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Smart Agriculture Based on Internet of Things (IoT)

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Abstract:

In India agriculture provides employment to large population which lives in villages and fully dependent on it to fulfil their livelihood. In the last decade, an incredible growth has been occurred in the use of electronic infrastructure for agricultural processes and development in India. In the recent time, an impressive development in information technology and electronic infrastructure has brought its usage well in the capacity of common people. The affordability of electronic equipment's and IT based applications resulted to a tremendous development in agriculture sector. Farming community at large have started to monitor and control various agricultural activities such as irrigation, foresee climate situation, check soil construction and variety of crop cultures through the various information technology-based systems and projects implemented by the Government of India and different State Governments in India. But these farmers are facing problems due to whether, humidity theft. This paper mainly focuses on how we can avoid theft of cultivated crops.

Key terms: IoT, Big Data, Cloud Computing, AI, TCP/IP.

Introduction:

Origin of the Proposal:

Agriculture is the basis of life for the human species as it is the main source of food grains and other raw materials. Agriculture also plays a vital role in the development of country's economy and provides ample employment opportunities to the people in rural areas in India. It has been observed that even though many latest technologies are evolving for optimizing the yield of crop, many farmers are still using the traditional methods of farming which results in low yielding of crops and fruits. Hence, this project takes care of the need to implement modern science and technology in the agriculture sector for increasing the yield.

Definition of the Problem:

The smart farm with IoT systems can support a wide range of devices from different agricultural device manufacturers. The enhancement in the field of agriculture has become biggest challenge, so innovative technologies must be adopted. The sensors are to be installed in the agriculture field to collect the data, and the collected data is mitigated into the cloud network with the help of IoT hub for monitoring the farm in real time and help farmer to be always updated.

Review and status of Research and Development in the subject:

Modernization of the farming process in rural India is an important task to improve the productivity of the agricultural field. Major challenges of the agriculture are the proper monitoring of the farm and to detect theft of crops by humans or pests.

International Status:

- Case Study - "Smart Agriculture Project in an Australian Nursery to Ensure Crops Health and Reduce Losses" (2017): This IoT project to control every parameter that affect crops growth cycle in the nursery has enabled to take any decision based on real facts. Every process has been improved and also the daily work of each farmer. Another outcome of the project is that it has greatly reduced the potential of any adverse litigation.

- Towards Smart Farming Agriculture Embracing the IoT Vision: Internet of Things allow an integrated, multidimensional view of farming activities. The set of technologies used in smart farming are fleet management, arable farming, large and small field farming, livestock monitoring, indoor farming, fish farming, forestry and storage monitoring. It also discussed about the urgency of the problems the world faces regarding food security.

National Status:

- Shruti A Jaishetty et.al., (2016), IJRET: The work discussed about the major challenges in the agriculture. A novel idea was proposed to have a control over the irrigation and monitoring of the agriculture field using IoT by connecting with the supporting devices which

helps in predicting the conditions well in advance to take the necessary steps to improve the productivity.

- Akash Raj N, et.al., (2016), IJIRSET: IoT based Agro Automation System using Machine Learning Algorithms was proposed to overcome the core problems faced by the farmers. A semi-autonomous agro robot was employed to simplify the endeavours undertaken by farmers. PTC ThingWorx cloud computing platform was used to monitor and analysis the experimental results.

Design and Implementation:

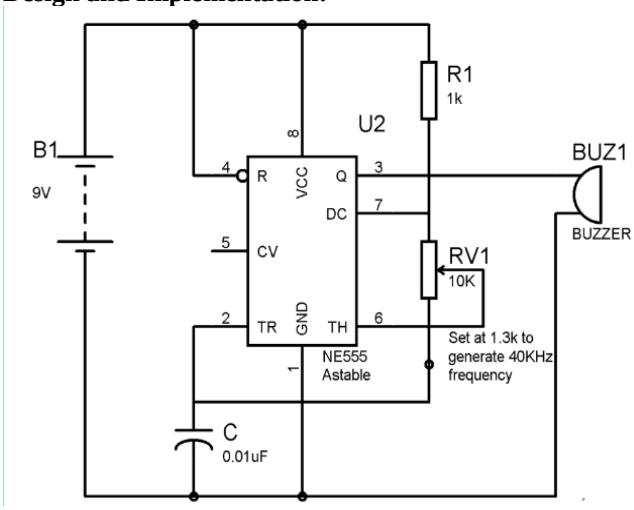

Fig: Circuit for Anti – Pest

This is an LCR circuit that generates supersonic waves and is fed to a speaker that emits these sounds. once insects or pets hear this frequency then they feel irritated and fly/run away. This circuit turned on once camera detects the pest or human. once the human is captured then an alarm to the farmer to his mobile app further as offers an alarm.

We use image reorganization in which we use existing images of insects, problematic harmful birds, humans and when encountered are used to give an alert message to the reporting circuit. When a human face is encountered then takes a picture and is matched with the local database. If there is a hit, then farmer is given data about the thief on his mobile. We use AI to detect and read data from the camera. We use the concept of big data to retrieve information (i.e., images of insects). Cloud computing is used to manage the activity of users. All the IoT devices used are autonomous (i.e., they are self-regulatory)

Circuit Analysis :

Circuit is designed using 555 timer IC in Astable mode.Output frequency is obtained using Piezo buffer, to generate high frequency output. To calculate value of resistor and capacitor of 40KHz frequency we can use the formulae :

$$F = \frac{1.44}{((R1+R2*2)*C)} \quad (1)$$

Theft Protection:

In India, there is always a problem with theft of crops, especially in night times. The IoT Device is implemented with motion detector sensors which detect humans and animals. When humans detected then alarm is raised, and image is searched with the database.

Visual & Voice Message Alert System:

Most of the villagers aren't educated. So, we this can give voice message to user in their native language and its more useable.

Energy Management System:

The IoT device is implemented with energy management system. The energy sources used are battery and solar panels.

Data Points

IoT Device:

1. All the IoT devices are uniquely identified by their addresses.
2. This is sent using TCP/IP and sent to centralized server for processing.
3. They can even control other IoT devices in the range.

Farmer:

A farmer himself can be the best point as he can feel everything in world.

Gram Panchayat:

Gram panchayat has the details of all the villagers which is periodically updated and can be used to as a tool for face recognition in case of human theft.

Proposed System:

Initially system will be taking images from farm video and perform modelling background as a form of codebook for some frames, then confirms moving object by comparing the input frames with modelling codebook. Because human as well as animals such a pig so we use Hilbert scanning distance allows the detected object to be distinguished as a human or animal.

Farmer has an option to customize the language so that its available in the native language of the farmer so that its accessible to everyone.

Hardware Implementation:

Raspberry Pi as Hardware for the OS, Microsoft IoT or Linux can be easily deployed to Raspberry Pi and can used for high computation. These can run on low power requirement.

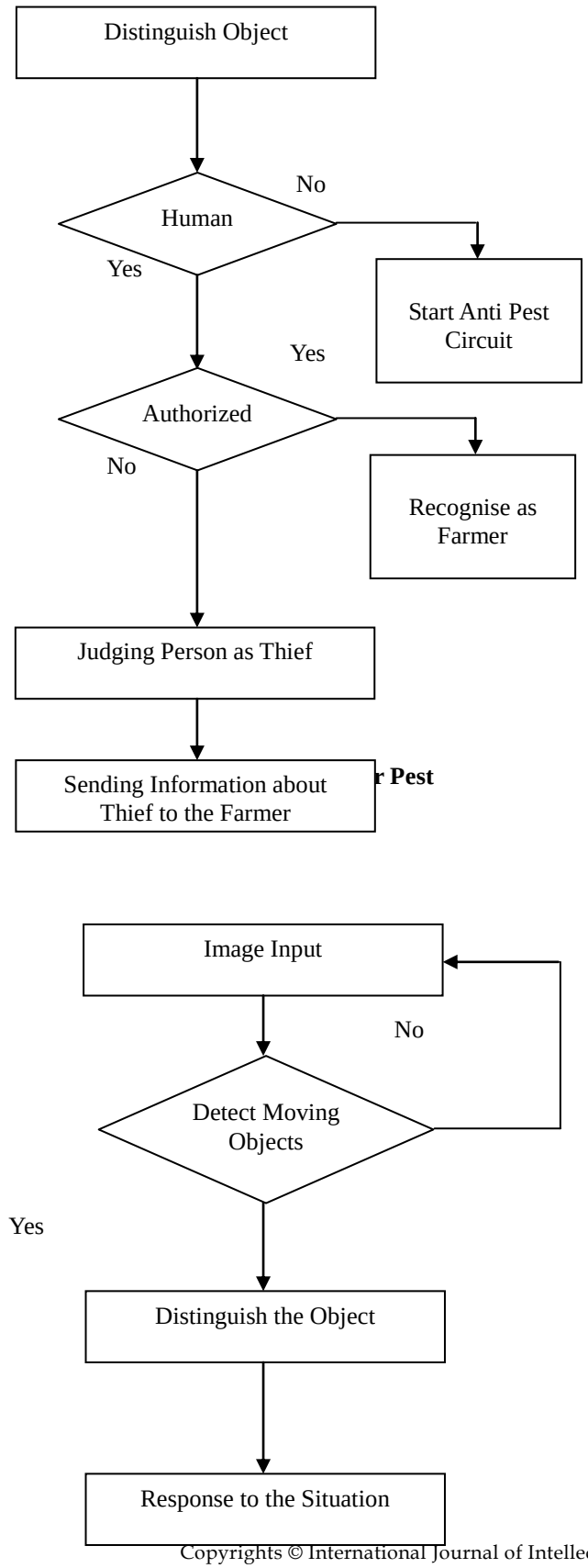

Fig: Diagram to Detect Moving Objects

Solar plate & Chargeable battery: As the device will be placed in open field eco -friendly energy system like solar plate will be connected to device with efficient chargeable battery to keep the device running 24 hours.

Conclusion:

So, by using this paper we want to create a system that is useful for farmers to keep an eye on their farms and corps. In India agriculture is producing food for so many Indians and other countries also. By giving visual and verbal features to farmers we can reduce the theft of crops from animals, birds, humans and other kinds

When intruders as humans enter the farm then their photograph is taken and sends them to central server which recognizes the faces and sends alarm message to the farmer's mobile. our further aim is to develop an actual implementation of the product on a agricultural land which would be an actual case study for the progress of our project.

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