

LITERATURE SURVEY

IoT BASED SMART CROP PROTECTION SYSTEM

FOR AGRICULTURE

DOMAIN : INTERNET OF THINGS

TEAM ID :PNT2022TMID50380

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INTRODUCTION:

With the exponential growth of world population, according to the UN Food and Agriculture Organization, the world will need to produce 70% more food in 2050, shrinking agricultural lands, and depletion of finite natural resources, the need to enhance farm yield has become critical. Limited availability of natural resources such as fresh water and arable land along with slowing yield trends in several staple crops, have further aggravated the problem. Another impeding concern over the farming industry is the shifting structure of agricultural workforce. Moreover, agricultural labor in most of the countries has declined. As a result of the declining agricultural workforce, adoption of internet connectivity solutions in farming practices has been triggered, to reduce the need for manual labour.

BI Intelligence survey expects that the adoption of IoT devices in the agriculture industry will reach 75 million in 2020, growing 20% annually. At the same time, the global smart agriculture market size is expected to triple by 2025, reaching \$15.3 billion (compared to being slightly over \$5 billion back in 2016).

Smart farming based on IoT technologies enables growers and farmers to reduce waste and enhance productivity ranging from the quantity of fertilizer utilized to the number of journeys the farm vehicles have made, and enabling efficient utilization of resources such as water, electricity, etc. IoT smart farming solutions is a system that is built for monitoring the crop field with the help of sensors (light, humidity, temperature, soil moisture, crop health, etc.) and automating the irrigation system. The farmers can monitor the field conditions from anywhere. They can also select between manual and automated options for taking necessary actions based on this data. For example, if the soil moisture level decreases, the farmer can deploy sensors to start the irrigation. Smart farming is highly efficient when compared with the conventional approach.

Paper1: An Overview of Internet of Things (IoT) and Data Analytics in Agriculture

- ❖ **Publication Year** : 2018
- ❖ **Author** : Olakunle Elijah, Tharek Abdul Rahman, Igbafe Orikumhi, Chee Yen Leow, MHD Nour Hindia
- ❖ **Journal Name** :IEEE
- ❖ **Summary:**In the deployment of IoT device, there are key technical parameters that needs to be considered. For wireless connectivity, the following parameters should be considered: the range of communication distance, data rate, battery life, mobility, latency, security and resilience, and cost of gateway modems. Among the communication technology, the LPWA is attracting so much interest especially with the emergence of NB-IoT. The NB-IoT promises interesting features which include low device power consumption, ultralow device cost, simpler to implement, support of a massive number of low-throughput devices, long distance coverage and can support upload and download of data . There are several use cases of IoT in agriculture which have adopted the use of the IoT ecosystems discussed in this section.

Paper 2: IOT in Agricultural Crop Protection and Power Generation

- ❖ **Publication Year** : 2020
- ❖ **Author** : Anjana M, Charan Kumar A, Monisha R, Sahana R H, Mrs. Sowmya M S
- ❖ **Journal** : IJSTR
- ❖ **Summary:** We will build a small greenhouse which is the area of 67X49 in centimeter. Here we used polycarbonate sheets made of rigid plastic that transmits light almost like glass sheet. Here we are concentrated on growing one crop in the greenhouse which is green chilly named as Serrano pepper grouped under commercial crop. It requires a 24°C-27°C temperature. So that temperature is maintained by setting this value. Crop needs well drained

sandy loam soil with rich organic content. It requires a moisture in the soil. In order to keep the soil in moisture condition here it is set to 100. If the moisture content goes beyond 100 then it will automatically shut down the water pump through relay if it is working in automatic mode otherwise send the notification to the farmer shutdown the water pump.

Our main objective is to protect and growing the crops during rainy season as many farmers will not get high yield during these days due to heavy rainfall. Rain sensor will notify the presence of rain comes. If it is heavy rain, then the roof top of the greenhouse will automatically be closed and protect the crops and completely shutdowns the irrigation process. That rainwater is collected, and it is used for other purposes also.

Paper 3: Intelligent Crop Monitoring and Protection System in Agricultural fields Using IoT

- ❖ **Publication Year** : 2019
- ❖ **Author** : Ramaprasad S S, Sivaprasad Lebaka, Rajendra Prasad, P, Manohar G N
- ❖ **Journal** : 4th international conference on electronics, information communication & technology
- ❖ **Summary:** Water is an important resource for human being, animals, and plants and also for next generations, this resource we have to use in controlled and effective way. As we all know that agriculture sector requires huge water, in this paper we have implemented intelligent agriculture system which uses optimal water and also gets good yield. With this work an irrigation system is operated measuring the moisture content of the soil, later harvesting the excess water from the cultivation field and recycled back to the tank. The developed system also alerts the farmer with buzzer when there is an intruder (human/animal) into the farm. The Field information is sent to the cloud using Wi-Fi and to the registered mobile at regular intervals to make the research about the field condition and also about the crops. In this system we have also used solar energy for backup purpose as there is a lot of load shedding in rural areas. This intelligent irrigation system gets good and quality

crop yield, it saves the water which is flowing as excess and also it protects the agriculture field from intruders.

Paper4: Development of IoT based Smart Security and Monitoring Devices for Agriculture

- ❖ **Publication year** : 2019
- ❖ **Author** : Tanmay Baranwal, Nitika, Pushpendra Kumar Pateriya
- ❖ **Journal** : IEEE
- ❖ **Summary:** Internet of things' is widely used in connecting devices and collecting information. The system is designed for identification of rodents in grain stores. After collecting and analyzing the data, algorithm is designed to provide accuracy in notifying user and activation of repeller. All the results are calculated by taking several readings. The testing is done in an area of 10 sq.m. with device placed at the corner. Once PIR sensor identifies heat it starts URD sensor and webcam, along with it, device sends random number of notifications (based upon timestamp) to user. For future upgradation, device will inherit a grid of sensor panels consisting PIR sensors and URD sensors. The device can incorporate pattern recognition techniques for machine learning and to identify objects and categorize them into humans, rodents and mammals, also sensor fusion can be done to increase the functionality of device. Improving these perspectives of device, it can be used in different areas. This project can undergo for further research to improve the functionality of device and its applicable areas. We have opted to implement this system as a security solution in agricultural sector i.e. farms, cold stores and grain stores. The results of the work point to the following directions of research that are likely to be needed for further improvement.

Paper5 : Smart IoT Monitoring System for Agriculture with Predictive Analysis

- ❖ **Publication Year** : 2019
- ❖ **Author** : Alaa Adel Araby, Mai Mohamed Abd Elhameed, Nada Mohamed Magdy

- ❖ **Journal** : 8th International Conference on Modern Circuits and Systems Technologies (MOCASST)
- ❖ **Summary:** This paper proposes, a smart system based on the integration between IoT and machine learning to predict the late blight disease in potatoes and tomatoes before the first occurrence which reduces the costs by giving the farmer an exact warning message on the specific time to apply the protective pesticides which help to save the yield production in the infection seasons and reduce the usage of the unnecessary pesticides. Each sensing node contains some low-cost sensors to collect the factors needed for the machine learning model which are: temperature, relative humidity, leaf wetness, and the soil moisture. These data are collected by nodes deployed in the field to be sent using the Wi-Fi module and MQTT protocol to the gateway on which the machine learning algorithm runs to output the predicted warning message. The predicted action or warning message is displayed on the website for the farmer.

Paper 6: Intelligent agriculture greenhouse environment monitoring system based on IoT technology

- ❖ **Publication Year** : 2015
- ❖ **Author** : Liu dan, Cao xin, Hwang chongwei, Ji liangliang
- ❖ **Journal** : international Conference on Intelligent Transportation, Big Data & Smart City
- ❖ **Summary:** Here they used Zigbee for green house monitoring system. The system realizes the remote intelligent equipment control through internet. This system is made up of front end data acquisition, data collection ,data transfer. The ambient temperature in real time is processed by temperature sensor and the processed data is sent to the intermediate node through the wireless network and there is the role of IoT and then it is send to PC for further more controlling .The main objective is to collect information like humidity, temperature, CO2 level with these the system can decide the controls like sprinkler control, wind control, screen control.

Paper 7: Sensor based Automated Irrigation System with IOT

- ❖ **Publication Year** : 2015
- ❖ **Author** : Karan Kansara , Vishal Zaveri , Shreyans Shah , Sandip Delwadkar2, Kaushal Jani
- ❖ **Journal** : International Journal of Computer Science and Information Technologies
- ❖ **Summary:** The system consists of five infield sensing stations distributed across the field, an irrigation control station, and a base station. The in-field sensing stations monitor the field conditions of soil moisture, soil temperature, and air temperature, whereas a nearby weather station monitors micrometeorological information on the field, i.e., air temperature, relative humidity, precipitation, wind speed, wind direction, and solar radiation. All in-field sensory data are wirelessly transmitted to the base station. The base station processes the in-field sensory data through a user-friendly decision making program and sends control commands to the irrigation control station. The irrigation control station updates and sends geo-referenced locations of the machine from a differential GPS mounted at the cart to the base station for real-time monitoring and control of the irrigation system. Based on sprinkler head GPS locations, the base station feeds control signals back to the irrigation control station to site-specifically operate individual sprinkler to apply a specified depth of water.

Paper 8: IoT Based Smart Irrigation Monitoring And Controlling System

- ❖ **Publication Year** :2017
- ❖ **Author** : Shweta B. Saraf, Dhanashri H. Gawali
- ❖ **Journal** : 2nd IEEE International Conference On Recent Trends in Electronics Information & Communication Technology
- ❖ **Summary:** All sensing nodes comprised in the WSN send soil moisture measurements frequently, which will help the algorithm taking decisions

concerning the need for irrigation. When a soil moisture message of any node has a value below the defined threshold, the algorithm will read the values of ambient temperature and humidity next 4 hours, in order to decide whether to irrigate or not. The cloud is also responsible for finding the right moment to stop the irrigation. For that, whenever all soil moisture sensor of the network assumes a soil moisture value larger or equal to the defined threshold will specify the end of the irrigation. When this condition is assured, the cloud sends a message to the WSN which contains an instruction to stop the irrigation. The study and analysis related to the interconnected field studies of Internet of Things, Machine-to-Machine and Wireless Sensor and Actuator Networks, it was possible to identify that there are various developments in the last couple of years, there is still problem to address regarding the generated and collected data. Being cloud computing a recent resource providing approach, the main work developed within the context of the paradigms presented above was not properly integrated with the possibilities that a cloud computing platform could offer. The system proposed in this paper, aims to lead to the combination of such systems with the attractive features offered by cloud computing. This integration could be applied to the agricultural applications. The automated irrigation system presented in this work was found more viable, and can manage irrigation water supply more effectively. It helps to optimize the use of water for irrigation purpose. It shows that water consumption is reduced with the implementation of soil-moisture based automated irrigation system.

Paper 9: IOT Based Crop Protection System against Birds and Wild Animal Attacks

- ❖ **Publication Year** : 2020
- ❖ **Author** : P.Navaneetha , R.Ramiya Devi , S.Vennila ,
P.Manikandan , Dr.S.Saravanan
- ❖ **Journal** : IJIRT
- ❖ **Summary:** The main aim of our project is to protect the crops from damage caused by animal as well as divert the animal without any harm. Crops in

farms are many times ravaged by local animals like buffaloes, cows, goats, birds etc. This leads to huge losses for the farmers. It is not possible for farmers to barricade entire fields or stay on field 24 hours and guard it. So here we propose automatic crop protection system from animals. Animal detection system is designed to detect the presence of animal and offer a warning. In this project we used PIR and ultrasonic sensors to detect the movement of the animal and send signal to the controller. It diverts the animal by producing sound and signal further, this signal is transmitted to GSM and which gives an alert to farmers and forest department immediately. In rural parts of India, farmers encounter severe threats such as damage done by animals. Hence, to overcome this issue we have designed a system in which sound is played and by using LDR it detects light intensity, if it is less, it will focus the light. So that wild animals will not enter into the farm. It will run away. GSM module sends message to the farmer to alert him. From this it is concluded that the design system is very useful and affordable to the farmer. The design system will not be dangerous to animal and human being, and it protects farm.

Paper 10: Smart Crop Protection System Using IOT

- ❖ **Publication year** : 2021
- ❖ **Author** : Shishir Bagal , Krunal Mahajan², Riya Parate ,Ekta Zade , Shubham Khante
- ❖ **Journal** : IJIRT
- ❖ **Summary:** The Smart protection system defines that this project help to farmer for the protection of a farm. We have designed this project for the only secure from animals but we this project have the provision to secure from the human begins also. This can achieve by the help of IOT device that we are discuss in this paper. The SCPS work on the battery so that this project can be easily portable and also we are add solar panels and converter modules this can help the battery to charge from solar energy. The IOT device is used to indicate the farmer by a message while someone enter into the farm and we are used SD card module that helps to store a specified sound to fear the

animals.in this NodeMcu microcontroller based wifi module is used and flame,pir sensors are also employed.

Paper11: IoT Enabled Smart Sensor Based Insect and Animal Detection System

- ❖ **Publication Year** : 2021
- ❖ **Author** : Prof. Subhash Chandra Yadav , Prashant Kumar , Pushpendra Kumar
- ❖ **Journal** : International Journal of Aquatic Science
- ❖ **Summary:** The crop yield also affected by the insects and pests invasion .So the field is monitored by the ultrasonic and IR sensors and the datas get collected in the thingspeak server.The sensors are connected to the Arduino and to the IoT system to inform the farmers about the animal or insect intrusion captured by the sensors.The IoT communicate with the farmers via SMS service and gives the alert.

Paper12: Internet of Things (IOT) Based Electronic Pest Control Using Image Processing System

- ❖ **Publication Year** : 2019
- ❖ **Author** : Babeetha Muruganantham , Farag Anjum Kureshi , Ishwarya J , Nivedha Murugan
- ❖ **Journal** : IJARIE
- ❖ **Summary:** The automated electronic pest control mechanism that takes help from the regression model and the image processing results to set up the correct Radio Frequency to remove pests from the crops and save them from diseases. This reduces the use of pests and thus the crop s are healthier and more hygienic since less poison is being introduced into the soil and surface of the crops. This also helps the farmers as they don't need to buy much pesticide thus reducing the expenses and help in the savings. The electronic pest repellants are one time cheap investment which don't require much

maintenance and is easy to use. It doesn't harm humans, birds or other animals. During rain, the pesticides wash off into the lakes and ponds killing aquatic life, electronic pest repellent will control that too. Matlab is used for image processing.

CONCLUSION:

That we have seen few proposed research papers and then got an idea about how to protect the crops from various factors like animals, insects, rainfall, etc. The advancements we were going to propose is as said by Tesla "if you want to change think in terms of sound, vibration and energy", the point to implant speakers which emits sounds only audible by insects and animals to get rid of them.