Smart Village: IoT Based Solar Powered Smart Agriculture System for Monitoring Climatic Change and Soil Fertilization

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Abstract— **In smart cities, access to sustainable energy services serves as the foundation for development. It empowers the internet connection with new opportunities to increase agricultural investment with relevant information and guidance, access to clean water, sanitation and food, the growth of productive businesses to increase the farmer's income. Land development depends on the development of the village. Most agricultural production suffers greatly from unexpected climate change. Therefore, farmers need to get the right information in the event of a sudden climate change, it should be notified in time to avoid any major damage to the agricultural sector. As part of a smart district concept, a smart plan has been developed that can help the farmer get the basics / basic infrastructure for agricultural development. Here a smart plan is proposed for farmers to get all the right information about improving soil and agricultural fertility by providing information on climate change through IoT (Internet of Things) devices. This information can be managed through the website and mobile. To facilitate the farmer's understanding of all facts and information related to soil fertility and weather warnings are presented as their native language / language of interest to them. The program can help its members work together and take it to the next level of needs in developing their productive capacity. These IoT devices are powered by solar or electric panels appropriately to balance energy demand throughout the field.**

Index Term: **smart village, solar based smart agriculture, Smart Cities, Internet of Things.**

I. INTRODUCTION

Government is committed to advancing and developing the rustic levels that have set the stage for development, in all the provinces and territories of the Union. A lot of Smart City management should be conveyed to its residents and organizations in a powerful and effective way on stage alone. The combined efforts of organizations, for example, Governments, civil society organizations, of all shapes and sizes Companies, Farmers, Workers etc. need to fall on businesses to build a vibrant city. It serves as a watchdog for a community based organization with a high level of preparation and thinking at a low level of making people aware of new structures. Agriculture is an important source of individual work in our country. Over the past decade, it has been observed that there is not much product improvement in the agricultural business sector. Feeding costs are steadily increasing because the yield has dropped. It has forced more than 40 million people to live in poverty since 2010. It is extremely important to make successful mediation in the agricultural business and its design is included with Wireless sensor systems.

II. LITERATURE SURVEY

Agriculture is the backbone of all districts; Information and communication technology and transforming the valley into a smart future. Their needs can be tracked at the Information Center of the farm. The sensors will assist farmers in determining the type of crop to be planted in a particular soil type, depending on the type of soil and climate predicting crop yields will be made, using irrigation systems can be fulfilled, fertilizer use determined according to soil nutrient requirements additional content will be provided. Pesticides will be used depending on the plant diseases that can be predicted as the new soil sensor technology. One agricultural site will provide information on pesticides, fertilizers and soil health. Information on crops, farm machinery, training and good agricultural practices and pricing, irrigation methods and livestock care are required [2]. The Agricultural Portal will provide access to all information and services.

There will also be agricultural advisors who will assist and advise farmers on agricultural development. These advisors will demonstrate and provide presentations to farmers on new farming techniques and make recommendations on agricultural nutrition and health care. In particular the ground sensors will keep the advisors updated on agricultural needs as a result of which they will educate farmers on the relevant information and provide them with the necessary documentation. In order to be more productive, crop advisors need to be updated with a climate report to take action on climate change. The increase in quality and quantity in agricultural production using new technologies such as "sensor" and IoT will make a huge difference in the near future of a smart town with 'smart farming' technology. The overall enthusiasm for Smart Village has grown, planted by the need to find successful solutions to the real problems predicted in the coming years.

Like any other use of Smart City, Waste Management in the city is a good test seen by civil society organizations. A squander is considered anything when something significant has not been used or not used and does not speak of financial incentives to its owner, a waste generator. Depending on the nature of the litter, they are classified as solid waste and liquid waste. With population growth, the status quo in squander management is getting closer and closer. Squander management includes planning, collection, transportation, treatment, waste recycling and transfer as well as observation and supervision. The current squander control framework, in which junk is collected from various roads, chambers and foundations in quotidian buildings, cannot cope with the produced squander. The town of Giraud in the Raipur area, the capital of Chhattisgarh, has dumped garbage cans on each street to collect garbage, which has contacted its staff and vehicles to clear the garbage. The average amount of aggregate waste generated by the city is 558 kg / day and liquid waste is 108040 lit./day, waste is collected daily and disposed of in landfills. In the event that a villager considers illegal dumping of any type of waste, he or she may be able to obtain this in relation to the relevant office. Since the disgraceful disposal of waste has a real impact on the well-being, resulting in the spread of diseases and problems in an all-encompassing state, full care is taken by waste collection and disposal managers [4] [5].

The Climate-Smart Village area is selected based on its air-conditioning status, the replacement area using optional options, and the desire of farmers and the local government to be interested in expansion. The inclusion of the team is critical to the achievement of Atmosphere Keen Town. The Framework for Climate Change, Agriculture and Food Security (CCAFS), or works with existing clusters, consisting of farmers, scientists, co-ops of national agricultural experts and city officials. They are informed of the intent of Atmosphere Shrewd Towns and are urged to formally register with the legislature (if they do not currently have one) in order to benefit from the proceeds of government programs. The city leader appoints a site planner and helps provide special input and communication with the people of the CCAFS legacy.

III. PROBLEM STATEMENT

A new concept called fog computing (FC) has been proposed to make the computational capabilities. FC takes the task to reduce the congestion and data analysis that produces when sending this task to the cloud. We use first come first serve algorithm to schedule the task. First Come First Serve (FCFS) is an operating system scheduling algorithm that automatically executes queued requests and processes in order of their arrival. It is the easiest and simplest CPU scheduling algorithm. In this type of algorithm, processes which requests the CPU first get the CPU allocation first.

IV. COMPONENTS

Arduino Uno

Uno is a microcontroller board based on ATmega328P. It has 14 digital input / output pins (of which 6 can be used as PWM output), 6 analog input, 16 MHz quartz crystal, USB connection, jack jack, ICSP header and button for reset. Each of the 14 digital anchors can be used as input or output, using pinMode (), digitalWrite (), and digitalRead () functions. They operate at 5 volts. Each pin can provide or accept 20 mA as the recommended operating condition and has an internal pull-off (automatically disconnected) 20-50k ohm. A maximum of 40mA is a value that should not exceed any I / O pin to avoid permanent damage to the microcontroller.
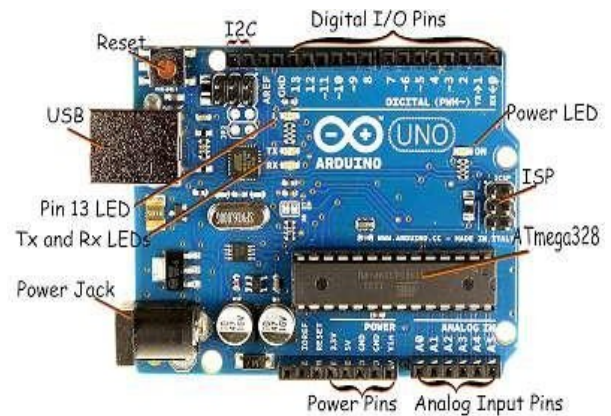

Figure 1: Arduino Uno

ESP8266

ESP8266 is a complete and independent Wi-Fi network solution that can carry software applications, or with another application processor disconnect all Wi-Fi connections. ESP8266 when the device is installed and as the only application processor application, flash memory can be started directly from External Move. Built-in cache memory will help improve system performance and reduce memory requirements Another situation is when wireless Internet access takes over the function of a Wi-Fi adapter, you can add to any design based on a microcontroller, and communication is easy, via the interface SPI / SDIO or central processor AHB bridge interface. Processing and storing power in the powerful piece of ESP8266, can be integrated with the GPIO port sensors and other resources operating certain devices to achieve the lowest possible development and performance of system resources. The ESP8266 chip is highly integrated, including a balloon antenna switch, power management converter, and therefore small external circuits, and includes a front-end module, including an entire solution designed to reduce the space created by the PCB. The system is equipped with the leading features of ESP8266 are: power saving VoIP switches quickly between sleep / wake patterns, low power consumption, front signal processing functions, problem solving and radio programs combine features removing cell phones / Bluetooth / Interruption -DDR / LVDS / LCD.
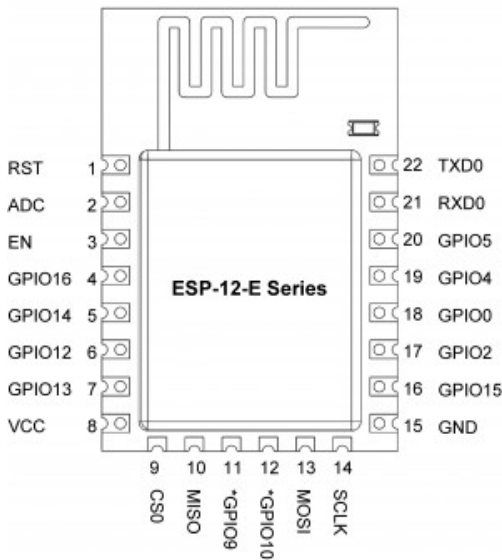
Figure 2: **ESP8266**

Soil Moisture Sensor

This humidity sensor can read the amount of moisture present in the surrounding soil. It's a low tech sensor, but it's perfect for monitoring an urban garden, or the water level of your pet plant. This is a must have tool for an attached garden. This sensor uses two probes beyond what is in the ground, and then learns that resistance to detect moisture level. Too much water makes the soil conduct electricity more easily (less resistance), while dry soil conducts more electricity (more resistance). It will be useful to remind you to irrigate your house plants or to monitor soil moisture in your garden.

Humidity Sensor

DHT11 is a Humidity and Temperature Sensor, which produces measured digital output. DHT11 can be the interface of any microcontroller such as Arduino, Raspberry Pi, etc. Then get instant results. DHT11 low humidity sensor and temperature sensor provide high reliability and long-term stability. For this project, we will build a small Arduino connecting circuit with the DHT11 Temperature and Humidity Sensor. One of the key applications to connect the DTH11 and Arduino sensor is to monitor the weather.

Pir Sensor

PIR sensors are common and for the most part differ only in price and sensitivity. Most real magic happens in the light. This is a very good production idea: the PIR sensor and rotation is fixed and costs a few dollars. The lens costs only a few cents and can change the width, width, sensory pattern, very easily. In the diagram at the top, the lens is just a piece of plastic, but that means the space to find is just two rectangles. Usually we would like to have a much larger finding area. To do that, we use a simple lens like the one found on the camera: it wraps a large area (such as a landscape) into a small area (film or CCD sensor). For reasons to be seen soon, we would like to make PIR lenses thinner and thinner and can be molded from cheaper plastic, or add a twist.

Pest repellent Module

There are many amazing things happening in the world of science and technology but yet there is no effective solution for computer insect repellent. This review paper focuses on a variety of pest control methods and discusses electronic pest control according to frequency production techniques. Various pesticides, herbicides and other repellents are dangerous and dangerous to human health. Electronic Pest Repellent (EPR) is an emerging technology that is cheap, friendly and effective and that does not pose a risk to humans. Electronic Pest Repellent is an electronic device that can create the sound of the ultrasonic frequency range, which is inaudible to the human ear but to insects such as rats, birds, insects etc. and because of the great pressure of hearing they move away from the device. The machine can be used by the general public to repel mosquitoes, farmers to repel rats, insects and other insects.

Figure 3: **Pest repellent Module**

Submersible Water Pump

A submersible pump (or underground pump, electric pump) (Fig. 3.8) is a device with a motor closed by a signal attached to the pump body. The whole assembly is immersed in the liquid to be infused. The main advantage of this type of pump is that it prevents the cavitation's pump, a problem associated with a large difference in height between

Figure 4: **Submersible Water Pump**

Solar Charging Unit

• Protects the battery (12V) from overcharging
• Reduce system storage and increase battery life
• Automatically charged index
• Reliability is high
• 10amp to 40amp current charging
• Monitors recurring current flow

V. EXPERIMENTAL RESULTS AND DISCUSSION

Data acquisition is done using solar wireless detection channels for the purpose of controlling irrigation valves. ... The available irrigation system not only prevents tree moisture and salt pressure, but also provides efficient use of fresh water resources. Agriculture relies on monsters that do not have enough water sources. Irrigation is therefore used in the agricultural sector.
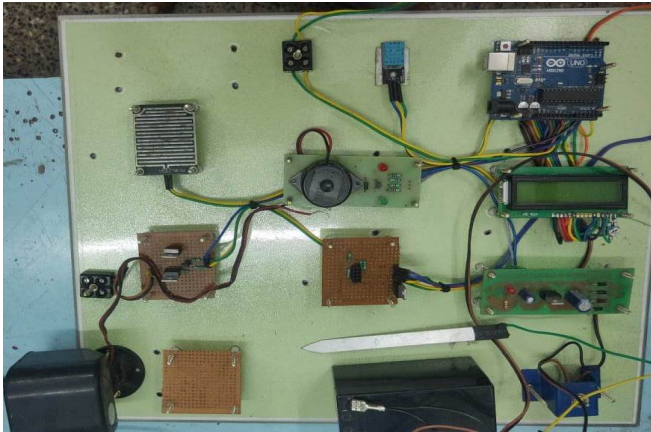

Figure 5: Design

In agriculture, two things are very important, firstly to get information about soil fertility and secondly to measure soil moisture. Nowadays, irrigation, various methods are used to reduce rainfall dependence. And especially this process is driven by electrical power and planning / shutdown editing. In this method, the water level indicator installed in the pool and ground moisture sensors are placed in the root zone of the plant and near the module and gate section the sensor data is processed and transmitted to the controller that maintains water flow control in the valves.
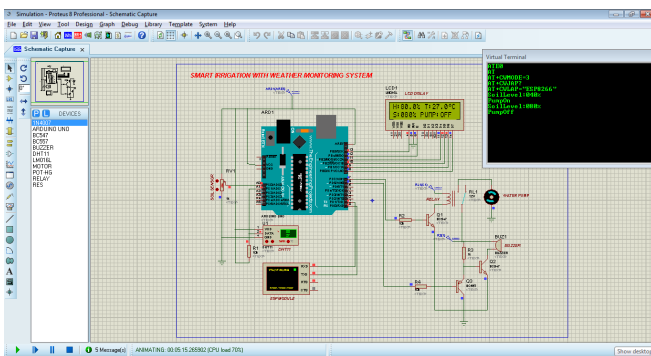

Figure 6: Outcomes

VI. CONCLUSION

Agricultural field tested and managed by MyMQTT android app for end user. ESP8266 is an app at the end of the field that receives messages from the merchant network and uses them and will perform the function specified in the message. After that it will send messages to the merchant network and in turn will be published to the Client (end user). ESP8266 is the best device for IoT projects. As it is small, compact, simple, easily configured, and easy to install and has enough GPIO anchors to use.

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