Smart Fencing Solutions for Crop Monitoring System Using Internet of Things

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Abstract
The main aim of our paper undertaking is to shield the harvests from harm brought about by creatures, winged animals, just as to redirect the creature with no damage utilizing current innovations to yield great assurance and production. According to the Department of Agriculture Government of India gauges, a region of 1.56 lakh ha is influenced by natural life hazard which every year causes loss of Rs.229 crores to the farmers. To shield crops from wild creatures, the government has formulated different methods not able to withstand, the issue despite everything perseveres and needs elective strategies to ensure the yields harms. It is the modern-day need to the growing security threat in denying, detecting while having the inbuilt capability to serve as a deterrent. Avoiding creatures from damaging crops is our main goal not hurting them. To overcome this issue, we are presenting a cost less module to save living beings from getting effected or killed in return which also saves electricity use the power for other purposes and save time for farmers and automate protection process, by implementing rain detection and identifying animals, humans producing automatic alarms also passing required amount of power based on size of creature from entering crops.

1. Introduction

Agriculture called the backbone of the Indian economy, nearly 75% of the Indian population depends on farming. Current India's population is 2 billion nearly and using 160 million hectors of land for cultivation and is the second-largest in the world, after the united states. At the constant rate of increasing population with limited resources and producing foods of less quality affecting the economy, in addition to that interference of animals in agricultural lands, few crops are destroyed due to animal menace and hence protection is required to save the crops from animals and birds.

Regularly the greatest importance is usually given to crop protection from diseases, insect pests, and weeds however, farmers also face another interesting challenge, often forgotten about or not understood wild animal yield assurance. wild creatures are exceptional difficulties for composers all through the world winged creatures, for example, crows, sparrows, cranes, peacocks, and creatures, for example, deer, wild pig, bunnies, moles, elephants, monkeys, and numerous others may make genuine harm crops. They can harm the harvest by benefiting from plant parts or just by running over the field and stomping on over the yields. in this manner, wild creatures may effortlessly cause critical yield misfortunes and incite extra monetary issues.More pronounced damage gets caused

by wild animals in lands adjacent to forest areas during summer because of nourishment and water lack in the forest.

To prevent this or for better cultivation farmers recommend 6 types of methods /technologies, they are:

- Fences
- Natural repellants
- Chemical repellants
- Bio physical barriers
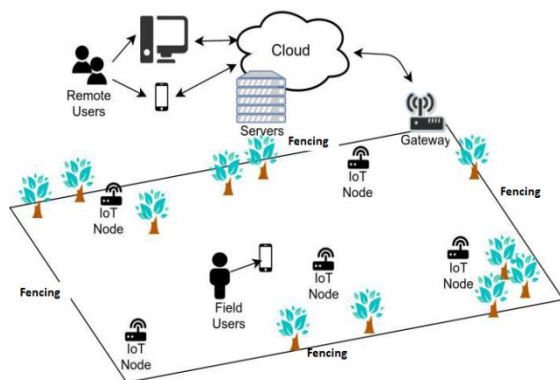- Electronic repellants.

Figure 1:   Fencing System around the Farm.

The importance of fencing is considered, since we as a whole know about the suicides of farmers in our nation. Individuals who are giving us the nourishment are committing suicides because of inappropriate consideration and monetary issues. In farm regions these days numerous animals are wandering in individuals living regions and numerous individuals are killed by these animals and furthermore the individuals are offering torment to animals. To secure the people and furthermore creature life, the farmers has to shield the yields from animals that decrease the loss. Prior to fencing use to physically monitor the harvests by remaining throughout the night in crops, now and again because of wild pigs' numerous farmers lost life or confronted harms to the yields and loose cash, even numerous animals kicked the bucket to a high measure of power.

1. Background Work

Why Fencing is required?

Fencing is certainly not a juvenile idea in farming. This is a well-established practice and has been completed in various modes.Different types of fencing are such as Wooden fencing,Stock fencing,Wire fencing,Synthetic fencing,Rail fencing, and Power fencing. Power fencing can be of two varieties- solar power fencing and electric power fencing.

Electric Fencing

Guaranteeing crop wellbeing, electric fencing works successfully in rural ranches. It creates electrical heartbeats in ordinary intervals of time and wards, wild creatures, off. creatures when interacting with electric fencing wire, are struck by a sharp electric stun that might be deadly however a greater part of the creatures figure out how to get away from it, many free lives, even human's life is in peril from the contact.

Solar Fencing

The solar Fencing framework is an incident option in contrast to the electric fencing framework to ensure crops at rural land and property. At the point when any living interacting with the fencing wire, it encounters a sharp, short yet a sheltered electric stun. It doesn't hurt the animal however secures your ranch successfully without utilizing too much electric force.Advantages of solar fencing are Cuts out power consumption, easily available, Easy to assemble, Lower cost, can be used at remote locations, protects nature Assurance of protection, unlike electronic fence, keeps animal safe, avoids charged fence. Disadvantages of solar fencing are it is vulnerable against power blackouts and may provoke loss of life and assets when supply stops to exists, additionally when it rains and charged fencing is hazardous if not dealt with, Manual off/one of the framework which require an individual to visit the field, Wastage of energy when not required.

2. Related Work

In as per the proposed system they will utilize solar fencing for assurance of yields from people, creatures. In any case, that framework has a few issues, for example, it can't
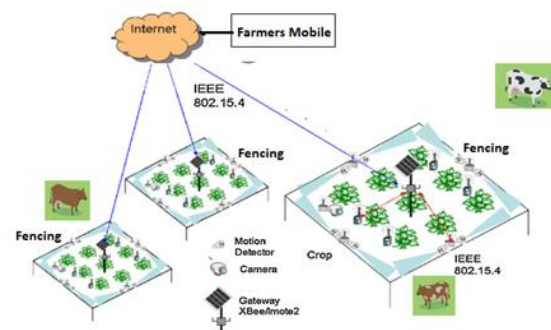

Figure 2: System Architecture for Fencing

control the voltage for various animals so it might cost the life of certain animals, moreover when it is coming down farmer need to go yield to stop the power which is hazardous at times. We always need to make sure there is no passage of power when it is raining.

In [1] they are utilizing Raspberry pi 3B in there venture, to discover the feathered creatures they are utilizing Ultrasonic Sensor, Ultrasonic Sensor set on one servo engine it will turn consistently to discover the fledgling development on the sky, in the wake of identifying any impediment in air or sky we will begin distinctive sort of sounds for making human

nearness condition. Next one for creature security, for shielding the yield from creature we shaped low voltage fencing that voltage won't impact on creature life. This paper disclosed unmistakably of how to keep away from flying creatures however if there should arise an occurrence of creatures the less voltage won't be adequately valuable to evade creatures additionally high or medium will even now murder cause a lot of harm to creatures or may execute them. Animals will escape enter crops hence, damaging them.

In [2] this paper they used PIR sensor 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. Here Giving alarms despite everything require farmers or officials to visit the spot and make a move however the sensors used to recognize are generally excellent even in our project we use image processing identify humans, detect humans produce sounds toward them off if not produce power based on size of animal for 5 seconds at regular intervals, after successfully chasing animal off again it monitors the field, meanwhile the power is saved can be used for other uses. We also use rain prediction if it predicts rain entire fencing power is stopped if not continuous monitoring will be there if fundamental, he can control things from his mobile.

2. Proposed System

Our model provides a cost-effective and efficient fencing system for farmers. We have to use modules and methods to make our system simple and automated. Firstly, we have used a live feed from CCTV as input. On the beforehand we have two ideal images of morning and night respectively. As we consider a few alternative frames from the live feed. Now the obtained input frame is compared to the ideal image of the morning. By using basic computer vision, we perform image subtraction for the input image and the ideal image of the day and followed by the ideal image of the night if required.

We decided a certain threshold that allows a minute change in the images due to the environmental conditions. But if the result after subtraction is found to be more than the threshold that we have fixed then it checks the left-over part of the image after subtraction and tries to analyze whether it is human or not. If human it checks with images of persons we gave if it matches the model stays idle. Else it alarms to not allow any human, Else we have given threshold range for the medium animal (for Ex: - 10000-15000 px). Automatic alarm will be on to scare and stop creatures from entering from fields creating a human presence. If the creature still not went off then we will go further.
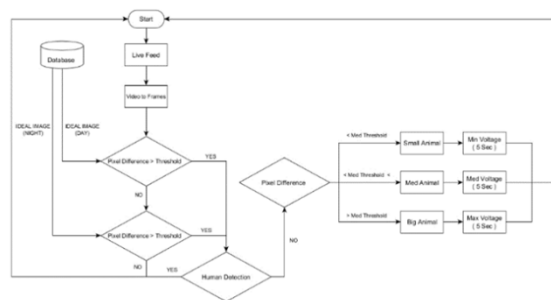
If the result is less that this range then we classify it as small animal and pass less voltage for 5 sec. If the

subtraction result falls between the range of the medium threshold range then it classified a medium animal and medium voltage is being passed for 5 sec. If the subtraction result ends up to be higher than the maximum of medium threshold range then we classify it as big animal and a greater amount of voltage is passed for 5 sec.

Note that after 5 sec the system comes to idle every time. If the animal is still existing then it passes the voltage for 5 more sec and it continues till the animal is out of our frame. As medium threshold is purely based on the resolution of the camera that we use. This model saves the electricity and cost-efficient solution and reduces the tedious work for the farmers by passing electricity only when its needed.

The model becomes active only if there is no rain as passing electricity during the rainy conditions is hazardousSo, the prior requirement for the model is rain prediction followed by all the above methodology if there are no traces of rain. Rain prediction can be easily analysed by reading of humidity sensor of moisture sensor. If there are any traces of rain the model will automatically turn off for avoiding hazardous effects. Therefore, this model aids the farmer from monitoring the field all the time and also save power. Even the power stored from solar can be used for other purposes.

Smart IoT-based farming enables farmers to cut waste and improve productivity varying from the quantity of fertilizer used to the number of journeys that farm vehicles have made, and facilitate cost efficiency such as water,

electrical energy, etc.Loss/Damage of crop through animals has led farmers running for their money and afraid that our economy will lose the backbone i.e agriculture .
Steps
• Farm will be monitored by the camera fixed at the 4 ends of the farm where continues monitoring of the farm will be captured to the database.
• A Database will be feed with different animal's images to recognize the behaviour, activity, strength of the animal.

- Whenever the animal's activity is captured at the place, the video frames are sent to the database to verify and identify the animal from the database.
- If it's not human, based upon identification a threshold will be set to the each kind of animal.
- If it's a small animal, minimum 5 sec Voltage will be passed to fencing system.
- If it's a Medium animal, minimum 5 sec Voltage will be passed to fencing system but with more threshold voltage.
- If it's a Big animal, minimum 5 sec Voltage will be passed to fencing system but with more threshold voltage.

3. Conclusion

The Paper concentrates on the smart fencing system using different methodologies such as IOT, Image processing etc. The system is feed with the prior information of different types of animals and their activities, based on the electric voltage will be passed to the animals. The system does not harm any of the animals, since minimum voltage is passed just to control the animal activity on the farm. The farmers can view the status of the farm from their mobile. . Future implementation can be done , with more sensors utilizing Artificial Intelligence, cloud, Deep Learning and many testing models to effectively identify creature from far and take activities to stay away from them and guarantee security of the both people as well as creatures. Likewise, by making things progressively mechanized to evade any mistakes and yield better exhibitions and production. we can likewise utilize these sensors for water, fertilizers supply through controlling of machines naturally and furthermore utilization of drones to screen, spread composts, take pics, caution to framework, kill weeds , bugs and so on., In certain spots every one of these advancements are executed yet least so government need to make a move to make it enormous scale and furthermore improve things better and develop a lot progressively such advances to improve the generation of yield with greater quality, security and amount.

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