Smart Farming Using IOT

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***Abstract*— Even today, different developing countries are also using traditional methods and backward techniques in agriculture sector. Little or very less technological advancement is found here that has increased the production efficiency significantly. To increase the productivity, a novel design approach is presented in this paper. Smart farming with the help of Internet of Things (IOT) has been designed. A remote controlled vehicle operates on both automatic and manual modes, for various agriculture operations like spraying, cutting, weeding etc. The controller keeps monitoring the temperature, humidity, soil condition and accordingly supplies water to the field.**

Keywords— IoT; Smart farming; Remote controlled vehicle; Productivity;

I. INTRODUCTION

Many countries like India, majority of the population depends on farming, and its national income comes from farming. In spite of this and even the modern technology is found everywhere, the agriculture area is following the old conventional technology. Our farmers still resort to traditional methods like manual distribution of seeds and ploughing, two crops per year pattern, unscientific systems of cultivation. The monsoons are irregular, and unevenness of availability of water throughout the year poses a major problem. All this leads to inadequate yield and low productivity. The implementation of scientific methods in the field of agriculture can bring about radical changes in the productivity of crops, due to improved efficiency in the farming techniques.

Of the various advantages that IoT brings to the table, its ability to innovate the current scenario of farming methods is absolutely ground-breaking. Mostly, we come across ideas that suggest a wireless sensor network that collects data from the various sensors present in the field and sends the data to the main central server. This method focuses on studying the environmental factors to improve crop yield. But it turns out, monitoring environmental

factors alone are never adequate to increase productivity of crops since a lot of other factors have a role to play. This may include spraying of insecticides and pesticides to prevent invasion of pests and insects, monitoring the fields at all times to stay aware of attacks by animals and birds, and thefts of crops during the stages of harvesting.

We need to implement an integrated system that will ensure increased levels of productivity, and crop monitoring at all stages of cultivation and harvesting.

This paper proposes smart farming by the aid of automation and IoT technology. We aim to implement a smart GPS based remote controlled vehicle that performs various tasks like monitoring fields to prevent thefts, scaring birds and animals, sensing soil moisture content, spraying fertilizers and pesticides, weeding, sensing soil moisture, etc. Smart irrigation, by usage of optimum amounts of water, depending on the requirement of each crop type and the soil will be executed. Finally, we plan on enforcing smart warehouse management, with temperature and humidity sensing for the benefit of the products being stored, and detection of presence of any invader who tries to steal from the warehouse. Controlling and monitoring of all these operations will be through a remote smart device with Internet connectivity and the operations will be performed by interfacing sensors, ZigBee modules, with micro-controller.

II. PROPOSED SYSTEM

The system is aimed to have two different sections or blocks, and a central computer or mobile application to control and monitor the entire system. Each of these blocks/nodes comprises of different sensors and devices and they are further connected to one central server via wireless Zigbee modules. The central device sends and receives information from user end using internet connectivity. The system operates mainly on two modes, namely: automatic mode and manual mode. In the automatic mode, the system takes its own decisions while controlling the various devices, while in manual mode, the user can himself operate the system with the help of a mobile app or PC commands.

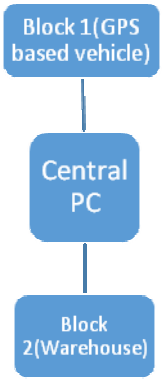

Figure 1: Interconnection between blocks and main server

A. Block 1

Block 1 is a GPS based vehicle which can be controlled remotely using central PC in the manual mode as well as it can be programmed so that it can navigate autonomously within the boundary of the entire field using the co-ordinates given by GPS module. The remote controlled vehicle will have various sensors and devices like obstacle sensor, soil moisture sensor, cutter, sprayer and using them it will perform tasks like spraying fertilizers and pesticides, scaring birds and animals, detecting thefts, monitoring, etc. The soil moisture sensor collects data from each individual field, and this in turn is sent to the microcontroller of block 2, which then operates the water pump ON/OFF.

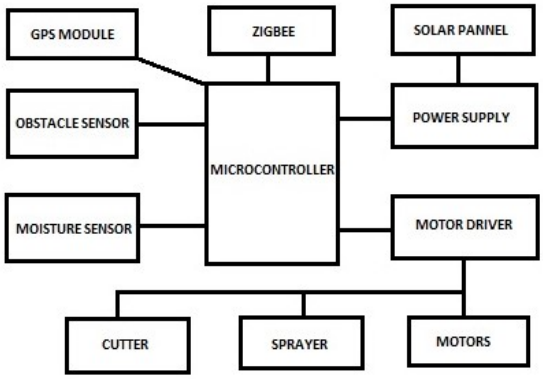

FIGURE 2 : GPS BASED VEHICLE

B. Block 2

Block 2 will be the warehouse. It comprises of the AVR microcontroller in the centre, connected to the various sensors like temperature sensor, humidity sensor, motion detection sensor(obstacle sensor), and depending on data received through the sensors, the heater, cooling fan, alarm and bulb will be switched ON/OFF. Motion detector will detect motion in the room when security mode will be ON.

Temperature and humidity sensors sense the temperature and humidity respectively and if the value crosses, the threshold then room heater or cooling fan will be switched ON/OFF automatically providing temperature and humidity maintenance. This block will also controls water pump depending upon the soil moisture data sent by block 1.

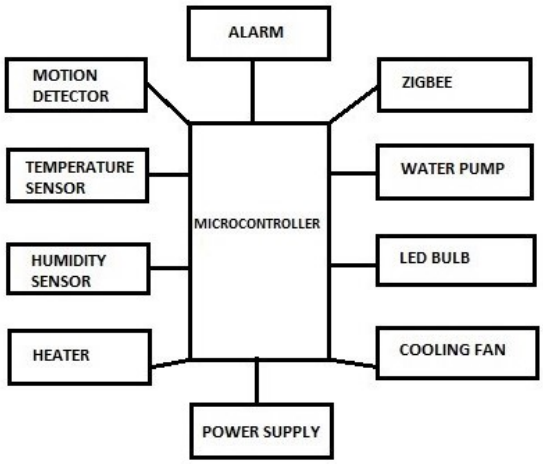

FIGURE 3 : SMART WAREHOUSE

C. Block 3

Solar PV panels have been used to generate electricity for the entire system. It will provide green and pollution free power.

III. DEVICES USED

A. Temperature Sensor

This sensor is mainly used inside the warehouse, and connected to the microcontroller. It detects temperature inside the warehouse, which can then be modified by switching the heater ON/OFF.

B. Humidity sensor

This sensor is used in the warehouse to detect the humidity inside. Accordingly, the cooling fan is switched ON/OFF.

C. Moisture sensor

The soil moisture sensor is used to sense the moisture in the soil of the field and transfer it to microcontroller of block 2 in order to take controlling action of switching water pump ON/OFF.

D. Ultra-Sonic Obstacle sensor

We use an obstacle sensor for obstacle detection in case of the remote controlled vehicle and as for theft detection in the warehouse.

E. AVR Microcontroller At mega 16/32

The 2 microcontrollers, one in the warehouse and the other in the vehicle are connected to the sensors and other devices, to monitor and control them.

F. ZigBee Module

ZigBee is used for wireless communication between the two blocks: remote controlled vehicle and warehouse.

IV. ACKNOWLEDGMENT

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VII. CONCLUSION

Based on using the green energy and smart technology the agriculture sector will find better productivity.

REFERENCES

[1] S. R. Nandurkar, V. R. Thool, R. C. Thool, "Design and Development of Precision Agriculture System Using Wireless Sensor Network", IEEE International Conference on Automation, Control, Energy and Systems (ACES), 2014

[2] Dr. V .Vidya Devi,G. Meena Kumari, "Real- Time Automation and Monitoring System for Modernized Agriculture" ,International Journal of Review and Research in Applied Sciences and Engineering (IJRRASE) Vol3 No.1. PP 7-12, 2013

[3] Y. Kim, R. Evans and W. Iversen, "Remote Sensing and Control of an Irrigation System Using a Distributed Wireless Sensor Network", IEEE Transactions on Instrumentation and Measurement, pp. 1379–1387, 2008.

[4] Hayes, J.; Crowley, K.; Diamond, D. Simultaneous web-based real-time temperature monitoring using multiple wireless sensor networks. Sensors IEEE, October 30-November 3, 2005, p. 4.

[5] Arampatzis, T.; Lygeros, J.; Manesis, S. A survey of applications of wireless sensors and Wireless Sensor Networks. In 2005 IEEE International Symposium on Intelligent Control & 13th Mediterranean Conference on Control and Automation. Limassol, Cyprus, **2005**, 1-2,

[6] N. Kotamaki and S. Thessler and J. Koskiaho and A. O. Hannukkala and H. Huitu and T. Huttula and J. Havento and M. Jarvenpaa(2009). "Wireless in-situ sensor network for agriculture and water monitoring on a river basin scale in Southern Finland: evaluation from a data users perspective". Sensors 4, 9: 2862-2883. doi:10.3390/s90402862 2009.

[7] Baker, N. ZigBee and bluetooth - Strengths and weaknesses for industrial applications. Comput. Control. Eng. **2005**, 16, 20-25.

[8] Viswanath Naik.S, S.Pushpa Bai, Rajesh.P and Mallik arjuna Naik.B, IOT Based Green House Monitoring System, International Journal of Electronics and Communication Engineering & Technology (IJECET), 6(6), 2015, pp.45-47.