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NFC Hybrid Harvester for Battery-Free Agricultural Sensor Nodes Using IOT

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ABSTRACT:The main source of national income is Agriculture. In few years India's populace will be going to confront difficult issue of nourishment, so improvement of farming is important. Due to unknown weather condition, intermittent supply of water and negligent maintenance of the farms, enormous amount of crops had been damaged and destroyed. As a result, information techniques must be used to accelerate growth.

This paper presents a low-cost hybrid power harvester that is reliable, low-complexity, and low-cost for supplying agricultural battery-free sensor nodes. This design is an electromagnetic (EM) energy harvester that powers the sensor nodes by collecting energy from the magnetic field generated between the primary and secondary coils. The primary coil can be operated by an AC power supply, which will allow the secondary coil to produce a magnetic field. Farming nodes in our farming system are powered solely by secondary coils, with no need for a power supply (AC), battery, or even a solar panel, resulting in low-cost battery-free sensor nodes. Each sensor node will include environmental sensors of humidity, temperature, soil moisture, and it will be able to send data to NFC reader. The farmer could securely read reader's identification number or upload configuration parameters without moving the node from its installed position. The availability of affordable devices and the incorporation of NFC readers into most current mobile phones build NFC technology key to the event of inexperienced web of Things (IoT) applications.

I. INTRODUCTION

Agriculture is the source of livelihood for many people and also it is the primary source of national income. Every person is dependent on agriculture for daily products and is the basic source of food for domestic consumption. India's populace is come to past 1.2 billion and the populace rate is expanding step by step and after a few years the populace will be going to confront difficult issue of nourishment so improvement of farming is important. So there is a need to bring modern agriculture but agriculture face many problems like, irrigation problem, soil quality problem, lack of market understanding, need of manpower etc and also farmers do not have full control of their crops. Massive amount of crops had been destroyed due to unknown weather condition and it also include a large amount of crops damaged due to irregular supply of water and negligent maintenance of the farms. So there is a need to make some changes in the agriculture pattern and to make use of information techniques to speed up the development.

Near-field communication (NFC) is famous wireless communication technology within the set of radiofrequency identification (RFID) systems that allows communication between two devices separated by a few centimeters [1]. Near-field RFID technology has seen a revival due to the recent inclusion of NFC readers in smartphones, with applications focusing on human-computer interaction, smart homes, payments, and healthcare. An NFC device can operate at the frequency of 13.56 MHz as reader or tag and has three different modes in the communication. The "reader/writer" mode, uses a NFC reader or smartphone to read/write information that are prestored in an NFC tag. The



“peer-to-peer” mode can be applied in information sharing between two NFC devices. Many integrated circuit (IC) cards, such as credit cards, may be replaced by smartphones for access control, transportation, and payments using "card emulation.". NFC technology is also widely used in the development of low-cost sensors because it makes obtaining data from them as simple as approaching the reader to the tag without need of pairing the two devices. The most biggest consideration of NFC is that it allows devices to operate without a battery by extracting energy from magnetic field induction between the reader and tag antenna.

II.EXISTING SYSTEM

- ❖ Within the prevailing system the RFID enables a 1 way wireless communication, typically between an unpowered RFID tag and a powered RFID reader.
- ❖ RFID tags are often scanned at distances of up to 100 meters without an instant line of sight to the reader and intrinsically RFID is employed globally for asset tracking in warehousing, airport baggage handling, livestock identification and far more.
- ❖ RFID operates at a selection of radio frequencies each with their own set standards and protocols.

DISADVANTAGES:

- ❖ RFID systems are often costlier than NFC.
- ❖ It take a lengthy time to program RFID device.
- ❖ Anybody can access information about anything.

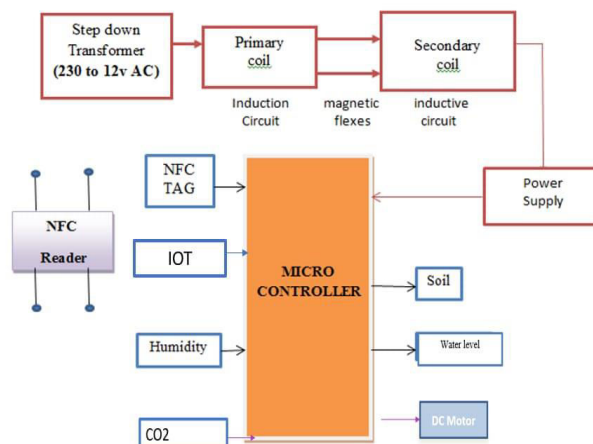
III.PROPOSED SYSTEM

- ❖ The NFC operates at 13.56 MHz and is a high frequency (HF) RFID standard extension.
- ❖ NFC therefore shares many physical properties with RFID kind of a way communication and thus the facility to speak without an instant line of sight.
- ❖ There are however three key differences.
- ❖ NFC is capable of two way communication and will therefore be used for more complex interactions like card emulation and peer-to-peer (P2P) sharing.
- ❖ only one NFC tag are often scanned at just one occasion.

ADVANTAGES:

- ❖ Quick access to information
- ❖ NFC is suitable for non-technical users because it provides automatic connections without need to setup
- ❖ Reduces cost

IV.BLOCK DIAGRAM





V.HARDWARE REQUIREMENTS

- Power supply unit:
 - Step down transformer
 - Rectifier
 - Filter
 - Voltage Regulator
- Arduino UNO-Microcontroller
- NFC Tag
- Humidity Sensor
- Soil Moisture Sensor
- MQ 135 Gas Sensor
- NODE MCU

POWER SUPPLY UNIT:

Power supply is a source of electrical power. A power supply unit, or PSU, is a device or system that transfers electrical or other forms of energy to an output load or group of loads.

➔STEP DOWN TRANSFORMER

The primary winding of the input power transformer is connected to the mains (line) supply in a simple power supply. A secondary winding, electro-magnetically coupled but electrically isolated from the primary is used to gain an AC voltage of suitable amplitude.

The transformer stage must be able to provide the current desired. If a transformer that is too small is used, the power supply's ability to sustain maximum output voltage at full output current is likely to suffer. With too small a transformer, the losses will increase vividly as full load is placed on the transformer.

➔THE RECTIFIER STAGE

Rectifier circuit is used to change the AC input into DC. The full wave bridge rectifier uses four diodes placed in a bridge circuit to provide full wave rectification without the necessity of a center-tapped transformer. An additional advantage is that, as two diodes are conducting at any one time, the diodes demand only half the reverse breakdown voltage capability of diodes used for half and conventional full wave rectification. The bridge rectifier are often assembled from separate diodes or a combined bridge rectifier are often used.

➔FILTER

A typical power supply filter circuit are often best understood by dividing the circuit into two parts, the reservoir capacitor and thus the low pass filter. Each of those parts contributes to removing the remaining AC pulses, but in several ways.

➔VOLTAGE REGULATOR

Voltage regulator ICs are mostly available with fixed or variable output voltages. They are also rated by the utmost current they will pass. Negative voltage regulators are available, mainly to be used in dual supplies. Most regulators include some automatic protection from excessive current as well as overheating.

ARDUINO UNO MICROCONTROLLER:

An Arduino is really a microcontroller based kit which may be either used directly by purchasing from the seller or are often made reception using the components, owing to its open source hardware feature.

NFC TAG :

NFC (Near Field Communication) is a wireless technology that allows data such as text or numbers to be transferred between two NFC-enabled devices. NFC tags, say stickers or wristbands, contain small microchips with minute aerials which can store a small amount of data for transfer to another NFC device , such as cell phone.



HUMIDITY SENSOR:

A humidity sensor is a device that determines the relative humidity of in a given area. A humidity sensor are often utilized in both indoors and outdoors. Humidity sensors are accessible in both analog and digital forms. This sensor module converts ratio to voltage and may be utilized in weather monitoring application.

SOIL MOISTURE SENSOR:

Soil moisture sensors determine the water content in soil. A soil moisture probe is built of various soil moisture sensors.

MQ135 GAS SENSOR :

For Air Quality, the MQ135 Gas Sensor module is used. Ammonia, Sulphide , and benzene steam, as well as smoke and other toxic gases, are highly susceptible to the MQ135 gas sensor. The MQ135 gas sensor's sensitive material is SnO₂, which has a lower conductivity in clean air. The sensors conductivity increases as the gas concentration rises when the target combustible gas is present.

NODE MCU :

Node MCU is an open-source Lua-based firmware and development board designed specifically for Internet of Things (IoT) applications.It contains firmware that runs on Espressif Systems ESP8266 Wi-Fi SoC and hardware this is primarily based totally at the ESP-12 module.

VI. SOFTWARE REQUIREMENTS

- Arduino Software IDE
- Embedded C

ARDUINO SOFTWARE (IDE):

The Arduino Integrated Development Environment (IDE), additionally called the Arduino Software, consists of a textual content editor for writing code, a message field, a textual content console, a toolbar with present day characteristic buttons, and more., and some of menus .It connects to the Arduino and Genuino hardware to add packages and speak with them.

EMBEDDED C:

Embedded C can even be a set of language extensions for the C artificial language that were developed by the C Standards Committee to handle similarity problems between C extensions. Embedded C programming has traditionally necessitated nonstandard extensions to the C language in order to accommodate exotic features such as fixed point arithmetic, several distinct memory banks, and simple I/O operations.

VII. RESULTS

In our farming system, farming nodes are powered by secondary coil alone , with no reliance on AC power , batteries or even through solar panel. So , we can use multiple farming nodes with the help of primary source coil.

NFC tags serve as the primary identifier for variety of agricultural paramaters.

The data can be accessed via cloud database services.

VIII. CONCLUSION

By deploying low cost and battery free sensors and monitoring the microclimate conditions (temperature , humidity , soil moisture , water level) the producers could stop making decisions based only on their own practical experience and optimize their daily tasks.

The availability of affordable devices and the incorporation of NFC readers into most current mobile phones build NFC technology key to the event of inexperienced web of Things (IoT) applications.



IX. FUTURE ENHANCEMENT

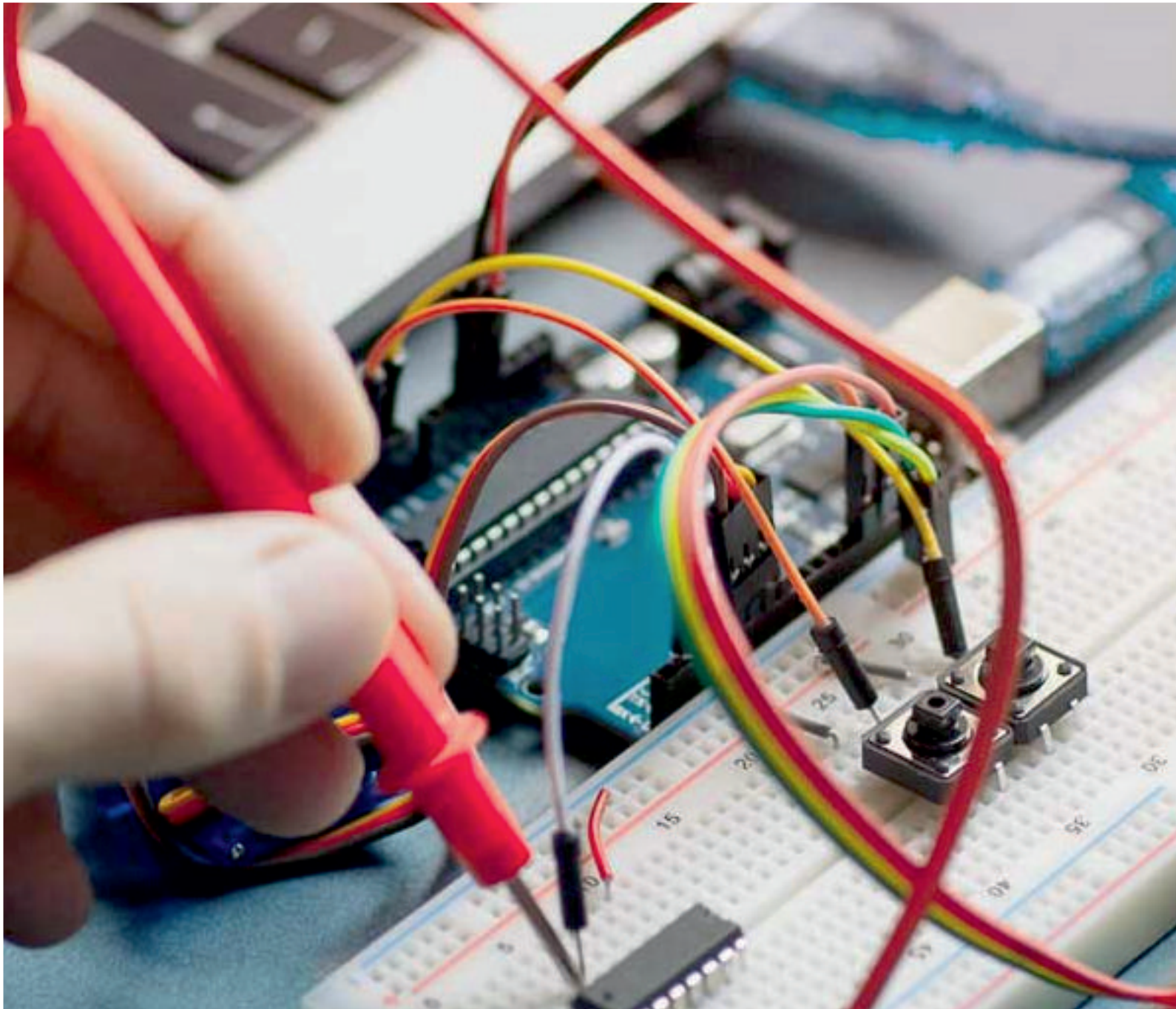
Smartphones with management assistant (app) and management service (app) applications configured for agricultural management support functions and agricultural management software specifications may be used.

Using GSM module , we can get instant values of the agricultural parameters.

Using NFC technology , fruit counting in a plant using image processing can be done.

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