LITERATURE REVIEW: SMART FARM USING IOT

Abstract:

Agriculture plays an important role in the overall economic development of a nation. Advancements in technological arena will increase the competence of some farming activities. In this paper, we have proposed a methodology for smart farming by using a smart sensing system which makes use of a wireless communication technology. This system focuses on the measurement of physical factors such as soil moisture content, nutrient content and pH of the soil. We will also use water level sensor and based on that sensor output, we will drive our motor to supply water to plant. The detailed meddling, control strategies and how we implement the concept of IOT are demonstrated in this paper.

I. INTRODUCTION

The development of agriculture spans thousands of years and has been affected by human cultures, climate variations, and evolving technologies. Despite the industry's evolution over the centuries, all types of farming still rely on methods to maintain environments conducive for raising domestic species.

As with advances in other industries, the agriculture industry has been also accelerating to develop by deeply employing information and communication technologies (ICT). In particular, automated farm systems, built with diverse wireless sensor devices and actuators, are able to monitor the environmental conditions and control the deployed devices according to the collected data through wireline and wireless access networks. A modern innovation in the agriculture industry is the Green Revolution, which began in the second half of the 20th century. This development is cited for saving people around the world from starvation through initiatives involving irrigation systems, production of high-yielding crops, and better management strategies.

Agriculture in India:

Agriculture is the most important sector of Indian Economy. Indian agriculture sector accounts for 18 per cent of India's gross domestic product (GDP) and provides employment to 50% of the countries workforce. According to the data provided by Department of Economics and Statics (DES) the production of food grains for the year 2013-2014 is 264 million tons which is increased when compared to (2012-2013) 257million tons. This is a good symptom for the Indian economy from the agriculture sector. Indian is an agriculture based country, where more than 50% of population is depend on agriculture. This structures the main source of income. The commitment of agribusiness in the national income in India is all the more, subsequently, it is said that agriculture in India is a backbone for Indian Economy. The contribution of agriculture in the initial two decades towards the total national output is between 48% and 60%.

WHAT IS SMART FARMING?

Smart Farming is a farming management concept using modern technology to increase the quantity and quality of agricultural products. Farmers in the 21st century have access to GPS, soil scanning, data management, and Internet of Things technologies. By precisely measuring variations within a field and adapting the strategy accordingly, farmers can greatly increase the effectiveness of pesticides and fertilizers, and use them more selectively. Similarly, using Smart Farming techniques, farmers can better monitor the needs of individual animals and adjust their nutrition correspondingly, thereby preventing disease and enhancing herd health.

WHAT IS IOT?

Internet of Things (IoT) is an ecosystem of connected physical objects that are accessible through the internet. The 'thing' in IoT could be a person with a heart monitor or an automobile with built-in-sensors, i.e. objects that have been assigned an IP address and have the ability to collect and transfer data over a network without manual assistance or intervention. The embedded technology in the objects helps them to interact with internal states or the external environment, which in turn affects the decisions taken.

HOW CAN IoT HELP?

IoT platforms can help organizations reduce cost through improved process efficiency, asset utilization and productivity. With improved tracking of devices/objects using sensors and connectivity, they can benefit from real-time insights and analytics, which would help them make smarter decisions. The growth and convergence of data, processes and things on the internet would make such connections more relevant and important, creating more opportunities for people, businesses and industries.

AGRICULTURE AND IOT

loT has been applied in agriculture in general, in arable farming, in fisheries and aquaculture, in animal food consumption, in agri-food supply chain, in green house horticulture and livestock farming.

The benefits that farmers get from applying loT is two pronged; firstly farmers can optimize the use of inputs and also farmers can decrease production costs. Furthermore, the other benefits were also itemized below:-

- Saves cost by effectively using inputs
- Better monitoring of crops and avoiding crop losses through disease or adverse weather
- Help in optimizing water use
- Better planning of farm activities

The challenges of loT in agriculture are the cost of equipment and the need for wider internet coverage. These two prerequisites eliminated many farmers in the developing countries to enjoy this technology.

In this paper, we demonstrate a prototype which aims to provide water to the plants in the user's home through an application, using various sensors and bluetooth (IoT).

II. EXISTING METHODS

a. Android Application (using USB)—This app works via USB On The Go (OTG) to connect your device to Arduino via USB cable. One of the benefits of USB is that it requires no internet or Bluetooth connection in order to operate. **Benefits**: Having an IDE to hand is the perfect thing to make quick changes in the field. Attaching an Android device is much less cumbersome than having to balance a laptop on your hand. **Drawbacks:** Typing code out on your device might not be too comfortable, especially if it is a smart phone.

b. Bluetooth Controller—The app sends data to your board via Bluetooth, allowing you to send serial data by pushing a button in the app. You will need a Bluetooth module for your board. **Benefits:** This app is less about programming an Arduino on the fly, and more about triggering changes in the uploaded sketch. **Drawbacks:**

c. Infrared Control— This method requires your Android device to have an IR blaster built in. There are many apps available to make use of this feature, though the Mi Remote controller is free, and functions with many other household devices. **Benefits:** It is the cheapest way to communicate with your board wirelessly. Even if you cannot scavenge the parts to do this, an IR receiver costs less than a dollar. **Drawbacks:** This method only works in the line of sight, which makes it difficult for the user to operate the system from some other corner of the house.

d. Blynk— Its flexibility and simplicity make it an intuitive way to trigger events on your board. **Benefits:** The service is well documented, and its intuitive app makes it simple to put together custom controls for the project. **Drawbacks:** It requires wi-fi or mobile data at all times for the project to work.

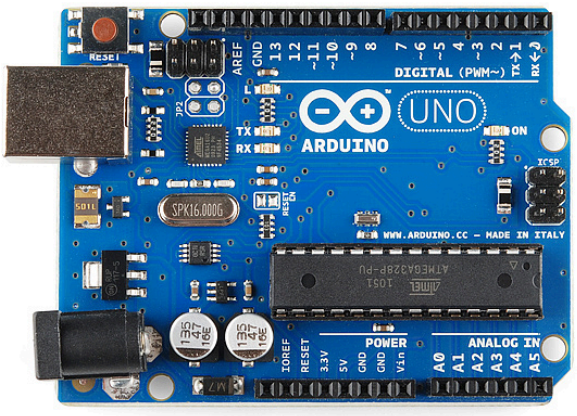
III. ANALYSIS OF VARIOUS EXISTING PROJECTS

PAPER	TECHNIQUES	RESULT	DRAWBACKS
Smart Drip Irrigation System using Raspberry pi and Arduino	Raspberry pi, arduino microcontrollers, xbee modules.	Automates and regulates the watering without any manual intervention. Sending the emails to the system.	Failure of any particular part or device is not informed and has to be tested manually
Multidisciplinary Model for Smart Agriculture using Internet-of-Things (IoT), Sensors, Cloud-Computing, Mobile-Computing & Big-Data Analysis	(IoT), Sensors, Cloud-Computing, Mobile Computing, Big-Data analysis.	Beneficial for increase in agricultural production and for cost control of Agro-products.	Different soil nutrient sensors are not used.
Nurture the nature with smart farming solutions by Kaa.	Raspberry pi.	promise to deliver 24/7 visibility into soil and crop health, machinery performance, storage conditions, animal behavior, and energy consumption levels.	Working of this model has to be tested manually.

UNE SMART Farm	farm-wide mobile phone network coverage, a terrestrial wireless NBN link, AARNet optical fibre and, most recently an NBN satellite link.	agri-ecosystem offering a farm (landscape)-wide communications (telemetry) backbone back to the new SMART Farmhouse, supported by farm-wide mobile phone network coverage, a terrestrial wireless NBN link, AARNet optical fibre and, most recently an NBN satellite link	Quite expensive for the farmers.
Yuktix Technologies Pvt Ltd	Raspberry pi, Android app development, low power wireless sensor nodes.	Remote Control of farm irrigation system - Remotely controlling motors irrigating fields either with a Android application or DTMF.	Model is not easily available.

III. ARDUINO

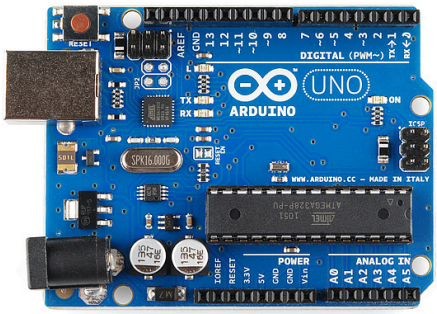
ARDUINO is a micro controller, which is a part of the computer. It can run one program at a time and can be powered using a battery pack. Arduino requires an external hardware to connect to the internet and has only one USB port to connect to a computer. This is available for low cost. The Arduino platform has become quite popular with people just starting out with electronics, and for good reason. Unlike most previous programmable circuit boards, the Arduino does not need a separate piece of hardware (called a programmer) in order to load new code onto the board – you can simply use a USB cable. Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program. Finally, Arduino provides a standard form factor that breaks out the functions of the micro-controller into a more accessible package.



THE ARDUINO FAMILY

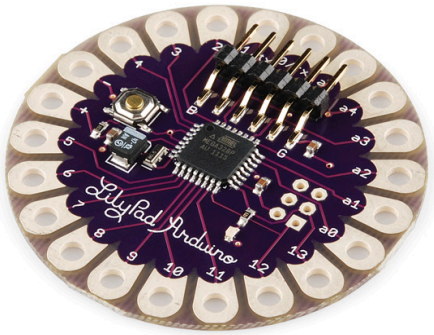
1. Arduino Uno (R3)

It is micro controller board that can easily be connected to a computer with a USB cable.



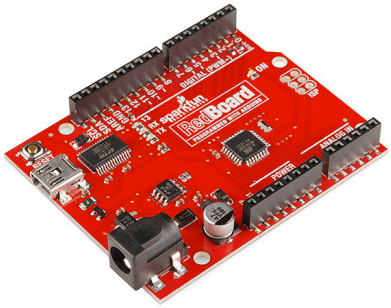
2. LilyPad Arduino

It is wearable e-textile technology developed by Leah Buechley. LilyPad has its own family of sensor boards that are also built specially for e-textiles which are washable.



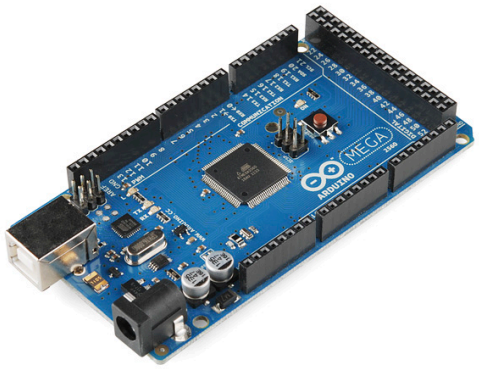
3. RedBoard

This is the simplest and most stable one. This can be programmed over a USB Mini-B cable using Arduino IDE.



4.Arduino Mega(R3)

It has lots of digital input/ output pins. Mega can also be simply connected to a computer with a USB cable. The large number of pins make this board very handy for projects that require a bunch of digital inputs or outputs.



5. Arduino Leonardo

This is the first development board to use one micro controller with built-in USB. This means that it can be cheaper and simpler.

IV. RASPBERRY-PI

A Raspberry Pi is was created by Eben Upton, whose goal was to create a low-cost device that would improve programming skills and hardware understanding. It is slower than a modern laptop or desktop but it is still a Linux computer and can provide all the expected abilities like a lower-power consumption level.
But Raspberry Pi is not compatible with other operating systems such as Windows. It is quite expensive as to make a full project using Raspberry Pi would cost one more than $35.
1st Generation - Raspberry Pi 1 Model B - released in February 2012. A computer model was released in 2014.
Raspberry Pi zero with a smaller size was released in November 2015.
Raspberry Pi Model B was released in February 2016 with 64-bit quad core processor, WiFi, bluetooth and USB boot capabilities. Finally, in 2018 model 3B+ which was three times faster network was launched.

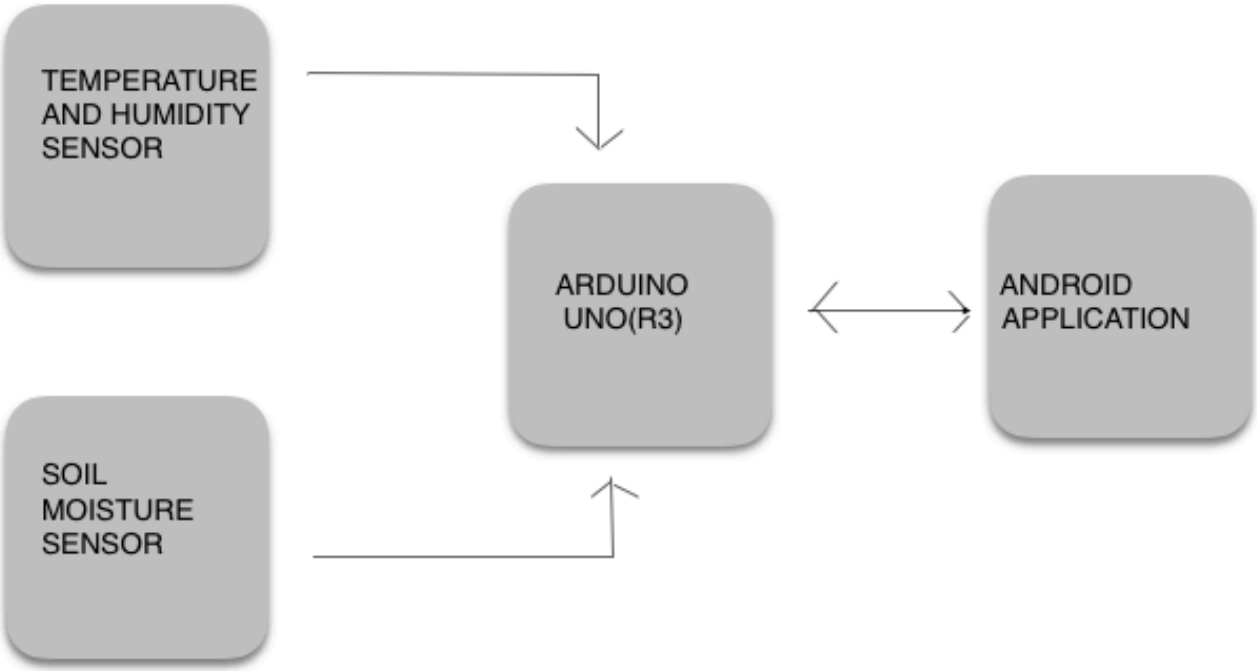
V. RASPBERRY PI VS ARDUINO

The following table draws a comparison between Raspberry Pi and Arduino, and explains why we chose Arduino for this project and not Raspberry Pi.

RASPBERRY-PI	ARDUINO
Any programming language can be used in order to operate the hardware.	Only C/C++ can be used to operate the hardware.
Speed of the process is 700 MHZ	The speed of the processor is 16MHZ
It is a fully functional computer.	It is a micro controller.
It is quite expensive.	It is affordable.

Arduino has a ‘real time’ and ‘analog’ capability that the Pi does not have. This flexibility allows Arduino to work with any type of sensor. It is easier to use Arduino, as one can get an LED to blink in just seven to eight lines of code and makes the hardware projects simpler. It is best for motor driving, sensor reading, LED driving etc. On the other hand it is not practical for the beginners to use any model by Rasperry Pi as the kit is quite expensive. The easy availability and affordability of Arduino makes it our first choice for this project.

VI. FLOWCHART FOR THE MODEL



VII. CONCLUSION

Despite being a newer concept in the field, there has been a tremendous popularity in the agricultural circuits about the benefits of smart farming and the applicability of IoT. It has been looked upon as a hope to encourage innovation in agriculture with "connected farms" speculated to be the future of farming.If we talk about the India perspective, with its experience in IP design and project management, it shows up unique potential to come up with innovative products. And with the government initiatives like "Make in India" and "Smart India", IoT could be utilized to make the best out of our agricultural potential.

Most micro controller systems are limited to Windows. Simple, clear programming environment - The Arduino programming environment is easy-to-use for beginners, yet flexible enough for advanced users to take advantage of as well.We are doing our project on a smaller scale at our initial stages and therefore arduino supports the developments of these initial stages in the best possible way.

VIII. REFERENCES

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