Agro based smart routing algorithm for preventing unwanted intrusion and systematic monitoring based farm automation –Exclusively for Groundnut fields

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Abstract: Animal intrusion is a critical unwanted issue. Leads to loss of agricultural production, cattle farm issues, results in jeopardy to all. Some time it is a challenge to maintain all these things, To handle this problem, this study offers a wonderful technology that WSN and IOT technology to aid in the detection of unwanted intrusions on agricultural farms by monitoring the field. Modern sensors are adopted at the forms, first detecting the intrusion, then capturing the image of the intruder with camera. an sensed component is post to the another device and to the farmer via IoT application. The performance of the proposed system has been analyzed with respective to the captured data of the intruder and notification alert. Using this proposed model, anyone can detect any type of intrusion around the field effectively. The above said is phenomenon one and another technology is used to automation of field along two in one method.

Keywords - Monitoring, WSN, Sensors

I. INTRODUCTION

Farmer animal disputes as a result of deforestation or any other negative actions have to take against these. The problem of animal intrusion in agricultural field has been well studied in different schemes according to many factors like maintenance cost, manpower, productivity issues. Crop yield is affected by so many factors, existing IOT based methods are suffer with the fault of energy depletion, routing problem, data collection and maintenance cost which affect the productivity of the coconut farm. Nowadays booming of remote technologies and WSN in every field is addressing a new height of research. The utilization of WSN in agriculture is also leading to many economic oriented inventions. Experience from the field shows that remote monitoring, oriented research using IoT, sensors and Actuators means of communication are carried out using wireless sensors in the quality of work. WSN, their advantages and disadvantages, leads to explore the unexpected useful results to the farmer world, especially the current technology usage and research will revive the agriculture world, as well as its potential value in the future.

Motivated from the above research and have intension to give a economical solution to these problems new wild animal intrusion detection system and for automation has been proposed by using ultrasonic sensors, Actuators and Microcontroller. The major contributions of the proposed model have been highlighted below:

1. ESP32 camera module used a microcontroller for capturing the real-time images.
2. Ultrasonic and PIR sensors are adopted around the farm to detect the motion of the intruder.

II. THEORETICAL BACKGROUND

A. Arduino UNO:

The Arduino UNO has been integrated into a vast area of electronic projects because it is simple to use and can easily programmable to an open-source Microcontroller board. We are using Arduino Uno IDE 2.3.4 version for developing this proposed system [3].

B. ESP32-CAM module:

The ESP32-Cam has been incorporated in this proposed model due to its low power consumption and small size. It is widely used to capture the real time images, QR identification in IoT applications.[2].

C. NRF24L01 module transmitter:

In this proposed model we used two NRF24L01 transmitters, one is for transmitting and other is for receiving. The modules are used on a wide range of applications which requires wireless control [5].

D. Real Time Clock Module:

The RTC module has been incorporated in the proposed model to control the movement of vehicle for a specific period of time. There are many types in RTC, we used DS1307 module in the proposed model.

E.PIR Motion sensor:

They are often referred to as PIR, "Passive Infrared", "Pyroelectric", or "IR motion" sensors.

F.GSM Module

GSM and data security:

Data security is the most crucial factor for usage operators. Specific aspects are now implemented in GSM to improve security. The system proposes two subsystems. The appliance control subsystem allows users to remotely control all appliances, while the security alert subsystem provides fully automated security monitoring. This same system can instruct users via SMS from a particular phone number on how to change the condition of the home appliance based on the person's needs and preferences.

The second element of GSM security is security alert, which would be accomplished in such a way that upon identification of an invasion, the system would allow for the automatic creation of SMS, thereby notifying the user of a potential threat. GSM technology will enable communication with anyone, wherever, at any moment.

G. Driver circuit board:

In the proposed model, the driver circuit board has been incorporated. We are using Driver Board (L298N) type in this model. It is an electronic device which is used to control other components which are present in the circuit and also control the flow of electricity.

H. Ultrasonic sensor:

In this proposed model we adopted ultrasonic sensors to detect the entry of any new things. The sensors send sound waves to a certain distance and when the waves are disturbed in the given distance it detects the motion of the intruder. These are also used to determine the distance of the intruder [11]. The Ultrasonic sensor has been represented below in

F.12v DC Battery Sprayer

Divinext 7.5 LPM / 12v DC Battery Sprayer Motor Pump Double-core Self Priming Double Head for Backpack Knapsack Agriculture Battery Operated Power Sprayer Electric Diaphragm with Pressure Adjustment DC Water Pump Diaphragm Water Pump (0.08 hp).Alarm with Flash light

III PROPOSED METHODOLOGY

The proposed block diagram has been presented in

The above system is implemented using Arduino Uno board PIR motion sensor, 12v Sprayer pump, 4ch relay GSM Module, Alarm Hoter, Mobile device and Moisture sensor Arduino board used for transmitting and receiving data ,and is adopted with four ultrasonic sensors which are used to detect the intrusion of animals and NRF24l01 Module Transmitter to transmit the data and the other Arduino Uno board is interfaced with a E vehicle prototype and NRF24L01 Module receiver to receive the data. When the sensors detect any intrusion, sensor send the signal to Arduino board, this will send signal to other components, like alarm, it will switch on chemical sprayer, then LED light, and give information via mobile.

B. Proposed Flow Chart

The proposed flow chart shows the comprehensive procedure of real time detection identification in Fig.7 First, we must create a pathway for the devices. When the sensors detect an animal or unwanted invasion, it will be sensed and informed to the Arduino board it will send the data to all components and it will send sms to the customer for further action using reply it will start the chemical spray, LED lights on, and automatic alarm will send signal instantly.

The timer module is also used to stop the process or start the process for this prototype we can set the timer to 2minutes and the action will stop or start the process after that time. When the intruder's image or movement is captured, an alert message is sent to the farmer via the IoT application. The process of movement of the animal or line following sensor is represented in below As the above figure represents

when the sensors are on the farm surface it will move in forward direction without any change in the direction, even when the PIR detector moves out of the direction the sensors check it and automatically adjust the detector.

IV. RESULT AND DISCUSSIONS

Hardware components that are used to develop the proposed model with their specification have been highlighted in TABLE I.

Sl.No.	Components
1	Arduino UNO
2	ESP32 Camera Module
3	Servo Motor
4	GSM Module
5	Alarm Hooter
6	Real Time Clock
7	Driver Circuit Board
8	Sensors
9	12V DC Battery Sprayer
10	NRT2401 Module Transmitter

Proposed model

The proposed model can find any kind of invasion of the Animals, birds or humans using ultrasonic sensor and can capture the image using ESP32 camera module and a notification alert is sent to the authorized perso through IoT application. When the motion of the anything is detected the alarm sound followed by Light is activated to prevent animals entering the field. Then still it is roaming to damage the field means depending upon the animal and decision using IOT application the farmer can stop the motion using remote control type chemical spray or smoke blow. When the motion is detected by using the motion sensor, ESP32 Camera module has captured the images of the intruder and also it will send a notification alert via IoT applications (Blynk Application). The respective results have been shown in Fig.10 respectively.

V. SOFTWARE REQUIREMENT

- c++ programming language for Arduino Microcontroller
- Android studio : XML, Java, SQLite for UI
- Image Processing for Identify the intruder

SOFTWARE SIDE PROCESS

Create an program with arduino IDE 2.3.4. the program is used for making further communication between hardware components, sensors, actuators, and arduino uno micro controller with WSN. Camera modules, ultrasonic sensors, PIR motion sensors are detect the intruders while they crossing the farm border line. Arduino uno getting values from sensors and its sends to the server-side application via NRF24L01 module transmitter. the application process the data to clarify the intruder by using Image classification. then send the value to the Arduino uno. it starts the particular actuator for any type of animal that intrude the farm field. send report and Notification to user about farm automation system actions against the intruders. The Reports are stored in SQLite Database. UI shows weakly and monthly reports to user.

After that Image clarification and intruder identification the System will be generate a complete report and notification to end user in a Pie chart that report will be change chart type by user's wish.

VI. CONCLUSION

In this paper, unwanted invasion detection system using Internet of Things has been implemented. Using this model, we can detect any intrusion of wild animals or other unwanted which help to prevent the crop damage and human loss thus increase the yield. Our current model is built using Arduino uno and various sensors. In the future we can make improvements include so many other features.

REFERENCE

[1] M. Begum H., D. A. Janeera and A. Kumar. A.G, "Internet of Things based Wild Animal Infringement Identification, Diversion and Alert System," 2020 International Conference on Inventive Computation Technologies (ICICT), 2020, pp. 801-805, doi:10.

[2] W. Xue, T. Jiang and J. Shi, "Animal intrusion detection based on convolutional neuralnetwork,"2017 17th International Symposium on Communications and Information Technologies (ISCIT), 2017, pp. 1-5.

[3] S. Yadahalli, A. Parmar and A. Deshpande, "Smart Intrusion Detection System for Crop Protection by using Arduino," 2020 Second International Conference on Inventive Research in Computing

Applications (ICIRCA), 2020, pp.405-408, doi: 10.1109 / ICIRCA48905. 2020.9182868

[4] S. Giordano, I. Seitanidis, M. Ojo, D. Adami and F.Vignoli, "IoT solutions for crop protection against wild animal attacks," 2018 IEEE International Conference on Environmental Engineering (EE), 2018, pp. 1-5, doi: 10.1109/EE1.2018.8385275.

[5] N. Datta, S. Sarkar, A. Malik and D. Punetha, "Automatic tracking and alarm system for Eradication of wild life injury and mortality," 2016 2nd International Conference on Advances in Computing, Communication, & Automation (ICACCA) (Fall), 2016, pp. 1-4, doi: 10.1109/ICACCAF.2016.7748972.

[6] P. Zhu, T. Peng, D. Du, H. Yu, L. Zhang and Q.Hu, "Graph Regularized Flow Attention Network for Video Animal Counting From Drones," in IEEE Transactions on Image Processing, vol. 30, pp. 5339-5351, 2021, doi: 10.1109 / TIP.2021 .3082297.

[7] A. A. Menshikova, A. E. Stepanova and A. A. Menshchikova, "Research on Reduction of Animal-Vehicle Collisions," 2021 IEEE Conference of Russian Young Researchers in Electrical and Electronic Engineering (ElConRus), 2021, pp. 545-549, doi: 10.1109/ ElConRus51938 .2021.9396238.

[8] H. S, S. Rao, C. P and C. N. G, "Survivalence of Rouge Wild Animals Using Image Processing and IOT," 2019 1st International Conference on Advances in Information Technology (ICAIT), 2019, pp. 540-543, doi: 10.1109 / ICAIT47043. 2019.8987324.

[9] H. -D. Yoon, S. Kim, Y. S. Jang, M. Ghil, W. Rha nd Y. Seok, "A study on the modeling of the IoT-based motion pattern analysis system to exterminating harmful wild animals," 2020 International Conference on Information and Communication Technology Convergence (ICTC), 2020, pp. 1908-1911,doi:10.1109/ ICTC49870.2020.9289298.

[10] R. K. Megalingam, G.P. Krishnan, K. Tanigundla, S. S. Pai, K. S. Sajan, A. Sujith, N. Samudrala, "Design and Implementation of Junction Boxes for Preventing Animal Attacks in Farms," 2020 IEEE International Students' Conference on Electrical, Electronics and Computer Science (SCEECS), 2020, pp. 1-5, doi: 10.1109/SCEECS48394.2020.119.

[11] P. K. Panda, A. Kumar, B. Priya, B. A. Wilson, Harsha B S, “IoT based agribot for irrigation, fire detection, and monitoring,”2020 International Journal of Advance Science and Technology, 2020, pp. 3527-3534.

[12] Panicker, Shruti Ajithkumar, Rahul Vinod Kumar, Aishwarya Ramachandran, and S. Padmavathi. "Analysis of Image Processing Techniques to Segment the Target Animal inNon-uniformly illuminated and Occluded Images." In Inventive Communication and Computational Technologies, pp.15-26. Springer, Singapore.