PLANT COLOUR DETECTION- AN APPLICATION FOR WIRELESS SENSOR NETWORK

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ABSTRACT

Intelligent Farming makes a marvelous impact on agriculture sustainability for 21st century. To design future agriculture, present agriculture should be improved established on the framework of intelligent agriculture that specifies the broad form of agriculture containing a social system. Wireless sensor network (WSN) and the various type of optical sensors are assumed to be a basic technology of smart agriculture which intends the harmony with the economic development and sustainable agro ecosystem. This research goal is to provide long term sustainable solution for automation of agriculture. Agriculture automation has several methods to getting data from paddy crop like sensor for environmental measurement. This research focuses on detection of color changing of plant by color sensor and send a message to controller. Further controller takes some decision for appropriate action and implement it. This paper encourages the researchers to improve the technique in this fields and enhance the productivity.

Keywords - *Wireless Sensor Network, Color Detector, Zigbee, IntelligentFarm.*

1.Introduction

A wireless sensor network (WSN) is a wireless network comprises of spatially assigned self-determining devices that uses sensors to measure various physical and environmental related parameters. A WSN node assembles and processes the measured data, and transfers the same towards the gateway. A WSN contains many tiny nodes. A node consists of a sensor, a transceiver, a power source, a battery, an antenna, an Analog to digital convertor (ADC), small memory and a processor. WSN have three main constraints: the available bandwidth, limited energy in each node and the computational power of each node. Based on the role in the network, the nodes can be classified as cluster head, sink node and active node. Cluster head collects data from all of its cluster member's nodes, collect them and then pass the same towards the base station. The base station collects the data from each cluster and processes it as per the need. Since the nodes work in an ad-hoc manner, each node in the network should be synchronized with each other. The application of WSN in the field can abundantly contribute in increasing the productivity paddy crop.

Intelligent farming is the consistent betterment of care farming. The target of care farming was mainly on technological invention to allow for site-specific farming. Furthermore, intelligent farming is about permitting farmers with the decision tools and automation measurement technologies that smoothly reconcile products, knowledge and services for better productivity, quality and profit. The most important thing of intelligent farming is environmental measurements. The reason is that the environmental aspects affects the productivity. Along with these, environmental measurements using wireless sensor network and plant color detection technology are much simpler, cheaper and lower running costs.

Agriculture is an art of development of land for growing corps. Agriculture is the major source of food, which is one of the important demands of the mankind. India comes at second position in terms of agricultural outputs. There are a number of environmental factors that affect the crop production like soil temperature, environment temperature, climatic

changes, rain, drought, soil composition, humidity, etc. Years ago, human observations were the only way to detect the needs of agriculture, however, with the betterments in the technology, the changes in environmental aspects can be predicted and be able to measure the composition of the soil, reduce the time and human effort required, improve the irrigation methodologies. Now, farmers uses a number of methods to improve the crop productivity.

1.   Related Work

The most imperative stuffs of intelligent farming are environmental dimensions and water management. The reason is that the environmental and water management affects plant evolution. In addition, environmental dimensions using wireless sensor network and water management technology are much humbler, cheaper and minor running outlays.

Researchers had developed and used numerous devices for spotting and collecting soil and environment situations [1]. Technological advances in these areas wrinkle increasing momentum, and this means that continuing an overview of latest developments suits more and more of an experiment [2]. They had connected the sensor devices and broadcast equipment's in apposite area [3].These sensor devices have cast-off in wireless sensor network (WSN). A case in point is certain researcher had studied the reflected of ultrasonic wave signals display a soil moisture and groundwater levels [4] to forecast the incidence of landslides and gradient. The environments have numerous factor relate to plant development such as temperature, moisture in the air, soil moisture (the water leakage outflow swiftness of groundwater) [5] and soil PH. Automated Irrigation system has described factors to farmer through mobile SMS, website [6] The part of device to communicate data is often used as a TinyOS or microcontroller (MCU) and ZigBee (XBee) for radio transmission to send data signals from source to destination [7, 8]. The most of system are motorized by solar cells and batteries [9]. The study of the measurement and investigation environment in agriculture has performed extensive research and continuous with the technology to help for sensing the amount of light, humidity and temperature using wireless sensor networks to accumulate and process on a computer server and explosion to farmer through mobile device like PDA or cell phone [10, 11].

2.   System Model
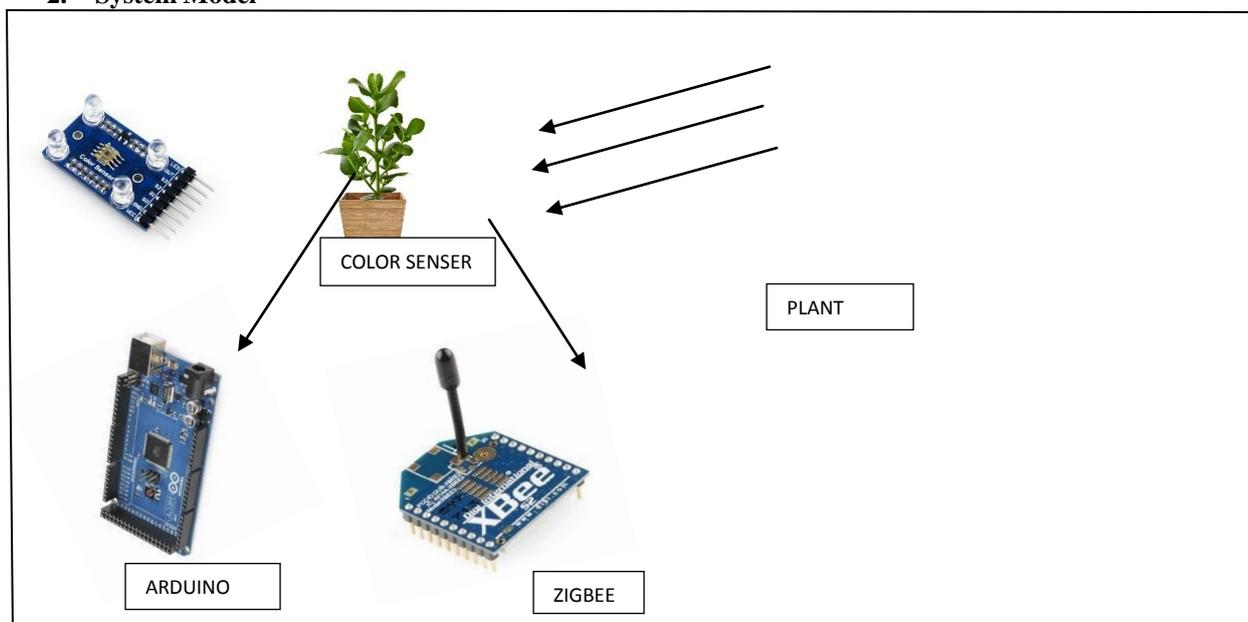
List of devices are: -

a) Arduino MEGA 2560- Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs such as light on a sensor and turn it into an output such as activating a motor, turning on an LED.

b) Zigbee- ZigBee is a low-power, low data rate, and close proximity wireless ad hoc network. Throughput of ZigBee is very low and the rate of data transfer is about 250 Kbps. Therefore ZigBee is useful for the applications which requires low data rate.

c) Color sensor-The color sensor provides red, green, blue and clear (RGBC) light sensing for precise color measurement, determination, and discrimination.

3. Methodology

Our model will work on the following flow chart.
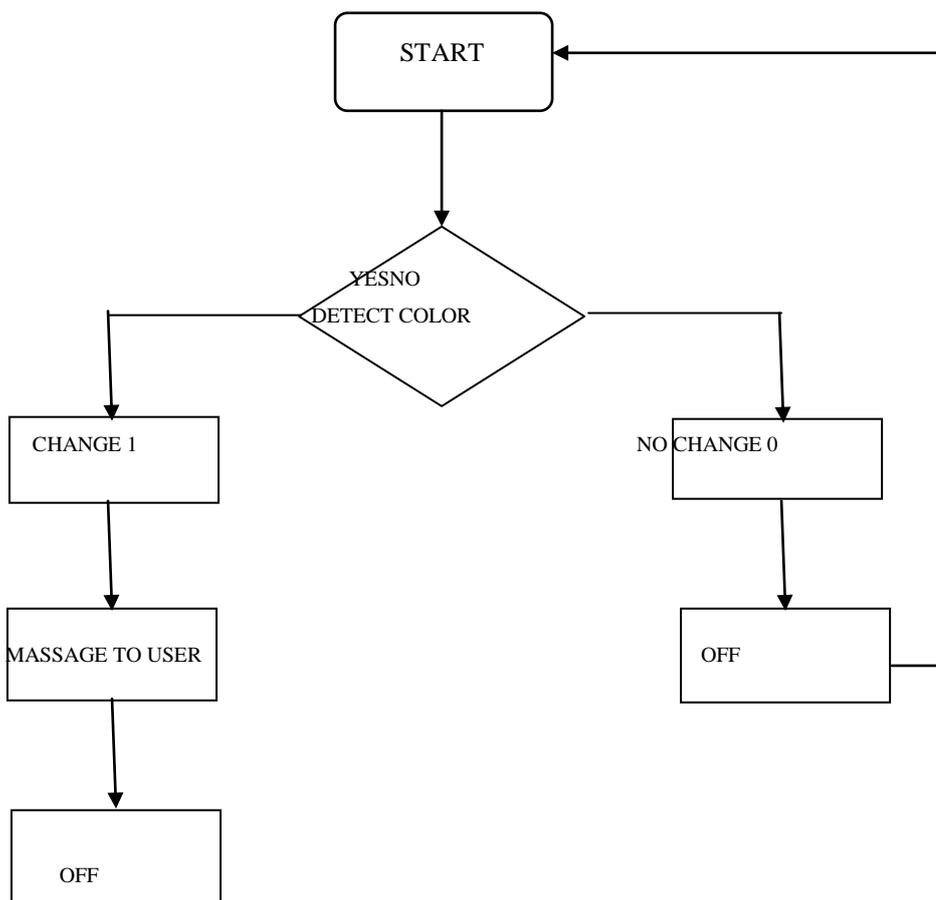
Arduino

The Arduino Mega 2560 is a microcontroller board based on the ATmega2560 (datasheet). It has 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Mega is compatible with most shields designed for the Arduino Duemilanove or Diecimila. The board

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can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

ZigBee: Zigbee is an IEEE 802.15.4-based specification for a suite of high-level communication protocols used to create personal area networks with small, low-power digital radios, such as for home automation, medical device data collection, and other low-power low-bandwidth needs, designed for small scale projects which need wireless connection.Zigbee is widely deployed for controlling and monitoring applications where it covers 10-100 meters within the range.Zigbee supports different network configurations for master to master or master to slave communications. And also, it can be operated in different modes as a result the battery power is conserved. Zigbee networks are extendable with the use of routers and allow many nodes to interconnect with each other for building a wider area network.

Color sensor: The color sensor detects the color of the surface, usually in the RGB scale. Color is the result of interaction between a light source, an object and an observer. In case of reflected light, light falling on an object will be reflected or absorbed depending on surface characteristics, such as reflectance and transmittance. Measuring colors of the ingredients are basically two ways. The easiest way is to use a color-changing light source and a sensor that measures the intensity of the light. Most industrial color sensors contain a white light emitter and three separate receivers. There are usually three sets of color source or color filter with peak sensitivities at wavelengths that we identify as red (580nm), green (540nm) and blue (450nm). All colors can be derived by their components
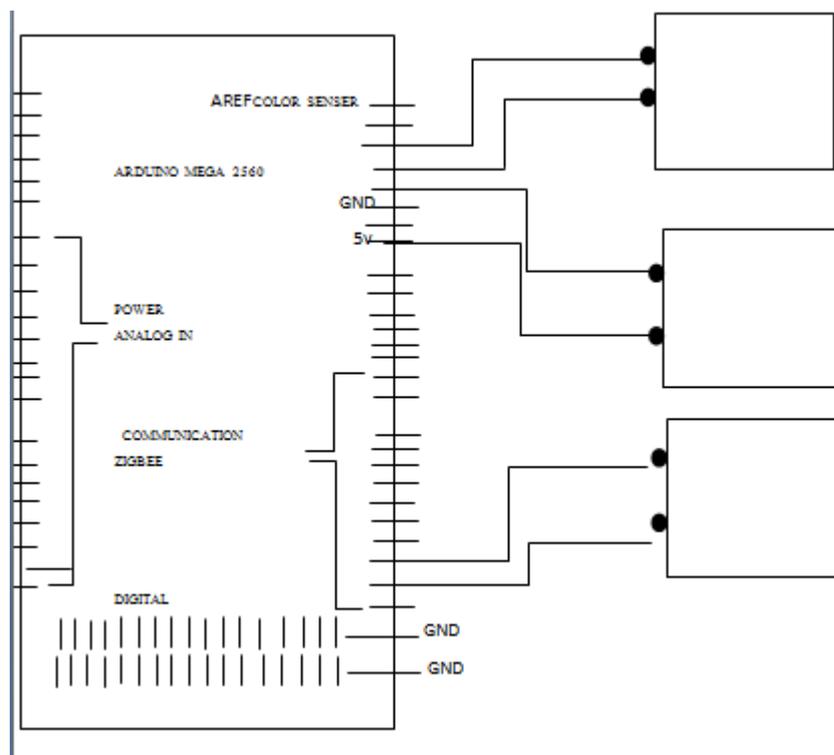
Circuit Diagram:-

Fig. 2 circuit of arduino.

a) **Network setup: -**It is a wireless monitoring system for agriculture and the environment. The set up consists of a node having four ports at the bottom to which sensors are attached. The node can be easily integrated with any low power sensor and can be deployed randomly in the field. The maximum allowable single hop distance between the nodes is 500 to 1500 ft with line of sight. To detect the sensor after connecting, the node should be reset once. The node can be easily integrated with a maximum of 4 different or of same sensors at a time. The nodes are connected through a wireless medium to the base station, which collects the data and sends the information to the gateway. A large area can be covered with the help of these nodes by arranging them in some topology. The information is hopped among the nodes and it finally reaches the destination.

b) **ZigBee: -** To receive and send data for wireless sensor network. The data is transmitted via XBee (wireless module ZigBee XBee Series 2). This system can work either indoors, outdoors and various environments as well. The XBee transmits the signal as the characters through small Chip. It can transfer the data as point-to-multipoint or point-to- point until the destination node has received the data. The XBee transceiver utilizes the Carrier Sense Multiple Access with Collision Avoidance (CSMA-CA) which is the multiple input-output channels to prevent the collision of signals. The network topologies would be a Star, Mesh or Peer-to-Peer. Each device address should be long as64bit or 16bit.

2. Results

In our model, the color changes were analyzed by transforming the RGB color system of the color sensor. We tried to develop a quantitative color sensing method of agricultural products using the simple illuminating information of the natural environment by developing the analysis on the relationship between the color appearance of the plantin ideal conditions and after any physical change. As the result, the color calibrations were very successful. After the detection of color changing of plant by color sensor, using a wireless sensor network ZigBee send a message tothe user's mobile phone.Further controller takes some decision for appropriate action and implement it. These results could play a very important role in developing the surface color analysis of agricultural products for both the simple and rapid evaluation at the field.

3. Conclusion

In this paper we have proposed an application of WSN in the cultivation of paddy crop. These WSN methodologies give favorable contribution for betterment of farming industry that results to sustainability of quality crop. We have considered the fact that the cost of WSN sensors should be kept low and be affordable to the farmers. The network set up is simple and compatible to changes in terms of node addition, new sensor deployment etc. This model is beneficial for the farmers of Chhattisgarh as some of them are unaware of technologies, hence, this model can be easily implemented by anyone and alerts can be setup to receive updates by message in the mobile phone.In future work we extend our work and introduce new algorithms and concepts of Artificial neural network for analyzing the behavior of plant and take appropriate action. So that the plant gets healthy in all season and provide fruitful result to the farmers.

3.Reference

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