VITALISING ICT RELEVANCE IN AGRICULTURAL LEARNING

Remote Monitoring and Control System for Greenhouse Based on IoT

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VIRAL

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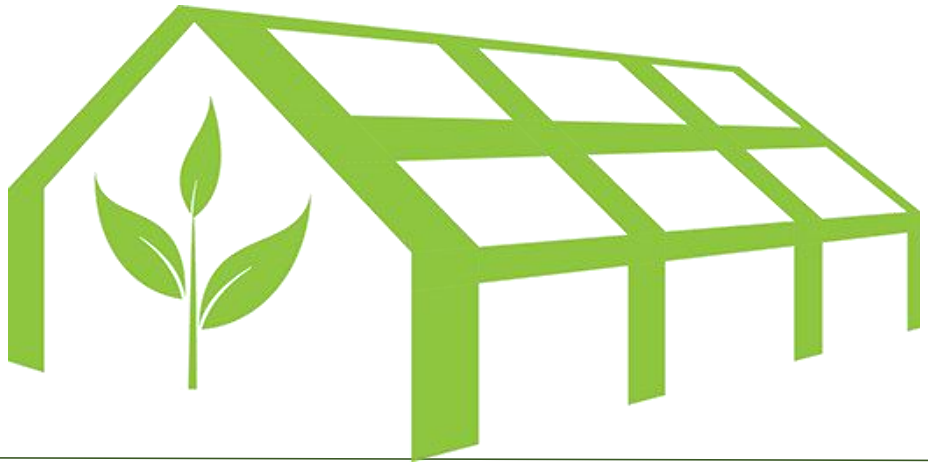
GREENHOUSE is something related to a building or a place where small plants and vegetables are grown. The area under greenhouse is covered with glass or translucent plastic roofs and this plays important role for the vegetation in cold regions, because it is still very cold to take them to an outside environment.

Greenhouse is the technical approach in which farmers in the rural areas will be benefitted by automatic monitoring and control of greenhouse environment replace the direct supervision of the human.

Automated greenhouse system helps the farmers by controlling the environment parameters through the internet of things (iot).



IOT and Arduino based Remote Monitoring and Control System for Greenhouse project use four sensors to detect the Temperature, Light, Humidity and Soil moisture in the Greenhouse.

Temperature sensor is used to detect the temperature inside the greenhouse. Reading from the sensor is sent to the microcontroler. The microcontroller is connected to different relays. One of the relays is connected to a cooling fan. If the temperature is above or below the treshold value, the microcontroller would send signals to turn ON or OFF the cooling fan.

Light sensor is used to detect the amount of sunlignt inside the greenhouse. Reading from the sensor is sent to the microcontroller. If the temperature is above or below the threshold value, the microcontroller would send signals to turn ON or OFF the cooling fan.

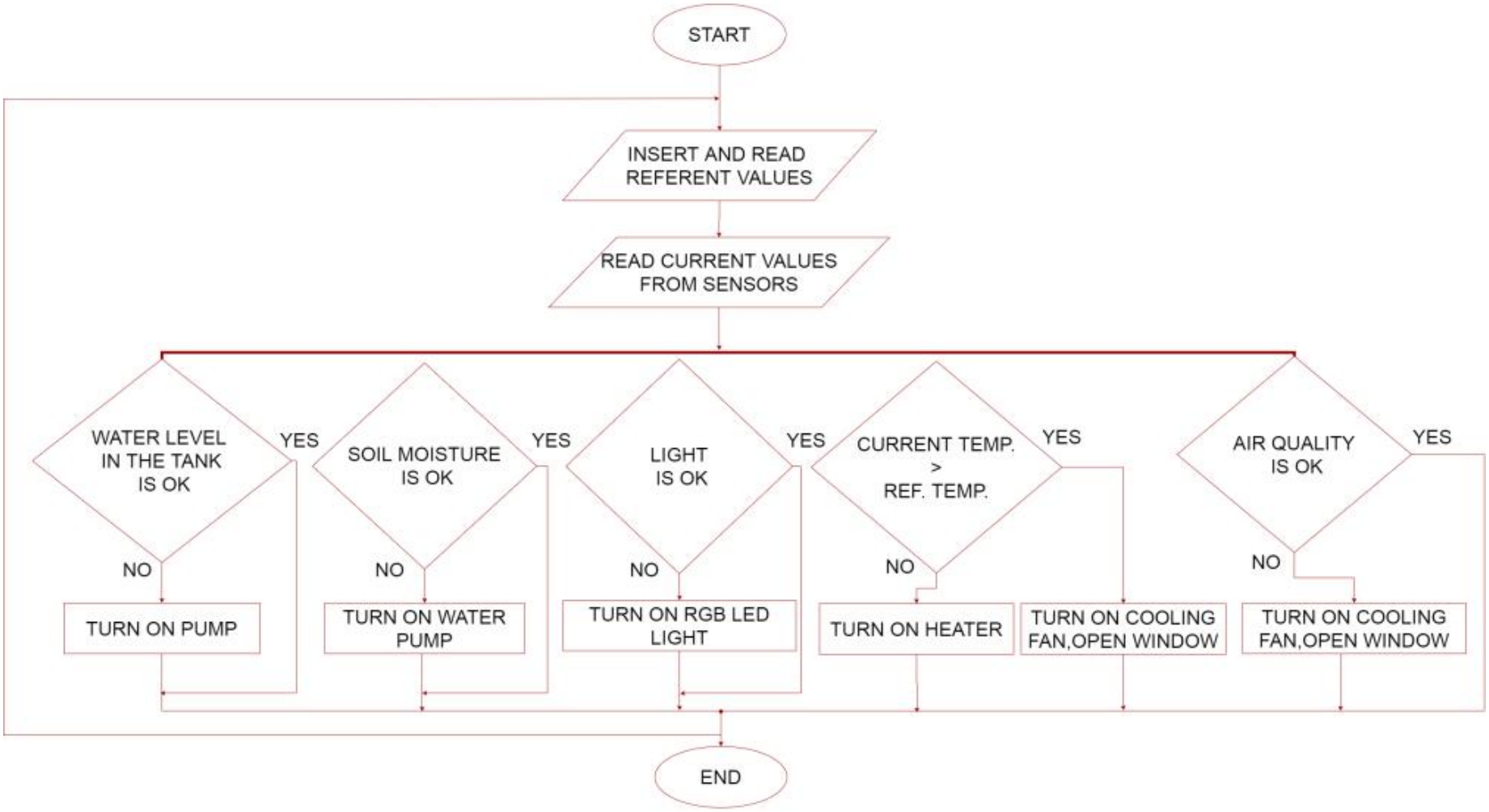
Similary, the **humidity** sensor is used to detect the humidity value and the **soil moisture** sensor is used to detect the soil moisture. If the humidity value detected by the sensor is above the threshold value or if the soil moisture reduces, the microcontroller would turn on the cooling fan to decrease the humidity and will open the electric valves for watering to increase the moisture in the soil.

At the same time, data regarding these parameters are sent to the **IOT module (ESP8266)**. The data sent to the IOT is sent at regular intervals irrespective of any threshold mismatch found.

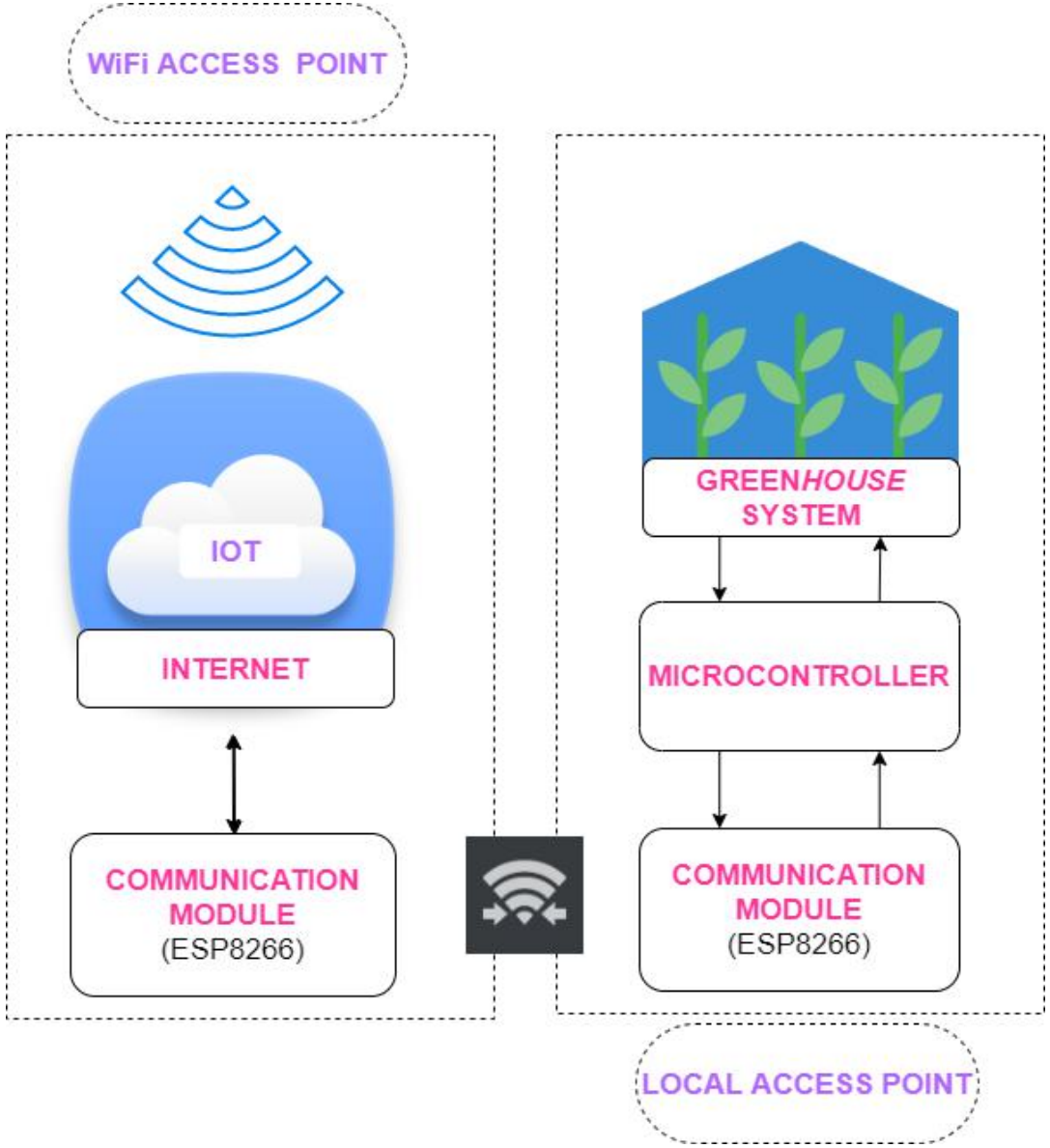
ESP8266 is a chip used for connecting micro-controllers to the Wi-Fi network and make TCP/IP connections and send data. Data, which is sensed by these sensors, is then sent to the IOT.

The Pre-requisite for this project is that the Wi-Fi module.

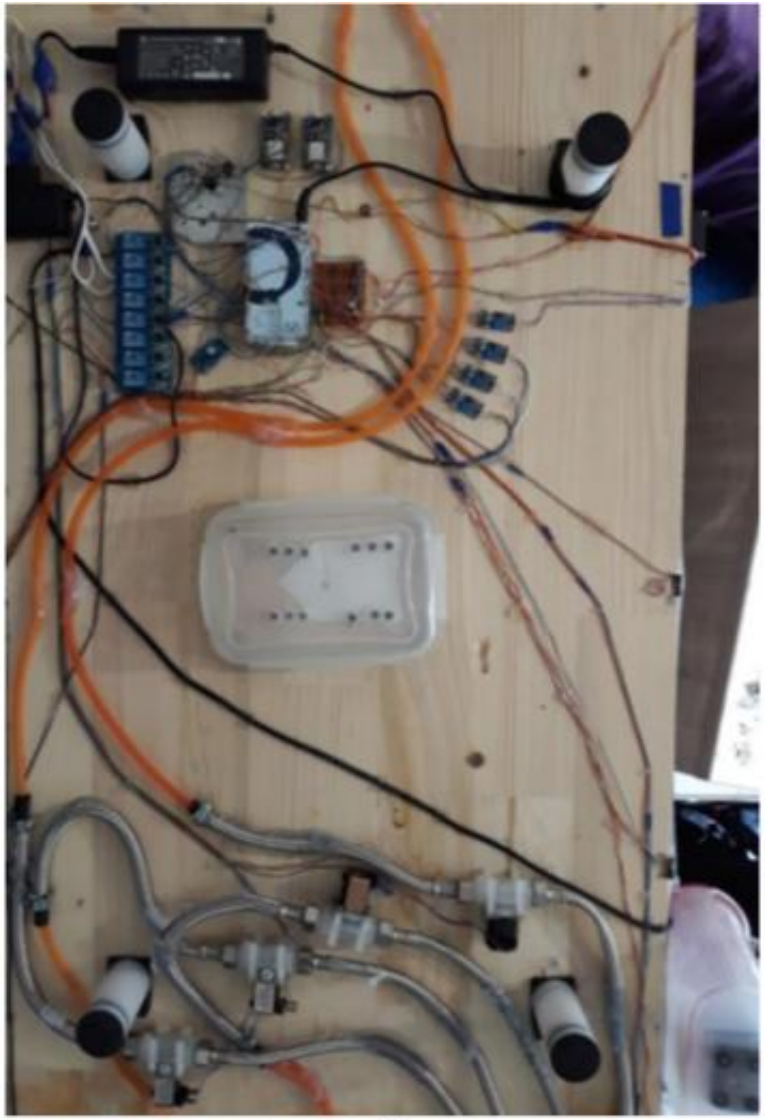
The algorithm of system operation



COMMUNICATION



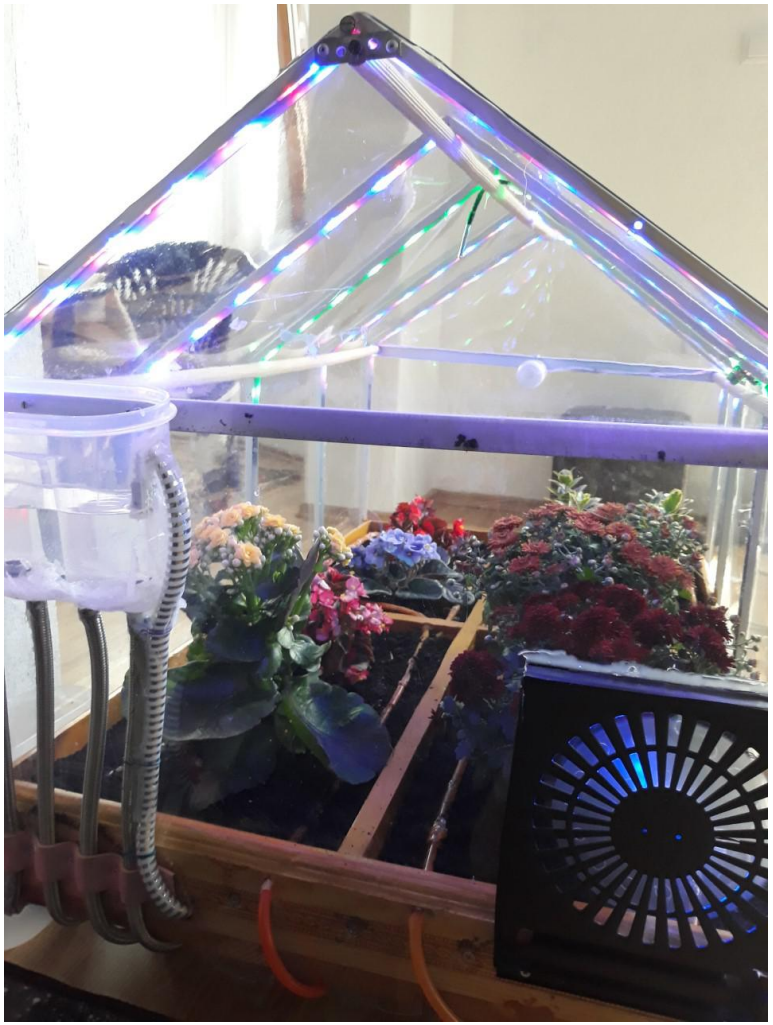
FINISHED SYSTEM APPEARANCE



a)

b)

Finished system appearance:
a) The control part placed below the greenhouse, b) appearance of greenhouse

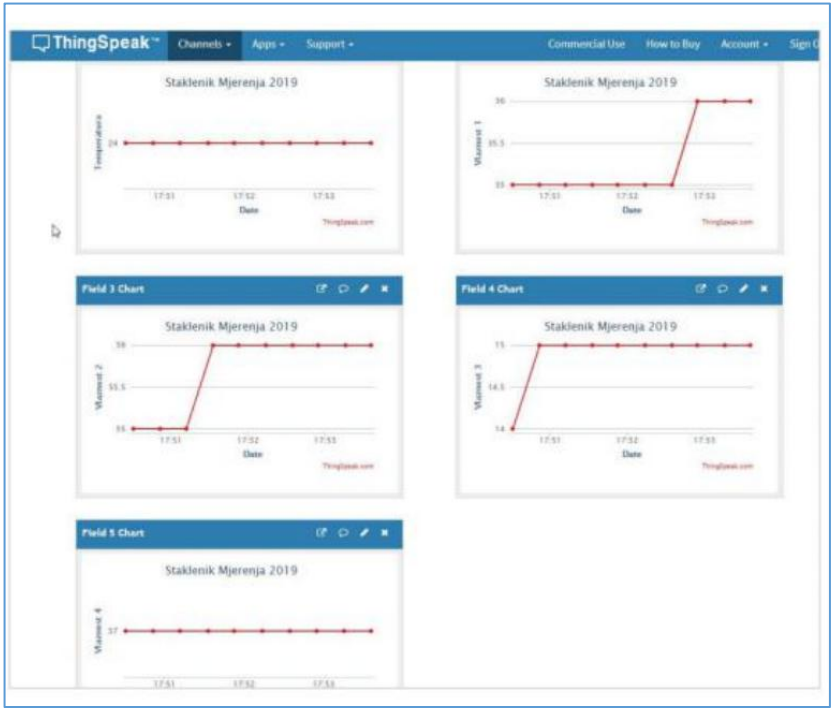


The subsystem for control and monitoring of the system using IoT is realized so that the parameter values read by sensors in the greenhouse model are sent by serial communication from the ATMega2560 microcontroller to the NODE MCU esp8266 communication module which further transmits these parameter values via WiFi network to the local network and into the cloud.

The ThingSpeak IoT platform was used for this purpose. For easier access, a website was created that communicates with the ThingSpeak IoT platform and exchanges the desired data with it.

On the Web page, in addition to viewing the parameter values, the user has the option to enter and send the desired parameter values. These values are transmitted in the same path all the way to the ATMega microcontroller connected to the greenhouse model. Based on the difference between the reference and measured values of the parameters, certain actuators are switched on or off.

The ThingSpeak channel ‘Greenhouse Measurements 2019’ has been created on which see the readings of the parameters for soil moisture 1, soil moisture 2, soil moisture 3, soil moisture 4 and for temperature. A Web page has also been created that continuously downloads data from the created channel in ThingSpeak.



IOT CHANNEL

WEBPAGE

CONCLUSION

Protected areas enable the cultivation and harvesting of quality fruits, vegetables and flowers throughout the year, provide several times higher yield compared to production in open fields and represent the most intensive form of production.

Protected areas ensure intensive production, combined production of fruits, vegetables and flowers out of season, greater control against diseases and pests with the application of biological control, and this ensures healthier food.

In the immediate vicinity should be built facilities that provide quality and secure supply of electricity, gas, water, telecommunications and the like as well as good road connections.

Remote control and monitoring represent the future for this way of agricultural production because they provide multiple advantages to the owners of protected areas: they reduce physical work, allow more free time and guarantee optimal microclimatic conditions for the growth of different crops.

CONCLUSION

For remote control and monitoring of microclimatic conditions using the Internet, the ThingSpeak platform was used because it enables management, monitoring and analysis of system operation for a longer period of time.

Based on the experimental analysis, it can be concluded that the presented solution for monitoring and management of the greenhouse / greenhouse is functional and that it can be mapped to the actual greenhouse / greenhouse with very small changes. In an actual greenhouse you should put stronger actuators (pump, LED lighting and heater) depending on the size of the greenhouse.

Future improvements to the proposed solution can be made by regulating additional microclimatic conditions, such as enriching the air inside the greenhouse with CO2 and visually inspecting the greenhouse.

Thank you !

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