Surveillance and Control of Vast Farms and Polyhouses using IoT

Team #3
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Abstract— **Continuously obtaining information on aspects such as temperature and soil moisture possess a major challenge in huge farms and poly houses. Certain variations in the above mentioned qualities when left unnoticed leads to diseases among the crops that reduces the total yield. In order to maintain and control the required environmental parameters in a poly house, internet based technology is used this model of smart farming primarily consists of three layers. Sensors forming the first layers that is situated in the field area, through Wi-Fi network which forms the middle layer. Lastly the information is passed through the program and then given out to the farmer. This helps the famer to make a transition from old methods to new and efficient methods of farming. The ease of accessing the current information related to field and receiving details on crop requirements becomes the peculiar feature. Hence helping in rapid diagnosis if pests and plant diseases.**

Keywords— monitoring and Control through internet, Polyhouse farm environment management.

I. INTRODUCTION

There couldn't have been a better time than today to be in the world of the technology we live in, even if id tend to put the word technology right there it would seem incomplete, as this era looks forward for more and more and towards the "What is the next big thing that we can see". Even the word internet would seem little, but to look at the span of all these years of what we could accomplish would even leave a tiny small space for Blasphemy. We can say we have the "God Tech" in our hands but nevertheless it's still a long way to go. To speak of what we have today we can boast of the word "Data". It's probably the only thing we see that runs the world right after money, "Data" The most important functionality of the web, give out the data or grab the data from whomever wishes to share it. This functionality in the web is the best fetch to build better automated system, AI, self-defending servers, this goes on. A balanced and justified usage of internet facilities can lead to reduction in design cycles and subsequent improvement of overall quality [1]. A better use of the combination of these internet components can hold a better strategy to one of the most ignored fields of interest "agriculture". Computer based acquisitions, web based experiments and virtual instrumentation and control applications have been an active era of interest in recent years [2-3]. The work reported by Regtien et al [4]. Exemplifies the magnitude of interest in web-based systems on measurement techniques. Simultaneously we have seen the exponential growth in mobile telephony in the last decade. It is natural that internet and mobile technology are going through a phase of fusion. India is the second largest mobile market in the world after china, with over 490 million subscribers in the mobile market according to the latest figures provided by Telecom Regulatory Authority of India [5]. In the context of large developing countries like India, it is increasingly becoming clear that mobile telephony coupled with internet services will prove to be one of the most efficient systems for penetration of services, products.

Polyhouse farming is an alternative new technique in Agriculture gaining foothold in rural India and can be successfully employed for niche areas of agriculture. A typical Polyhouse (metal structure covered with Polythene) is from 400 - 10,000 m_2; this makes them suitable for farmers with Small land holding also. A low - to medium - cost Polyhouse Could cost between Rs. 125 to Rs. 500 per square meter in India, whereas a high-cost, fully-automated Polyhouse costs Rs. 2,000 per square meter [7]. Most Indian farmers cannot afford such high costs but group of farmers and co-operatives can use such systems. Farmers do require expert guidance to Use this new technology of Polyhouse farming. This Methodology of farming reduces dependency on rainfall and Makes the optimum use of land and water resources; typical gains may be three times those of traditional farming [8]. It enables cultivation of regular crops in off-season too. Parameters such as moisture, soil nutrients, solar flux, air movement, humidity, dry bulb and wet bulb temperature etc., inside a Polyhouse needs to be controlled to ensure timely and abundant yields. Information on the installation of the Polyhouse, its economic viability, availability of subsidies for erecting them, and other technical information is available through various agriculture universities, district central nurseries and also by private consultants [6, 9, and 19]. Currently, farmers from the states of Himachal Pradesh, Punjab and
Maharashtra are taking interest in Polyhouse farming [11-12]. Other than usual agricultural processes, practices and Methodologies like usual pre and post-harvest operations, one aspect which differentiates a Polyhouse from conventional farm is the control and monitoring of the process parameters. This is exemplified through a recent work by Cha´vez et al [13]. Wherein a remote irrigation monitoring and control system has been studied for precision control irrigation in areas having scarcity of water. Sometime back Rokade [14] has also addressed these issues. At present there are very few companies/service providers who are involved in such control, monitoring and automation of Polyhouses in India [15]; few examples can be seen in states of Maharashtra, Gujarat and Tamil Nadu [16]. Popularity of Polyhouses will naturally lead to increase in demand for better control and automation. In this paper, we suggest and demonstrate an integrated system monitoring and control of a Polyhouse environment through internet based services. This is done by incorporating analog sensor network followed by integration with digital data acquisition and control platform through LabVIEW® interface. The developed system allows toggle on/off as well

as implementation of sensor based control algorithms. Various analog parameters like temperature, humidity, pressure, etc. can be sensed and relevant controls like fan, pump, louvers, shades, air movement, etc. can be activated; All this is achieved through internet connectivity or alternatively through a mobile telephone network.

II. FUNCTIONALITY

The product ensures safety of the farm and vast poly houses from trespassers and animal invasions. The product is exceptional as there is no certain product that does all the mentioned functions and thus reducing the time and increasing the efficiency of the farmer. There are five major components of this product, firstly it works on both microprocessor and a controller. The microcontroller used is esp8266 (***figure 1)***. Most of the functions of this product is executed with the help of microcontroller. It has functions such as detecting when an animal is going to feed on our crops or some ill-wishers trying to destroy the yield. The product can also be used in poly house where the entry control can be sensed. Also the message will be sent to the owner of the farm. This will help the farmers keep track of all the people entering the farm. This is better than using a camera in the entrance because the response to the entry will be faster if unexpected entry is made. In case of using a camera at the entry, then they will be able to figure out who entered after a very long time gap. This can also be fooled easily, which is happening frequently nowadays. The next feature to the product is the light. There are few crops that need light for the whole 24 hours period of time. Or there are conditions where increased period of time will increase the total productivity of the field. Crops such as tomatoes, peppers and beans can grow with greater speed when increased period of light is given. Hence helping the farmer. Next best feature introducing to Indian farmer is the soil moisture sensor. The amount of water in the soil effects the crops in a highly different way, the increased irrigation may even lead to destruction of the entire crops. Crops that catch diseases due to over irrigation will lead to spreading of the diseases to the entire field. Hence detecting the moisture in the soil becomes extremely important. The last function of the product is detecting the temperature, a little variation in the temperature can cause drying up of the crops that will again lead to reduction in the yield. The arising issue in the generation being global warming, it becomes very important to detect the increase and decrease of the temperature. The product facilitates and helps farmer take immediate action that is required to make the crops survive.

III. SYSTEM ARCHITECTURE

The functional setup was built completely by the enlisted components itself, the major components used are the basic blocks of the whole electronic systems that is the microprocessor and the microcontroller. The microprocessor used is the raspberry pi which is connected with the passive infrared sensor that detects the human movements based on human body temperature. This is then connected to the firebase cloud which is then in turn connected to the mit app inventor, thus notifying the farmer about anyone's entry. Secondly the lights used here are led which switch on when there is a loss of sunlight. The LDR is connected with the led lights such that when the intensity of the sunlight decreases then the resistance in the LDR also simultaneous decreases which in turn lets the current to flow in hence lighting increases. This can be further improved by using an air heater instead of a led. Next we are using a soil moisture sensor which detects the amount of soil moisture present and then sends the information to our cloud based ubidots platform that is coded in such a way that when there is a decrease in soil moisture then the farmer is notified. So that immediate action can be taken. The quirky feature about the product is the ultrasonic sensor. The ultrasonic sensor is connected with a buzzer and coded for it to start buzzing when a certain plucking of plants or any such activities are initiated. The last feature included in this project is the ability to detect the temperature. The DHT sensor is used and coded such that when the temperature falls or increases above a particular temperature then the farmer is again notified. In the upcoming models, the notification will be designed in such a way that it will be provided in the regional language and even the needed suggestions is given to the farmer

Figure 2.

IV. SUMMARY AND CONCLUSION

During the time of working on the given project, the concepts that would be most important and hence shaping the future of the farmer is the knowledge of iot. The concept of iot helps in data storage in the cloud which automatically reduces the time required for data accumulation and data processing and also error correction. Thus making the process of farming simple and easy.

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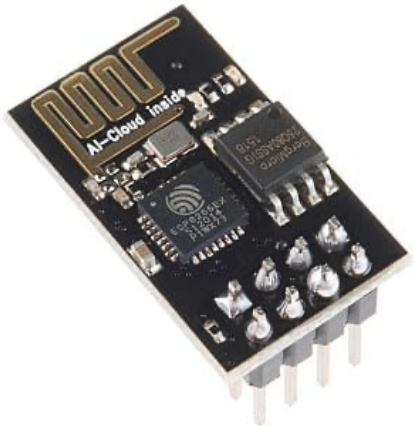

Figure 1.

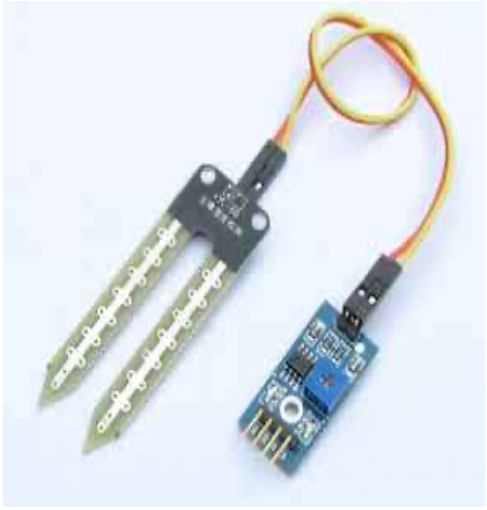

Figure 3.