# Idea/Approach Details:

- Greenhouse farming is the practice of growing plants in controlled indoor environment that creates optimizing conditions for higher yield and provides protection from unwanted external factors.
- To overcome the drawbacks of traditional Greenhouse farming we came with an Idea of Automated Greenhouse Farming.
- Automated greenhouse farming involves the integration of sophisticated technologies to facilitate the optimal cultivation of crops within a controlled environment. This approach utilizes the advancements in artificial intelligence (AI) and Internet of Things (IoT) technology to enhance and regulate various aspects of the growing process, ultimately leading to maximized yield and quality outcomes.
- Our greenhouse is structured in a way that it will be covered with a translucent material that allows sunlight to partially penetrate.
- We are also focusing on the agenda of save water, for this we are using the approach of drip irrigation.
- The biggest drawback of traditional Greenhouse farming is excess of Humidity, to overcome this, we will be installing dehumidifier that will regulate excess humidity.
- It also regulate the excess temperature within the Greenhouse using external fans.
- We will also install UV-C lamps that will emit ultraviolet (UV) light of wavelength 200 to 280 nm. UV-C light is germicidal, which means it destroys the DNA and RNA of unwanted organisms present in soil such as nematodes and other pathogens, for prevention of pests, we will install the sprinklers.
- We will add Emergency system that can detect the unwanted circumstances such as cattle attacks, fires, malfunctioning of sensors and report it to the authorized person using AE GSM Modem.
- To enable real time data monitoring, we'll integrate our system with Cloud.

Circuit Diagram:
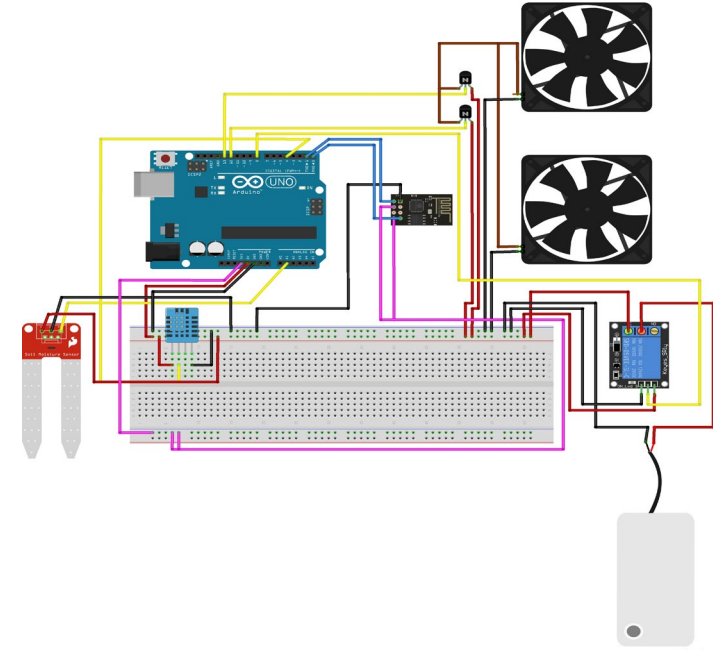
Technology Stack:

Sensors and Actuators:
- Soil Moisture Sensor
- DHT11 Sensor
  (for humidity and temperature)
- Ultrasonic or Motion Sensor
  (for cattle invasion detection)
- Sensing Camera
  (for crop imaging)
- Fans and Irrigation System
  (actuators)

Microcontroller:
- Arduino Uno

Communication:
- GSM Modem .
- Esp 8266 Wi-Fi Module

Data Processing and Analysis:
- AI Models (for disease and insect detection)
- Natural Language Processing (NLP)

Cloud Platform and Storage:
- ThingSpeak
- Cloud-based Storage
  (for images and data)

Prototype/Working:

- Our approach is to automate the temperature and humidity inside the Greenhouse without any need of manpower.
- Farmers need to set the type of crop they intend to grow and by using that data our IoT device will automate the temperature and humidity conditions as per the requirements of the crop growth.
- Our System provides features, like drip irrigation that saves a lot of water by delivering sufficient water to every plant in the farm drop-by-drop.
- For this Project we are using Arduino Uno attached with a ESP8266 Wi-Fi module to upload our data to ThingSpeak Cloud that will make data monitoring easier.
- IoT device provides functionalities such as humidity monitoring through DHT11 sensor and dehumidification will take place with the help of fans hooked through a NPN transistor.
- We will connect the drip irrigation system with a tank for efficient supply of water, soil moisture sensor and motors will be used to regulate the water supply.
- The sensing camera captures images of the crops at regular intervals within the greenhouse, these images are then sent to the AI/ML system for analysis.
- The AI/ML system processes the images using computer vision techniques to detect signs of diseases, pests, or other anomalies in the crops. It provides real-time feedback to the farmer, identifying issues and suggesting appropriate remedies.
- Our user interface offers a control panel for remote monitoring and control of the greenhouse system. It displays data from sensors and actuators in real time, enabling farmers to make informed decisions.
- Natural Language Processing (NLP) is used in the interface to enable user-friendly interaction. Farmers can use voice or text commands to query system status, receive recommendations, and issue commands, making it easy to use and accessible.

Showstopper:

Certain showstopper that could appear:

- **Weak signal strength:** Sensors will collect the real time data but if we are not having an adequate supply of internet ,data might take some time to get displayed on cloud.
- **Legal and regulatory barriers:** Greenhouse farming is subject to various regulations, such as environmental health and safety standards.

Future Scope:

- We can create a virtual environment for the growth of weather-dependent crops, such as exotic fruits that are imported from different parts of the world.
- We can use Soil NPK sensor which can quickly test the content of nitrogen phosphorus potassium in different kinds of soil, according to which we can develop the required soil composition for the crop.

Features and Benefits:

- **Energy Efficiency:** Utilizing solar power for farming not only reduces the farm's carbon footprint and greenhouse gas emissions, but it also reduces energy costs by reducing reliance on grid power.
- **Water Conservation:** Drip irrigation is a water conservation method that delivers water to the plant's roots precisely in the required amount, reducing water wastage. With IoT, farmers can schedule watering based on local weather forecasts and soil moisture sensors, which reduces the risk of overwatering.
- **Lower Labor Costs:** With automated systems, farmers can minimize labor costs since there is no need for manual monitoring and watering of the plants, which leads to increased productivity.
- **Improved Quality of Produce:** With precise control over the growth environment, farmers can produce crops that are more consistent in size, shape, and quality.
- **Disease Prevention:** Automatic IoT-based monitoring systems can help detect plant diseases and infestations quickly, enabling farmers to take corrective measures immediately, reducing crop loss.

UML Diagram:
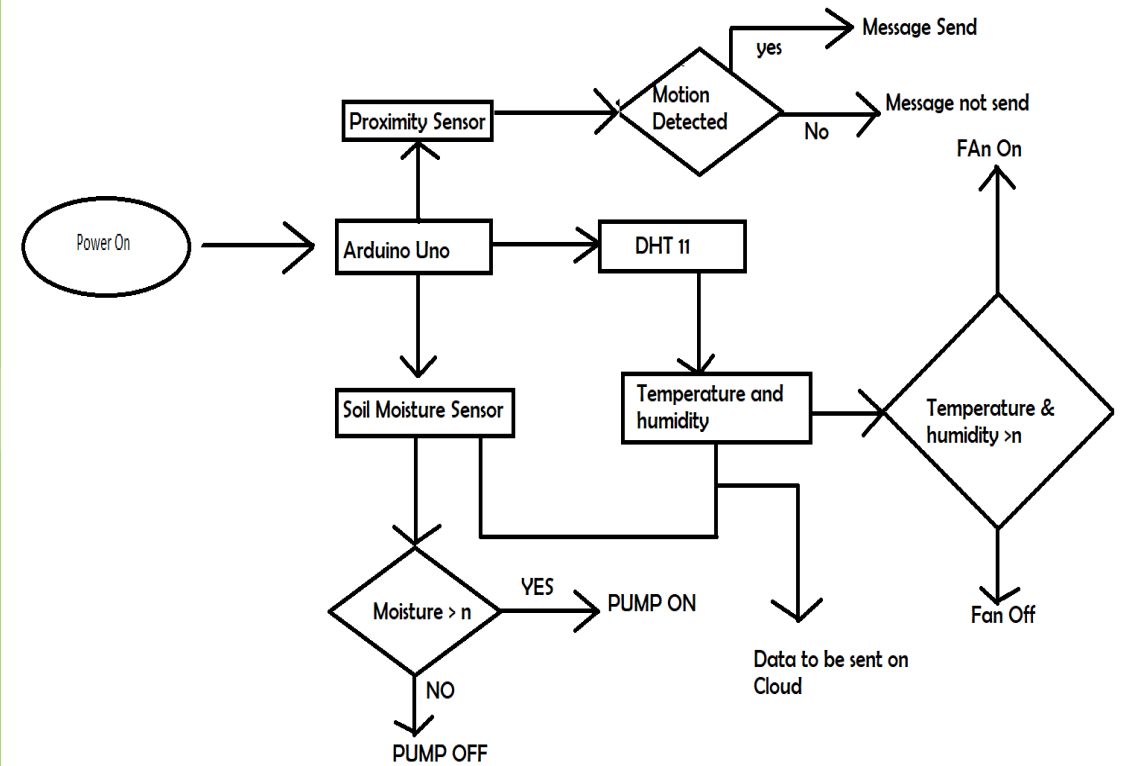
Dependencies:

Sensors and Actuators:
- For Our project we are going to use Temperature and humidity sensors, UV sensors, for checking soil moisture we are going to use soil moisture sensor.

Software Required:
- Arduino IDE
- Thingspeak Cloud

Additional Devices:
Pump, motors for drip irrigation., sprinklers for pesticides, image sensing camera.