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A REVIEW OF EMBEDDED CONTROLLED INVERTER FOR SMART AGRICULTURE

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ABSTRACT:
The intelligent use of electronic technologies in the modern era has significantly improved our quality of life. The technology also greatly facilitates our improvement. There are numerous areas where the existing smart UPS system might be improved. There is a lack of natural resources in our day and age, which results in a lack of power delivered through these power networks. In this essay, we will discuss a smart inverter system that increases a battery's fundamental life and is very helpful during prolonged and unheard-of power outages. The user's family life is unaffected, and he uses the inverter in a clever and simple manner. The primary part of a smart inverter that is directly connected to the grid and acts as a bridge between the grid and RES (Renewable Energy System). Based on various data, including soil moisture, weather forecasts, and other variables, the suggested method can optimise water utilisation. Through GSM technology, it will also inform its owner of the soil and motor's present state. By detecting the soil's moisture content in response to the field's need for water, the proposed model may automatically turn the motor pump ON and OFF. Data on the amount of soil moisture in a certain area is gathered using a moisture sensor. After the water requirement is met, the motor will automatically shut off, and it will turn back on when the field is dry. The update (ON/OFF) of a motor is sent to the farmers via GSM technology. The proposed system is fully automated.

KEYWORDS: GSM Technology, RES, Sensor, Relay, Water pump, Charge control Circuit, UPS System.

INTRODUCTION:

Embedded systems can only be programmed to perform one very specific task at a time. Particularly the memory, embedded systems' resources are extremely constrained. They typically lack secondary storage options like CDROMs and floppy discs. Systems that are embedded must meet certain deadlines. A certain task must be finished in a certain amount of time. Deadlines are strict in some embedded systems known as real-time systems. Failure to meet a deadline could result in a catastrophe, including human or material loss. The amount of power available to embedded systems is limited because many of them rely on batteries to function. Extreme environmental conditions, like as high temperatures and humidity, are required for the operation of some embedded systems.

An irrigation system is a method that artificially regulates water supply using pipelines, drains, etc. The major goals of irrigation systems are to support plant development, maintain landscapes, lessen the impact of insufficient rainfall, etc. Sprinklers and flood-type irrigation systems are considered modern irrigation techniques, whereas Dhekli and Rahat are two historic approaches[1]. The availability of water has a significant impact on agricultural

production. Frameworks for smart water systems enable timely and enough field water supply. Water is a necessary component for all living things. Nearly 70% of all water use is accounted for by just the agriculture sector, making it the biggest water user[2]. While watering the land, water wastage is evident.

To sensors that keep tabs on physiological information. connections of different kinds, including RFID, NFC, WI-FI, Bluetooth, and Zig-bee. Sensors Wide area connectivity options including GSM, GPRS, 4G, and LTE are also possible. But the amount of energy consumed now is rising quickly. Different forms of Source energy are employed. The majority of energy sources are traditional fossil fuels. Fossil fuels, such as oil, coal, and gas, have significant and dangerous effects on the environment. It has been identified as the primary culprit in increasing greenhouse gases (GHGs) in the atmosphere, which is causing global climate change, in addition to destroying the environment and contaminating the air. IoT and fuzzy logic controller are combined to create a smart irrigation system[3]. This technology senses the temperature and moisture of the soil to control the flow of water using fuzzy rules. Another smart irrigation system powered by IOT has been developed, and it can track the irrigation process. An Arduino connected to a Thing Speak channel that the owner can use to control the process A photovoltaic energy based, easily accessible, and energy efficient irrigation system is displayed, supplying the plants with the correct amount of water. To supply the necessary amount of water and electricity for the irrigation system and the pump, respectively, a fizzy-based automated irrigation system is created. Farmers are currently having some serious issues with watering their agricultural lands. Decision support systems (DSS) based on wireless sensor and actuation networks (WSAN) have been developed and can assist farmers in managing the irrigation process. It is suggested in[4] to use a Raspberry Pi-based autonomous irrigation IOT system to perform precision agriculture (PA) using cloud computing. A fee control terminal-based agricultural power management system is suggested. Communication, data management and storage, event recording, parameter setting, and card processing are all functions of the fee control terminal. The complexity of agricultural energy use is reduced by this method, which also stabilises the connection between electricity consumers and suppliers.

LITERATURE SURVEY:

Biao Zhao, Qiang Song, Wenhua Liu, and YI Xiao[5] presented a multi-functional modular intelligent UPS system for smart grid, which is made up of four identical H-bridge converters. They also offered a development direction for uninterruptible power supplies (UPS). It is capable of both the cyclic use of electrical power between the power grid and storage battery as well as all the fundamental operations of a conventional UPS system. Additionally, because of its modular design, it is simple to transform into a variety of power converters for use in other applications.

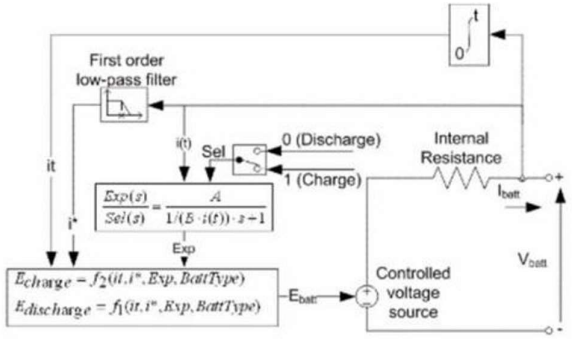
All farms can connect and share farming expertise from seasoned users, thanks to IOT devices. The smart farm can accommodate a variety of devices because it is integrated with IOT systems. Due to the deployment of connected farms, disease on crops or viral transmission over farms can be easily detected utilising prediction technique. A gateway connects all the sensors and actuators that are watching over and nourishing the creps. The gateway is interconnected with a Mobius server. To make the farm ideal for growing crops, it will communicate with expert agricultural information systems and control actuators. Combining KF: It is used to reduce the noise that interferes with communication. The leaf node will send data about various

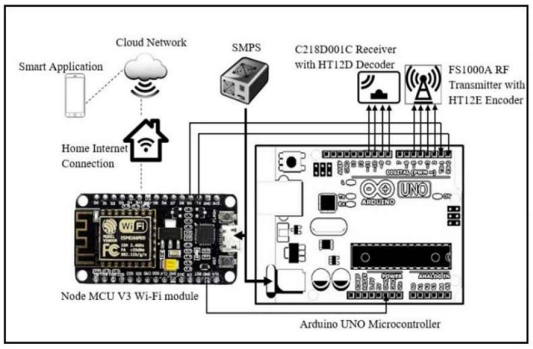
environmental characteristics to the cluster head Cation. The nodes group together into a collection of clusters for KF prediction. Farmers can address complex agricultural production issues with the aid of this information technology resource. The inputs for DSS are water-based. Energy, industry, and human resources are outputs that contribute to production[6].

A camera's image sensor is housed in a sealed, waterproof housing. Camera takes of the image of Soil to photographs the soil to measure its water content. To discriminate between light pixels and dark pixels, a grey scale analysis is used. The gateway route forwards the commits. On a smartphone with computing and connectivity capabilities, an app is created[7].

DESIGN and METHODOLOGY:

The design, development, and operating principles of the created smart module solar inverter system are presented in this part. The system includes hardware and software for bio components. The modular inverter is controlled by a single control unit as well as a mobile application control mechanism (a touch control interface for smartphones). The hardware for the modular inverter system is made up of numerous pieces. Because home appliances use alternating current (220240), which is converted into alternating current (AC) by the inverter, the energy stored in the battery is in the form of direct current (DC). To guarantee that each user utilises a sufficient amount of power and does not have an impact on the load, the metre controller tracks the power dissipated on the nodes. utilising other users' (nodes') connections to the inverter. This suggested concept is built to automate the irrigation system by monitoring the soil's moisture content and turning the motor pump ON/OFF. The importance of irrigation in agricultural fields cannot be overstated. Therefore, a sufficient volume of water may be provided in the field at the appropriate moment by employing this prototype model. A microcontroller from the 8051 series is utilised in this project. This microcontroller's programming was done in such a way that it can take in information about the changing moisture level of the soil through the sensing system.



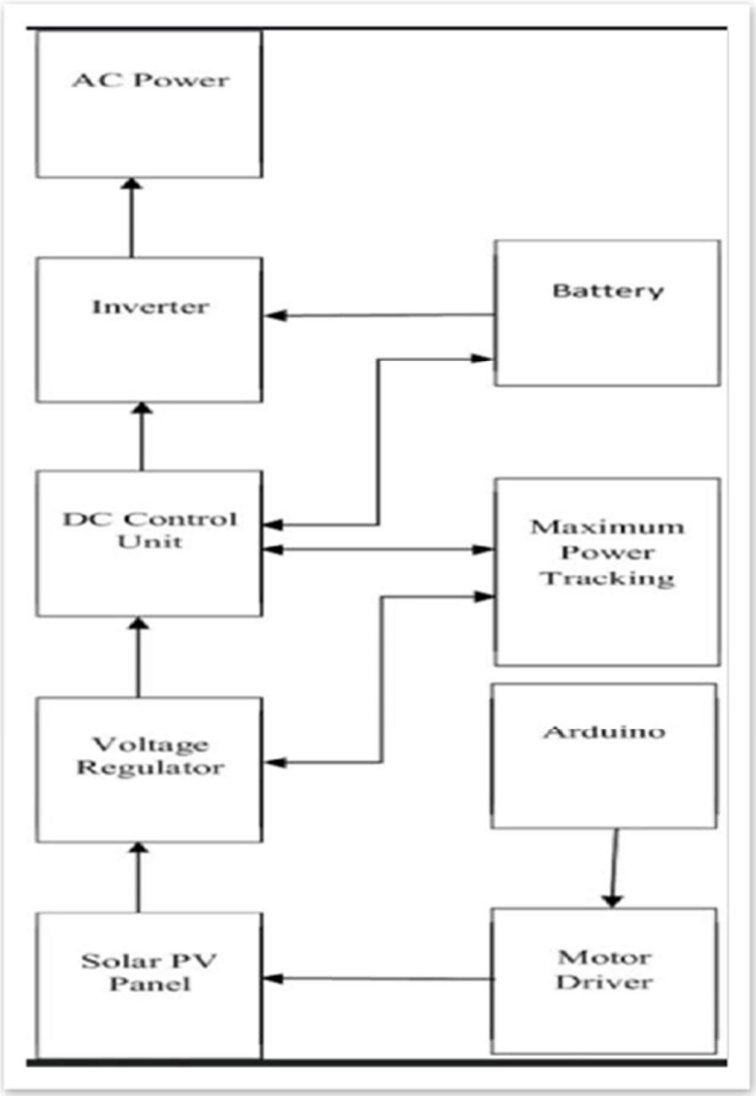


REQUIRED MODULES:

1. Hardware requirements
2. Soil moisture sensor
3. Temperature sensor (DHT-11)
4. Relay
5. Pump
6. IOT (WI-FI module ESP8266)
7. Battery

8. Node Red

BLOCKDIAGRAM:



SOIL MOISTURE:

A tool used to measure the amount of moisture in the soil is a soil moisture sensor. Soil moisture sensor is sand. When the sensor detects the field's water shortfall, the If a module's output is high, it is, otherwise, low. This sensor also serves as a reminder for the user to water their plants. observes the soil's moisture level. It has received a lot of attention. It is used for irrigation on the land, agriculture, and botany.

TEMPERATURE SENSOR:

The temperature and humidity of the atmosphere are measured using a temperature sensor (DHT-11). A basic, extremely affordable digital temperature and humidity sensor is the DHT-11. To evaluate the air quality around it and break off a digital signal on the data pin, it uses a thermistor and a capacitive humidity sensor. The electrical resistance between two electrodes is measured by the DHT-11 to determine relative humidity.

RELAY:

As an electrically operated switch, a relay is employed. It has a set of working contact terminals and a set of input terminals for one or more control signals. The switch may have several different types of contacts that can be used to make or break connections. In order to maintain the crop's moisture level, a relay is employed to activate the water pump.

PUMP:

A cheap, compact submersible pump motor is the DC 3-6V Mini Micro Submersible Water Pump in Figure 5. Power between 2.5 and 6 volts is required for operation. With a very low current consumption of just 220mA, it can pump up to 120 litres per hour. The motor outlet must only be connected to the tube pipe before being powered and submerged in water.

IOT WIFI MODULE(ESP8266):

The microcontroller Node MCU (ESP8266) has a built-in Wi-Fi module. This device has 30 total connections, 17 of which are GPIO (General Purpose Input/Output) pins, which are used to connect to various sensors and receive data from them as well as provide output data to other connected devices. The Node MCU contains 4MB of flash memory and 128KB of RAM for storing applications and data. Through USB, the Node MCU receives the code and stores it. Every time the Node MCU receives input data from the sensors, it double-checks the information before storing it.

BATTERY:

A battery serves as the inverter's source of DC power. The simulation's battery is built on a dynamic Lithium-ion model.

NODE RED:

Node -RED, an open-source Java development script built on JavaScript on Node.js and created by IBM engineers, processes and displays data sent from MATLAB. Node-RED is ideally suited for IOT development programmes. By generating "data streams" from the sensor to the cloud services, it is a flow-based programming tool for fusing hardware, software, and internet services.

INVERTER:

The inverter's primary function is to transform the battery's stored energy to AC electricity because the majority of appliances are AC-powered. The circuit for the full bridge inverter. By closing or opening the switches in accordance with a predetermined switching pattern, the inverter operates. Different operational states of the inverter depend on closed switches in order to produce AC. A switch that allows the current to be reversed every 50–60 times per second is required to get proper AC. Through the use of power switches like MOSFETs or power transistors, the input DC voltage can be turned ON or OFF.

CONCULSION:

An Agriculture System with Embedded or IOT inverter using Soil Moisture Sensor and implementing by an inverter. Compared to traditional methods in farming, it is remarkable to use sensors to monitor crop by using inverters with Solar panels, batteries, nodes etc. The Sensors used in the system can be continue operable for the whole cultivation period by using rechargeable batteries. From the obtained result the power observed by connecting various loads are to be observed accurately recorded by the system.

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