Team Name : HYBRID AUTOMATION MODEL FOR AGRICULTURE AND HOME APPLICATION

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Abstract:

This idea is primarily about the improvement of current agricultural practices by using modern technologies for better crop production. This idea provides a model of smart greenhouse system, which helps the farmers to carry out the work in a farm automatically without the use of much labour power. Greenhouse, being a closed structure protects the plants from extreme weather conditions. The irrigation of agriculture field is carried out using automatic drip irrigation system, which operates according to the soil moisture threshold set by the user so that optimal amount of water is applied to the plants. Water management tanks are constructed and they are filled with water after measuring the current water level using an ultrasonic sensor. Temperature and air humidity are controlled by humidity and temperature sensors.

Introduction :

In India 70 per cent of the population performing agriculture, but contribution of agriculture to nation's Gross Domestic Price is only around 17-18 per cent. This lower contribution is because of lack of using technology. Farmers are following traditional agriculture technology because of higher cost to the smart agricultural devices. In order to increase productivity to serve the immense population, it is inevitable to use technology in agriculture.

In order to solve this problem the smart greenhouse is a revolution in agriculture, creating a self-regulating, microclimate suitable for plant growth through the use of sensors, actuators, and monitoring and control systems that optimise growth conditions and automate the growing process.

Motivation

Collecting information from the agriculture field is a very big task to a farmer who doesn't know about electronics, so in order to minimize (or eliminate) this problem this idea will do all the work efficiently and farmer friendly.

In this networking world, communication is happening through the internet .What if one day internet stops working? Also in the rural area where the cellular network is not available and people of that area want to communicate with each other ,in both of the situations, this idea will help by connecting people through wireless radio frequency mesh network.

Methodology:

Proposed idea is about the model which can be deployed in both agriculture and home automation. This conceptual idea consists of a hardware which collects the readings from the sensors present in the agriculture field, sends those readings to the hardware in the farmer's house (Base station). At the base station, green-house parameters will be saved in a file and live graph will be plotted to visualise and to give alerts about green-house environment change to monitor the plant health to increase the productivity. Hardware uses radio waves to communicate with the base station since internet might not be available in some rural places. Farmer can control the green-house environment from anywhere in the world using cellular communication.

Same hardware by attaching switches as peripherals can be used in home automation. In this mode only authorised clients can control the home appliances with their mobile phones from anywhere in the world. It also monitors the energy consumption of each appliances using current sensors so that the user can distinguish which device consume more energy than the rated energy consumption, thereby he can find easy way to replace the deprecated devices. Idea is to use low power devices to increase the battery life of this IOT device and the components that can be used are cost-effective and efficient so that the hardware should cost less and work properly for longer period to attract the farmers to use this device and hence to increase the productivity.

Block diagram of the system at transmitter end:
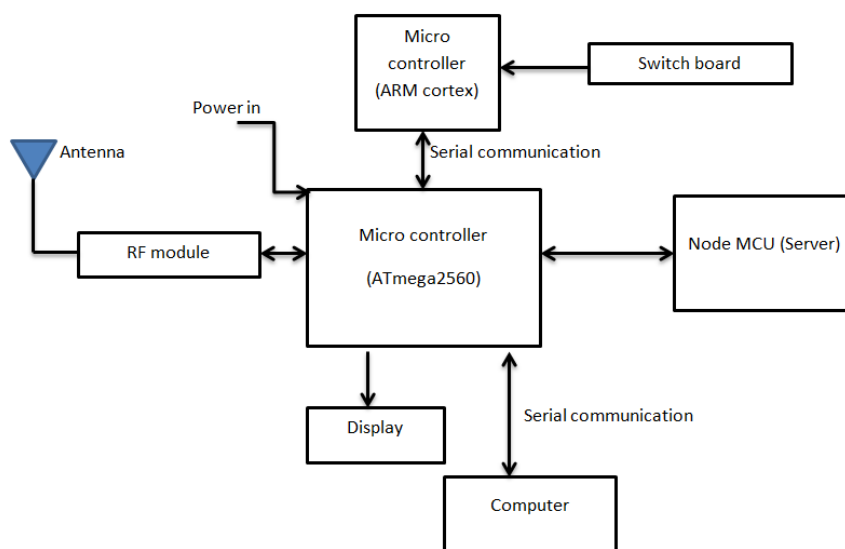
Block diagram of base station

1. Brain of the system: This block will receive the current state of the switch from slave micro controller serially connected to it to actuate the devices which are present at the receiver nodes. It also communicates with the server by sending live data to it to display on the web. It receives radio signal from other stations, process it and send it to the computer for visualization. It also sends commands through radio signals to the other stations.

2. Server: It mainly consists of NodeMCU ESP8266 configured in station mode which connects to the existing network (hotspot or LAN).It collects data serially from the master and uploads the same to the web.

3. Slave micro controller (ARM cortex M3): In order to reduce the workload of the master this slave device reads the switch state (on or off) from the switch board and sends serially to the master.

4. RF module: It is used for transmission and reception of information from base station to all the nodes.NRF24L01 is capable of listening simultaneously from 6 transmitters and store the message in the FIFO (queue).The message is sent to the master through SPI bus.

5. Monitoring and visualization: Achieved by writing set of python programs to receive serial data, save it in the file and a live graph is plotted for easy visualization and analysis

Block diagram of the system at the receiver end:
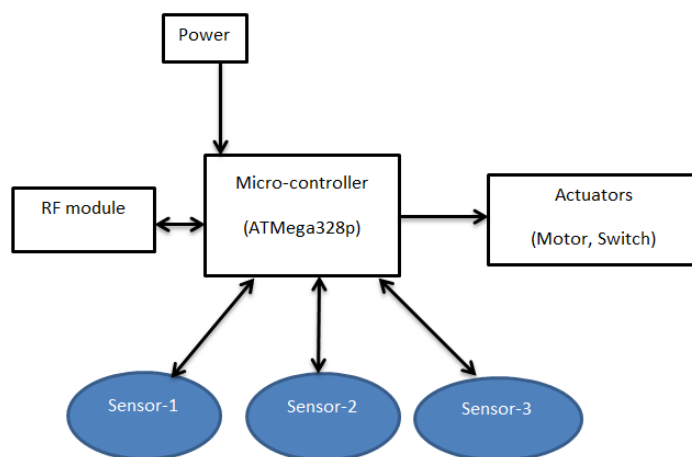
Block diagram of sensor node

1. When the transmitter sends the message it is received by the RF module and sends it to the micro controller for processing. Based on the received message specific action is performed by sending instruction to the corresponding actuators.

2. Sensors connected to the micro controller send the sensed values periodically for broadcasting to the base station.

Social Impact

By implementing this model on the agriculture land, farmer's income will raise because of increase in the productivity, thereby his status in the society increase. In India there is a shortage of labour in agriculture field that's why most of the people stopped cultivation and started moving towards city. By using this model dependency of farmer on labours will reduces. The productivity of the nation increases thereby increases the overall GDP.

Market Survey

Currently available home automation and smart agriculture devices are costlier than our theoretical bill of materials. All the commodities (both software and hardware) which can be used in our conceptual idea are open source and are free to use, therefore no third party licences are not required. Since the model uses RF technology dependency on cellular network and Wi-Fi is zero therefore consumers of this hardware would be found around the nation.