeds in farm with particular distance between seed is adjusted. It can automatically sow seeds in land. It can be also used as fertilizer sowing instead of seed. The basic requirements of this machine for small scale cropping, they should be suitable for small farms, simple in design and technology and versatile for use in different farm operations. An automatically operated template row planting will designed and developed to improve planting efficiency and reduce drudgery involved in manual planting method. Seed planting is also possible for different size of seed at variable depth and space between two seeds. In the present era the vast majority of the nations don't have adequate talented labor particularly in agrarian area and it influences the development of creating nations.

Food preservation is very important to fulfill the food supply chain needed by the developing countries like India. There is a huge need for preservation, protection, storage, distribution and consumption of food at later stage. There is a need to preserve the food grains from rodents invading at warehouses and also threat to destruction of stored crops, due to variation in temperature, excess humidity, fire, theft, rain, flood, etc. The project includes smart warehouse management system which includes temperature and humidity maintenance, theft and fire detection in the warehouse and deliver the real time notifications through GSM without human intervention. So that stored food grains can be delivered as and when required (real time).

### 1.1 Bluetooth Module

HC-05 Bluetooth is a serial port convention module. It is a simple to utilize "Bluetooth" and intended for straightforward remote serial association setup. HC-05 Bluetooth module was associated with the same microcontroller to set up a duplex correspondence channel amongst itself and the android advanced Mobile Phones. Normal Bluetooth works for range up to 100 m. Bluetooth 5.0 ranges up to 400 m.



**Figure 1.1 Bluetooth Module**

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## 1.2 Embedded System

The system in which dedicated purpose of software is embedded into a hardware design is known as embedded system. The software gets embedded into memory modules as ROM, and it does not need any secondary memory as in a computer.

Embedded system design process is done by simulation and used for testing the circuit because changing hardware becomes very difficult if the circuit malfunctions. If the results are matched with the desired ones, the process will be designed permanently by sequential wafer processes.

The two main elements of the systems are:
- Embedded System Hardware
- Embedded System Software

- **Embedded System Hardware -** platform interacts with various real-time inputs and outputs or variables. The hardware includes controller like microcontroller or microprocessor, memory modules, I/O interfaces, display systems and communication modules, etc.
- **Embedded System Software** - Allows programming in a desired fashion such that it controls various operations like seed sowing, ploughing, crop cutting and warehouse management. It is written in a high-level format, compiled into code, and then dumped into hardware controllers.

The agricultural system movement on the land can be controlled by embedding the commands into the Renesas 64 pin microcontroller. The system works according to the embedded C programmed by the user.



**Figure 1.2 Embedded System**

## II. LITERATURE SURVEY

In India, near about 70% people are dependent upon agriculture. So the agricultural system in India should be advanced to reduce the efforts of farmers. Various number of operations are performed in the agriculture field like seed sowing [1], weeding , cutting, pesticide spraying etc. Very

basic and significant operation is seed sowing. But the present methods of seed sowing are problematic. This situation makes think of a control mechanism which aims to drop seeds at particular position with specified distance between two seeds and lines while sowing.

Warehouse management system controls the movement and storage of materials, inventory and finished goods, transportation, logistics, financials, manufacturing, sales order management and supply chain execution. Effective warehouse management [2] helps to preserve the quality of the stored products overtime. WMS also provides the service for the customer relationship such as automated pick replenishment, automated data collection, first in first out, wave picking and cross docking.

Agro-Technology is the process of applying the technology innovation occurring in daily life and applying that to the agriculture sector which improves the efficiency of the crop produced and also to develop a better mechanical machine [3] to help the agriculture field which reduces the amount and time of work spent on one crop. The autonomous system architectures give us the opportunity to develop a complete new range of agricultural equipment based on small smart machines that can do the right thing, in the right place, at the right time in the right way.

The design, development & the fabrication of the agricultural system which can sow the seeds, plough the land, cutting the crop plant. The sowing machine [4] can be advanced for sowing seeds in farm with particular distance between seed is adjusted.

Robots are highly complex, consisting of different sub-systems that need to be integrated and correctly synchronized to perform tasks perfectly as a whole and successfully transfer the required information. Agriculture robots [5] for field operations must be able to operate in unstructured agricultural environments with the same quality of work achieved be current methods and means. The robotic system must be cost-effective, while being inherently safe and reliable – human safely, and preservation of the environment, the crop and the machinery are mandatory.

Most cultures in greenhouses largely use technology; human operators still manually perform most operations on the crop although they are often highly repetitive and sometime even dangerous. This fact greatly impacts on the quality of the product, on the production costs and on collateral issues, such as pollution and safety. A multi-purpose low-cost robot [6] prototype, designed and built according to such characteristics, is then presented together with the results of some preliminary experimentation with it.

## III. AUTOMATED AGRICULTURAL SYSTEM

The multipurpose agricultural system can sow the seeds, plough the land and cut the cultivated crops. The whole agricultural system works with battery and controlled through Bluetooth technology. Various operations are performed in the agriculture field like seeding, weeding, waste plant cutting, plowing etc. Very basic operation is seeding, plowing & crop cutting. But the present method of seeding, plowing & crop cutting are problematic. The

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equipments used for seed sowing are very difficult and inconvenient to handle. The machine can be advanced for sowing seeds in farm with particular distance between seed is adjusted. In the agricultural system four wheels are connected at the base for the flexible movement of system. DC motors are used to drive the wheels connected to the system. L293D is used to drive the DC motors. LCD are the display used in the entire process. The system direction is provided by embedding the commands into the Renesas 64 pin microcontroller.

The current warehouse management system fails to preserve the quality of the stored products overtime, monitor the temperature, humidity, theft and fire attacks in the warehouse. The project also includes smart warehouse management system which includes temperature and humidity maintenance, theft and fire detection in the warehouse and deliver the real time notifications through GSM without human intervention.

The proposed project has the following benefits, reduce the manual tasks, helps in effective data and time management, increase the yield of crops, profit and preserve the quality of stored products overtime.
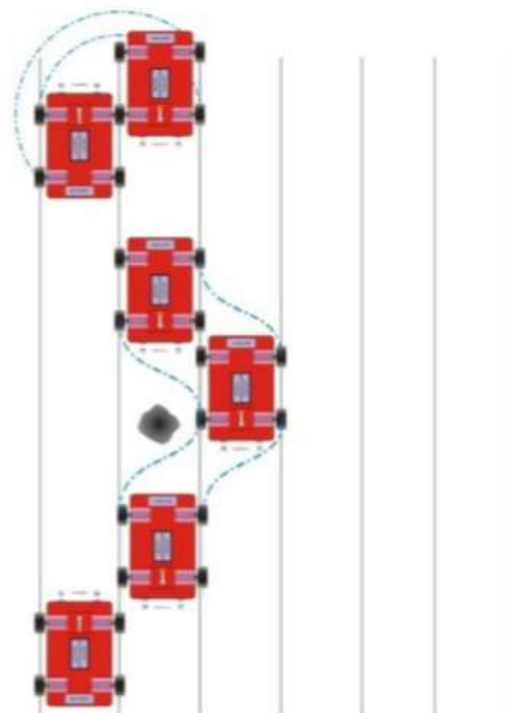
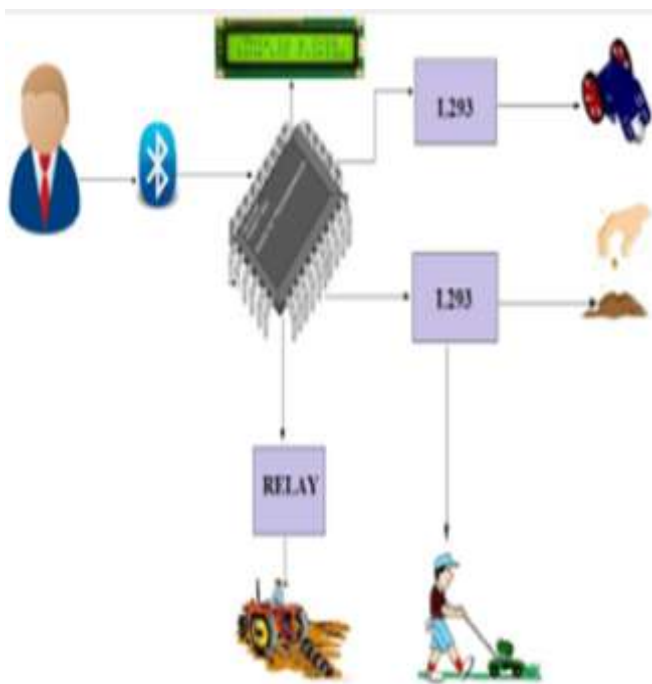

**Figure 3.2 Path Control of Agricultural System**



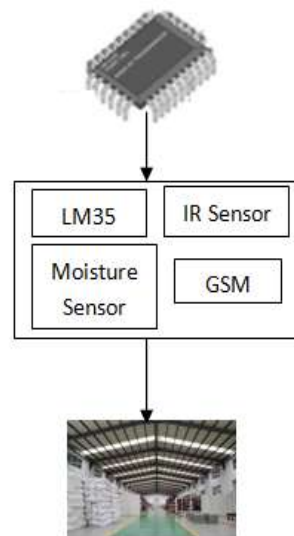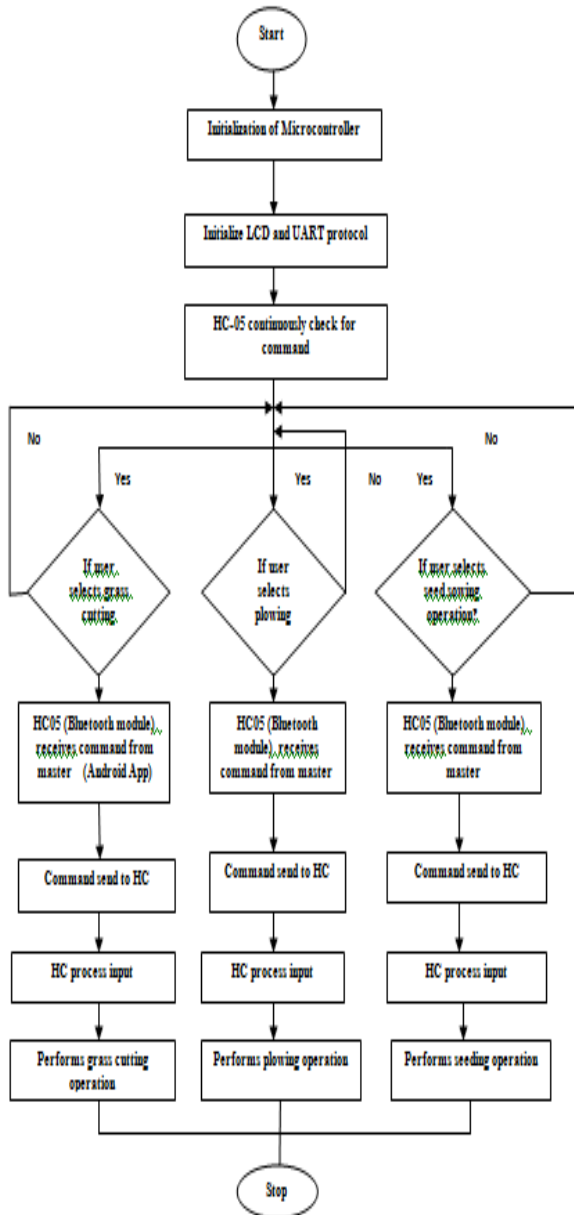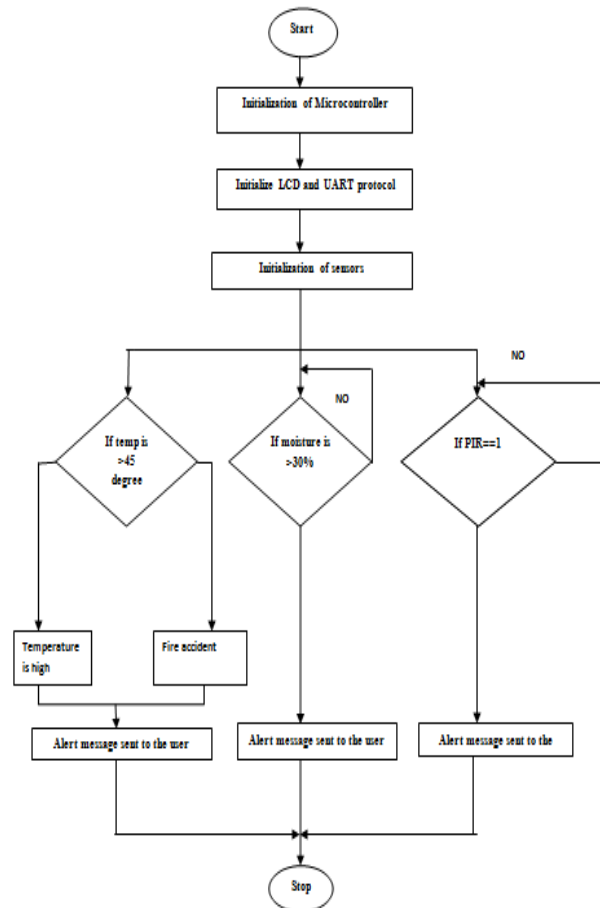**Figure 3.1 Block diagram of agricultural system model**



**Figure 3.3 Block Diagram of Warehouse Management**

**Flow Diagram 3.4 Multipurpose Activities of Farmers**



**Flow Diagram 3.5 Warehouse Management**



**Figure 3.6 Snapshot of Overall Agricultural System**

## IV. PERFORMANCE COMPARISON WITH EXISTING METHODS

Prototype of the agricultural system developed has the following Performance characteristics.

- Working speed of the machine depends upon the DC motor and energy stored in the battery
- Prototype Machine can dig the soil in three rows up to 5 inch by rotating the digging tool by the help of DC motor
- Digging speed depends on the moisture content in the soil and tool tip

| SR.NO | Parameter | Manual | Tractor | Agricultural System |
|-------|-----------|--------|---------|---------------------|
| 1 | Man Power | More | Moderate | Less |
| 2 | Time Required | More | Less | Less |
| 3 | Sowing Technique | Manually | Manually | Automatically |
| 4 | Distance Between Seeds | Not Fixed | Not Fixed | Fixed |
| 5 | Wastage of Seed | Moderate | More | Less |
| 6 | Required Energy | High | Very High | Less |
| 7 | Pollution | No | More | No |
| 8 | Alarm and Display | No | No | Yes |

**Table 4.1 Comparison between Seed Sowing Methods**

The existing system in agriculture is manual where it requires more labor work and investment.

The disadvantages of existing methodologies in agriculture are

- Repetitive manual process
- Doesn't provide the remote monitoring facility
- No proper methods to preserve the quality of the stored products over time
- No automated system for decision making

The proposed project has the following advantages

- The mode of operation of this machine is very simple even to the layman
- Plowing, seeding , grass cutting processes are random instead of sequential flow
- Single circuit board on the system is sufficient for both agricultural activities and warehouse management which minimizes the cost incurred
- Labor problem can be reduced
- Wastage of seed is less
- The existing system will be removed successfully in this automated system
- The agricultural system can be connected to the tractors to do automation

## V. EXPECTED RESULTS

The Bluetooth operated agricultural system will plough the land, sow the seeds and cut the crops according to the commands embedded in the Renesas 64 pin microcontroller. The system sow the seeds one at a time in farm at particular distance and depth. The project also includes smart warehouse management system which includes temperature and moisture maintenance, theft and fire detection in the warehouse and deliver the real time notifications through GSM without human intervention. The system reduce the manual tasks, helps in effective data and time management, increase the yield of crops, profit and preserve the quality of stored products overtime.

## VI. CONCLUSION

The Paper aims on the design, development & the fabrication of the agricultural system which can plough the land, sow the seeds, water spray, pesticides spray, monitor the crops and soil, cut the cultivated crops, separate the grains from the crops, cut the grass. It also aims on upgrading of existing marketing methods. The whole agricultural system works with battery and controlled through Bluetooth technology. Various operations are performed in the agriculture field like seeding, weeding, waste plant cutting, plowing etc. The Paper also includes smart warehouse management system which includes temperature and moisture maintenance, theft and fire detection in the warehouse and deliver the real time notifications through GSM without human intervention. The system reduce the manual tasks, helps in effective data and time management, increase the yield of crops, profit and preserve the quality of stored products overtime.

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