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Next Generation of Agriculture with Arduino Uno

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ABSTRACT

Agriculture is a basic profession in our country to give the production that the local consumer needs. Through the five-year plan, Libya aims to modernize the agricultural sector and keep pace with the economic, social, and scientific changes taking place at the local and international levels. This plan will enable the country to increase the contribution of the agricultural sector and increase the rate of economic growth through employment. The project examines the agricultural environment of temperature, humidity, and irrigation control. The project works by voice commands, so that, the farmer is careful and knows the temperature and humidity, the proportion of water in the soil and all the information needed by voice commands. The environment will not be an obstacle to the production and growth of any plant, we can overcome the problem of scarcity of agricultural production, and can call a smart way to automate. The focus will be on providing a favourable atmosphere for plants. Monitoring the environment and providing solutions in line with climate change and real-time follow-up is an important factor in smart farming. A smart way to automate the farming process can be called smart farming. Using the system automatically enables you to eliminate potential crop threats by reducing human intervention, increasing productivity, improving a product, and providing private nurseries and farms to Agriculture Research Centre and farmers. The focus will be on providing a favourable environment for plants. This project includes many features such as ***a device,*** humidity, temperature control, intruder risk, water flow and monitoring using different sensors**.**

الجيل القادم من الزراعة باستخدام *Arduino Uno*

مؤيد م. السوكاح، عامر ر. زريق، ليلى ساسي يونس

الزراعة مهنة أساسية في بلدنا لاعطاء الانتاج الذي يحتاجه المستهلك المحلي. من خلال الخطة الخمسية ، تهدف ليبيا الى تحديث القطاع الزراعي ومواكبة التغيرات الاقتصادية والعلمية التي تحدث على المستويين المحلي والدولي. ستمكن هذه الخطة البلاد من زيادة مساهمة القطاع الزراعي في الناتج المحلي الاجمالي وزيادة معدل النمو الاقتصادي من خلال التوظيف. يفحص المشروع البيئة الزراعية لدرجة الحرارة والرطوبة ومراقبة الري. حيث يكون المزارع حريصًا ويعرف درجة الحرارة والرطوبة ، ونسبة الماء في التربة وجميع المعلومات التي تحتاجها الأوامر الصوتية. لن تكون البيئة عقبة أمام انتاج نمو أي نبات ، يمكّنك استخدام النظام تلقائيًا من القضاء على تهديدات المحاصيل المحتملة عن طريق الحد من التدخل البشري ، وزيادة الانتاجية ، وتحسين المنتج ، وتقديم مشاتل ومزارع خاصة الى مركز البحوث الزراعية والمزارعين. يتضمن هذا المشروع العديد من الميزات مثل الجهاز والرطوبة والتحكم في درجة الحرارة ومخاطر الدخيل وتدفق المياه والمراقبة باستخدام أجهزة استشعار مختلفة.

INTRODUCTION

Agriculture is the bases of human life and the continuation of the human life cycle that provides food needs, meet needs and even export abroad. In recent years, farmers face problems due to climate change or natural disasters such as floods and fluctuating weather conditions. Accompanying intelligent farming, agriculture or education is a vital profession where the continuity of humankind is maintained and the focus of precision agriculture has been mainly on a technological invention to allow site-specific cultivation (*Klug et al., 2012*). Also, there are other advantages, Smart Farm revolves around empowering farmers today through decision tools, and automation measurement techniques that seamlessly integrate products, knowledge, and services to improve productivity, quality, and profitability. Technological advancement in these areas is gathering increasing momentum, and this means that maintaining an overview of the latest developments becomes more and more challenging (*Kumar et al., 2013*). The most important things in smart agriculture are environmental measurements and water management. The reason is that environmental management and water directly affect plant growth. Vertical agriculture is a modern tool to feed large numbers of the world's population by 2050. Sensor networks used are a set of small, low-cost sensors that collect and distribute environmental data. Sensor to monitor and control the corresponding physical environments efficiently, follow-up and better accuracy (*Willig and Karl,2015*). Smart agriculture is essential to balance demand and supply, as the population increases day by day, increasing demand for and consumption of food commodities. Compared to the past 50 years and earlier, the demand for food has increased, to overcome the requirements and keep pace with the demand for food commodities, it is necessary to spread the modern technology of this vital source of human beings. Agriculture is a vital part of human society and a real need for its continuation. In 2007, the number of agricultural holders in Libya were 163,440, by sex, to 151,912 males and 11,534 females. 23. 3% of the owners are their main profession. The total area of agricultural property is 1,105,357 hectares, an average of 7. 1% (administrative section during 2007). This average increase in the popularity of the prairies to 38.4 hectares for tenure and the lowest average in the popularity of Tripoli, where it reaches 3.1 hectares. The data collected from sensors provide information about various environmental factors including temperature, humidity, and others. Monitoring environmental factors not the complete solution to increase crop abundance, good growth, product development, and product quality. Many other factors significantly reduce productivity and smart farming in agriculture to overcome and reduce these problems. Therefore, the search for a solution to all these problems to develop an integrated system that monitors and addresses all factors that affect productivity at every stage of the productive cycle. But full automation in agriculture has not been achieved due to various issues but significant development has been observed in recent years. This paper then discusses the development of smart farming and gives farmers better opportunities to develop and increase productivity as well as self-sufficiency for home and laboratory users. In this research, the project helps together information about conditions such as humidity, temperature, humidity and motor control using the Arduino Microcontroller. Crops can be monitored and controlled using Arduino Uno. Sensors are used to monitor farm conditions and use Microcontroller to control Arduino UNO and automate agricultural operations. This paper is useful for farmers in maintaining and controlling crop production.

METHODOLOGY

The project aimed to design the next generation of a smart farm, focusing on the application of sustainable agricultural practices, increasing productivity and flexibility, monitoring production, reducing greenhouse gas emissions and reducing pressure on depleted water resources. This system has been studied so that it can be manufactured and developed locally. Once the research is completed, the smart farm model is manufactured, analyzes of system stability and feasibility study are carried out. The main goal of the team will be to design a reliable local smart farm by completing the following objectives.

1. To analyze all current environmental agricultural products and choose from the darkest quality levels concerning price.
2. To manufacture and develop a smart farming model.
3. Identify and support the overall quality of the smart farm.

4. Development of a small farming system.
5. No need to connect to the Internet.
6. Control of agricultural fields.
7. Environmental monitoring system.
8. Expand farm automation.

CHALLENGES IN AGRICULTURE INDUSTRY

1. Lack of interest and guidance of the agricultural profession among young and educated professionals.
2. Lack of awareness among farmers about the benefits of ICT in agriculture.
3. Know less about the weather forecast.
4. Radical changes in climate conditions
5. relatively high cost for large areas.
6. Incomplete production information.
7. Weak ICT infrastructure and ICT illiteracy.

RELATED WORK

(Suchithra, et al., 2018) works on "Monitoring Of Agricultural Crops Using Cloud and IOT with Sensor Data Validation", they conclude those work details do farming in a smart and more efficient way. In addition, this method advocates for the use of the Internet of Things. Internet of Things has enabled the agriculture crop monitoring easy and efficient to enhance the productivity of the crop and hence profits for the farmer (*Suchithra et al., 2018*) . (*Shaji and MTech Student* , 2018) works on "Raspberry pi based real time monitoring of Agriculture & Irrigation Using IOT ", They conclude that work details by using various sensors. Also, agricultural product quality can be improved because farmers observe the whole cycle from seeding to selling using this IoT based agricultural production system (*Shaji and MTech Student* , 2018). (JanhaviKasaA, et al., 2018), works on "Smart Agriculture using Clustering and IOT", They conclude that this work details implemented a system that will collect data from multiple nodes and using this sensor data the farmers will be able to control the operations on the agricultural field wirelessly and remotely anytime (JanhaviKasaA., *2018*). (Ahmed & Iftekhar ,2018) works on " Internet of Things (IoT) for Smart Precision Agriculture and Farming in Rural Areas "they conclude these work details have presented an IoT-based control system for advancement in agriculture and farming of rural areas. Different components and enhancements of the control system are discussed and analyzed in all aspects including testbed evaluation(Ahmed & Iftekhar , 2018). (Yadav et al.,, 2017) works on " Design and implementation of Smart Agriculture using Embedded System ", They conclude this work details The existing system works in a manner in which it firstly does data collection from the farm via the help of sensors, then it sends data to the server-side from where and on which further actions can be taken (*Yadav,et al., 2017*). (Mohitkumar & Rahul , 2017) works on "A Review Paper on Internet of things based Application Smart Agricultural System" ,they conclude this work details As per the existing system, there is a need for those type of system, which is real-time data analyzer which can send data around the world using the concept of IoT((Mohitkumar & Rahul , 2017). (*Sen* & *Madhu* ,2017) works on "SMART AGRICULTURE: A BLISS TO FARMERS ", They conclude that this work details needed farmers are provided with proper training about technologies, with a smart mobile in hand they can perform many of their agricultural tasks without even reaching there. It helps farmers to stay connected with their farms from anyplace anytime (*Sen* & *Madhu* ,2017). (Odara & Zain, 2015) works on ,"Integration of Precision Agriculture and SmartGrid technologies for Sustainable Development" , They conclude that this work use of commercial agricultural practices such as irrigation and fertilization cannot be done in an efficient manner without the use of P A (Odara & Zain , 2015). (Roham, et al., 2015) works on "Smart Farm using Wireless Sensor Network ", They conclude this work detail is going to monitor these changes periodically and take action automatically or pretend the required action to the farmer. System will has a provision to visualize the graphical representation of all the streaming data from the greenhouse (*Roham et al., 2015*).

NASA AND AGRICULTURE BY PROTOTYPE LUNAR GREENHOUSE (LGH)

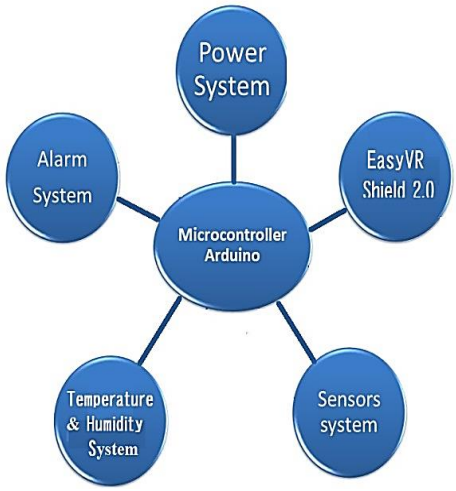
NASA is concerned with the challenges and its long-term goal in space, in a colony on Mars or in another world, a difficult subject to occur, including the need to grow and produce food.Scientists at the Kennedy Center for Advanced Lifestyle Research are working on a typical (protected) green home project on the moon or Mars to meet this challenge.NASA researchers are developing a global warming system that can help support astronauts working in space and provide them with the lunch they grow and harvest themselves.While NASA has already planted plants on the International Space Station, it is seeking the best solutions and techniques for planting in space, the moon, and spacecraft.NASA unveils the design of an inflatable "greenhouse" tube that can feed early explorers on Mars missions, and includes a prototype project of the Moon / Mars inflatable tube greenhouse.It recycles nutrients in a loop, mimicking processes on Earth that support life, advanced prototypes 18 feet in length and over 8 feet in diameter to protect astronauts from space radiation, and greenhouse units are likely to be buried under topsoil or reorganized, thus Requires specialized lighting.Prototype Lunar Greenhouse (LGH) is equipped as a bio-generation life support system (BLSS) . Figure 1 below shows a draft prototype of the Moon / Mars for global warming.

"Fig 1," :- The Prototype Lunar/Mars Greenhouse Project.

PROPOSED METHOD

An intelligent planting system is required. The system is designed to be light and easy to use. All this is done by the farmer's voice commands. The system consists of a controller with an Arduino Uno system to control the system using Easy Virtual Reality 2.0 used to activate voice commands and connect sensors.

Smart farm and devices are connected to all sensors in Arduino Uno. System components include Arduino Uno controller and Easy Virtual Reality sensors designed to receive changes in environmental factors including temperature, lighting, humidity, etc. by connecting the system, the transceiver circuit, LM35 temperature sensor, and motherboard are inserted with the subscriber identity module card used to communicate with Registered farm values. Figures 2 below shows the block diagram proposed a method.



"Fig 2," :- Block Diagram Proposed Method.

HARDWARE

Arduino Uno microcontroller, Easy Virtual Reality 2.0 , Lighting, relay, pump, ADC adapter, PIR Sensor, Soil Moisture Sensor, Temperature Sensor LM35, Aquarium and Pipes.

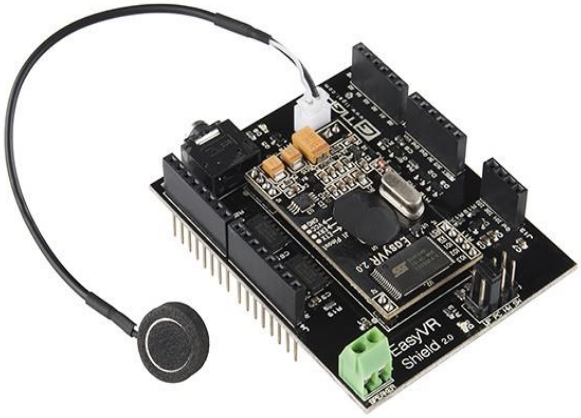
Ardunio Microcontroller

The Arduino system has become very popular in people who have just started using electronic devices, unlike most previous programmable circuit boards, Arduino does not need a separate piece of hardware (called a programmer). In addition, the Arduino IDE uses a simplified version of C, making programming learning easier. Figure 3 below shows the Arduino Uno microcontroller board.

"Fig 3," :- Arduino Uno Microcontroller Board

EasyVR Shield 2.0

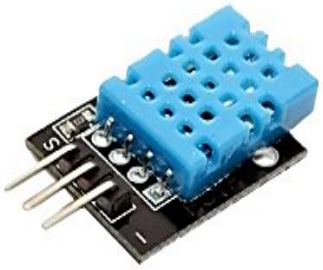
Shield 2.0 Standalone (SI) commands with a custom speaker 28. This piece increased the efficiency of the project so that we and the words of the volunteers who contributed to the initial tests concluded that having an interaction through voice commands was a super cool project and attracted their interest. Figures 4 below shows the EasyVR Shield 2.0.



"Fig 4," :- EasyVR Shield 2.0

DHT 11 - Temperature And Humidity Sensors

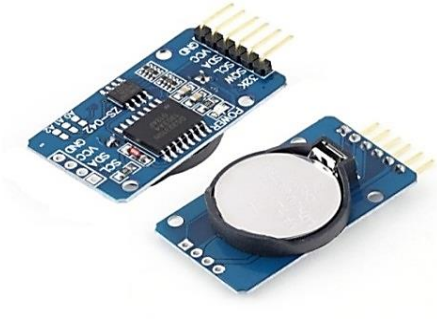
The DHT11 humidity and temperature sensor makes it very easy to add humidity and temperature data to the project. This sensor helps to know the temperature and humidity in the room. Figures 5 below shows the DHT11 Temperature and Relative Humidity Sensor Module.



"Fig 5," : : DHT11 Temperature and Relative Humidity Sensor Module

DS3231 Real Time Clock Module

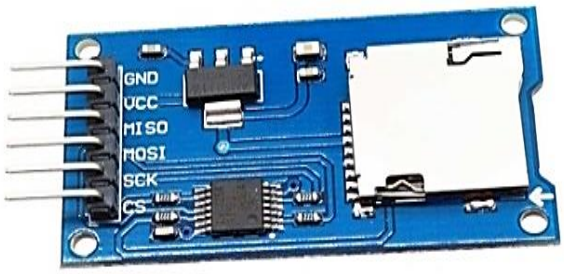
DS3231 Real Time Clock Module runs on a battery and can track time even if we reprogram the Microcontroller or disconnect the mains. An integral part of the project to knows the time. Figure 6 below illustrates the DS3231 real-time clock module.



"Fig 6," :- : DS3231 Real Time Clock Module

Micro Secure Digital (SD) Card for Arduino

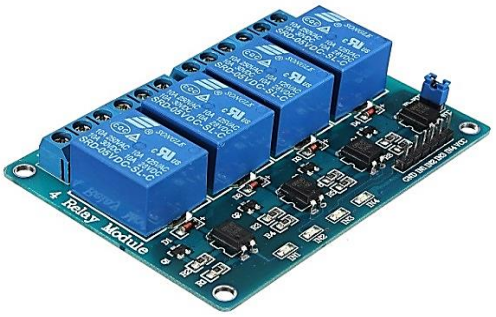
The Secure Digital card module is a simple solution to transfer data to and from the standard Secure Digital card. This card allows us to add mass storage And record the data to the project. You can read and write to the Secure Digital card using the Arduino and modify them. Figures 7 below shows Micro Secure Digital Card for Arduino.



"Fig 7," :- Micro SD Card for Arduino

Relay Module

Relay monitoring is an essential part of any automation system and evolution of the IoT and AI. In this project, the first part is devoted to how to read data from a temperature and humidity sensor. The second part was opening and closing the TV, Radio, light and air conditioner. Figure 8 below shows the relay.



"Fig 8," :- Micro SD Card for Arduino

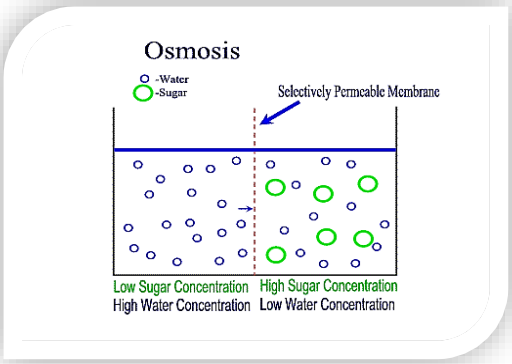
RESULTS

Slow Growth Conservation

The growth of plant material under limited growth conditions from several months to a few years. Such as the use of growth retardants and osmotic agents for instance the use of elevated concentrations from :

- ✓ Sucrose
- ✓ Sorbitol
- ✓ Mannitol
- ✓ Abscisic acid (ABA)

Figure 9 below shows theOsmosis



"Fig 9," :- The Osmosis

PROJECT FEATURES

Advantages

1. Easy to use and absorb.
2. Remote monitoring and monitoring.
3. Increase and abundance in production.
4. Enhanced security and safety.

5. Easier farming procedures and record production data.
6. The possibility of immediate interventions around the clock.
7. Keeping pace with the development of advanced agricultural techniques.
8. The possibility of adding other features.

Disadvantages

1. Needs periodic maintenance and detection.
2. Simple contrast in reading sensors when exposed to different environments.
3. Large-scale implementation may be more expensive.

FUTURE SCOPE

By further strengthening this project farmer can bring large tracts of cultivated land and spread it widely. Avoiding one of the biggest limitations of these systems is that the constant Internet connection is required at the end of the user, which may be expensive for farmers and also the lack of service in most agricultural areas. We overcome this by extending the system to send suggestions via SMS to the farmer directly on his mobile phone using the GSM module instead of the mobile application. Our trying to work the future on the project of designing an intelligent system and without the need for the Internet.

CONCLUSION

Since the project is a model developed in a short time, it can be improved by developing that practice on a large area as well as the use of public spaces, markets, roofs, corridors of buildings and schools. To improve and develop agriculture, switch to self-sufficiency, save water and monitor the weather, collect environmental data for a smart farm through sensors, send data to the farmer on the phone. The economy of the developing country is primarily dedicated to agriculture, so the use of modern technology, low-cost intelligent agriculture, controllable solutions and direct control over production and farms to increase production abundance to meet the need for lunch. Agriculture is gradually being replaced and promoted by a more sophisticated and accurate digital and electronic device. All experimental studies and tests show that this project is a proposal of embedded systems, irrigation problems, and significant water saving. This project in the field can certainly help to improve crop production, general production, self - sufficiency and small and small agriculture, as well as agriculture in spacecraft and space stations.

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