Investigation of Impact of Temperature on Proposed Device with Reference to DIEL CYCLE

Deepa Sonal[1], Khushboo Mishra[2], Mohit Kumar Mishra[3], Shailesh Kumar Shrivastava[4], and Binay Kumar Mishra[5]

[1]Research Scholar, Department of Computer Science, V.K.S. University, Arrah, India
[2]Research Scholar, Department of Physics, V.K.S. University, Arrah, India
[3]Department of Electronics and Communication Engineering, Manipal University, Jaipur, India
[4]Scientist-G, DGRC, NIC, Patna, India
[5]Assistant Professor, Department of Physics, V.K.S. University, Arrah, India

Correspondence should be addressed to Deepa Sonal; deepsonapwc@gmail.com

ABSTRACT- A Proposed device designed to protect the crops not only from the birds but also it is equipped with the multiple sensors to sense and repel the wild animals also from the cropland. It is also designed to sense any kind of fire around the cropland. It can also sense the moisture level of soil and alarm the farmers about it if moisture level goes down or high. In this research paper we have done an experiment to check the effect of temperature on this device. We have kept this device under various environments with different temperature and keep on observing it 24 hours. This DIEL cycle of 24 hours in various temperatures shows the effects of temperature on this designed model. We have clearly found out the effects of temperature on this device and can work efficiently in our region. We can also extend this experiment in various regions of country also. For this experiment, we have chosen our local area of Ara, Bihta and Patna. We have tried to find out the difficulties in working environment of this device.

KEYWORDS- Temperature impact, sensors, DIEL cycle, Wild Animal Attack, Repelling of Animal, Crop Protection

I. INTRODUCTION

India is a country with a heavy reliance on agriculture, with more than 50% of the population employed in the sector. Animal attack on crops is a serious concern that occurs frequently and causes significant losses. Farm crops are frequently destroyed by local animals like buffalo, pigs, goats, birds, and fire, among others[1]. Since the implementation of the Wildlife Protection Act (1972) and the general management method, the majority of wildlife species numbers in India have increased dramatically, and a few have obviously reached regional overabundance[2]. Due to a variety of usually incompatible land use practices, these species have evolved into ecological dislocates. Species that have adapted well to man-made settings have thrived, and in many places they have turned into severe field crops pests that compete with domestic cattle for food[3].

In Bihar, the area under observation is Ara, Bihta and Patna. In these regions, crop destruction factors are many such as flood, drought, wild life attacks etc. We have designed a device that can detect/sense the objects near the crop field. As any object tries to enter into the field, sensors sense the object and produce the alarm sound. It also sends the message to farmer's mobile phone[4]. We have keep on observing the device 24X7 to check the working efficiency of this device. We have keep on observing it in DIEL cycle i.e. for 24 hours and examined every hour's data. In this research paper, Section 1 represents the Introduction part. Section 2 describes the objective of this research. Section 3 shows the methodology of the research. Section 4 describes about the data analysis part and finally Section 5 describes the conclusion of the research.

A. Existing System

Numerous local animals, including buffalo, pigs, goats, birds, and fire have harmed farm crops. There is no effective crop protection mechanism in the current system. Farmers employ thread and stone, hell-kites, balloons, shotguns, and other conventional agricultural techniques. These methods are typically cruel and ineffective. In this work, the implementations of wireless sensor networks for agriculture activities have been explicated[5]. These applications include crop production security against attacks by wild and domestic animals using IoT wireless sensor networks, and solar power harvesting at remote regions for use in agro - ecosystems[6].

B. Crop Area under Observation

Area of Concern Crop destruction is a serious issue in Bihar's Daniyawan Village (Hilsa), Newra, Bihta, Patna and Ara districts. The majority of these impacted sites are located on alluvial soils in river plains in the Ganga basin. Rice, wheat, and corn are the three main cereals. There is a lot of cultivation of pulses such arhar, urad, moong, gramme, pea, lentils, and khesari[7]. The majority of the veggies are dominant, including potatoes, onions, eggplant, and cauliflower. Sugar cane is another crucial cash crop that Nilgai uses as a great cover (Blue Bull or Antelope). Because when crops like corn is fully grown, rat eats and destroys plants and cereals like maize[8][3].

II. OBJECTIVES AND PROBLEM STATEMENT

We have done this research with objective to find out the efficiency of this proposed device and also the impact of temperature on working of this device. This research is done to check the no. of times this device is able to detect the attack of animals that is efficiency of this device and also to find if there is any impact of temperature on this device or not[9]. Following are the objectives of conducting this research:

- To find the efficiency of this device.
- To find if there is any impact of temperature on the device.

III. METHODOLOGY

A. Protection of Crops

Efficient crop protective techniques are required for the rural populations living in the Nilgai and blackbuck afflicted areas. Fencing of any kind is rarely utilized[10]. Some locations use brushwood fences, which are only efficient against cattle and infrequently deter Nilgai and blackbuck[1][11]. The most typical defense tactic employed by farmers is to watch over their fields during the growing season. In this research, we have tested our proposed device and kept it in observation for one month after installing in a crop field. We keep on observing and counted the frequency of animal tried to enter into the crop field[12]. We also counted the frequency device was able to track animals correctly. We have put those data and tried to analysis the various aspects such as impact of temperature on this device[3][13].

B. Experimental steps

Step 1: The proposed device is kept in a room where temperature can be increased or decreased using temperature controller.

Step 2: Temperature is set at 5 oC at first and then slowly kept on increasing

Step 3: An object was passed near the device and it was observed whether it is detected by the device or not.

This experiment was repeated by varying the temperature in range from 5 ºC to 50 ºC which is generally the annual weather temperature in the area of observation (Ara, Bihta and Patna of Bihar). The above experiment can be shown through Figure1 and Figure 2 respectively.

Figure 1: Temperature reading during day time

In the above figure Figure 1, temperature reading during day time is being shown. In figure Figure 2 temperature reading at night is shown[14].

Figure 2: Temperature reading during night time

IV. RESULTS AND DISCUSSIONS

The experiment that we conducted in this research is done for observing the effect of temperature on our proposed model[15]. We have taken the reading for one month during day and night time and observed the number of times object got detected[16]. The total number of arrival of objects during this time period was 174 and number of times objects got detected was 152. So the efficiency of this proposed model system can be calculated as:

Efficiency= No. of times detected / No. of times arrival
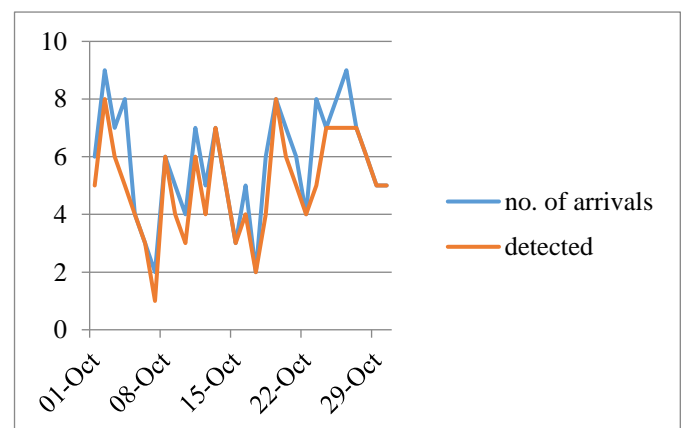Hence,   Efficiency= 152/174   = 0.873563

Figure 3: Graph showing the efficiency of the proposed model

Hence, the efficiency of the proposed model can be shown through Fig3. It clearly shows the no. of times this model is able to detect the object comes across. Thus, its efficiency is around 87.35%. We have also done the ANOVA analysis to check whether temperature is the factor that affects the working of this proposed system or not[17]. Table 1 shows the ANOVA analysis done on the data collected.

In the Table 1, it can be seen clearly that F-tabulated value is 4.006873 and F-calculated value is 2.4283. We know that the experiment is significant only when F-Calculated value is less than F-Tabulated value. Here, F-Calculated value is less than F-Tabulated value. So the experiment is significant.

Table 1: ANOVA Analysis table to show effect of temperature on system

Anova: Single Factor

SUMMARY						
Groups	Count	Sum	Average	Variance		
no. of arrivals	30	174	5.8	3.682759		
detected	30	152	5.066667	2.96092		
ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	8.066667	1	8.066667	2.428374	0.124597	4.006873
Within Groups	192.6667	58	3.321839			
Total	200.7333	59				

V. CONCLUSION

This research was done to check the efficiency of the proposed system. After the experimental data analysis of this system, it shows that the experiment done is significant. It shows that this device can work efficiently in the given temperature range from 5 °C to 50 °C which is generally the annual weather temperature in the area of observation (Ara, Bihta and Patna of Bihar). Thus this device can work in this environment in agricultural field. We have clearly found out the effects of temperature on this device and can work efficiently in our region and also regions of U.P and M.P with similar temperatures.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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ABOUT THE AUTHORS

Ms. Deepa Sonal Gold Medallist in Bachelor of Computer Applications from Patna Women's College, Patna University, Patna, Bihar in 2015 and Gold Medallist in Master of Computer Applications from LNMI, Patna, Bihar in 2018. She qualified UGC-NET in 2019. Currently pursuing Ph.D. from Veer Kunwar Singh University, Arrah and currently working as Assistant Professor in Department of Computer Science, Patna Women's College, Patna. She is also the Life member of Indian Science Congress Association since 2016. She has been awarded "Young Achievers' Award" from InSc (Institute of Scholars). She has published 15 research papers/ book chapters/ conference proceedings. Her area of interest is Design and Analysis of Algorithms, Artificial Intelligence, IoT through Arduino Programming, Quantum computing, Cloud Security, Big data Analytics. She has 5 years of teaching experience and 4 years of Research experience.

Khushboo Mishra did her M.Sc. from v k s University, Ara, Bihar. She did her B.Sc. (Hons) from Vinoba Bhave University, Hazaribagh, Jharkhand. She has attended 4 International Conference and 2 National Coference. She has 4 Publication.
She is Doing Ph.D in Physics from Veer Kunwar Singh University, Ara, Bihar

Mohit Kumar Mishra is a student of Electronics and Communications Engineering, Department of Electronics and Communication Engineering Sikkim Manipal University, Jaipur. His area of interest is Antenna and propagations.

Shailesh Kumar Shrivastava is Deputy Director General (Level-14) Scientist-G and Head, DGRC, NIC, Patna. He has more than 25 years of research experiences. He has worked on many government projects. His area of interest is database, big data, android, Artificial Intelligence, Cyber Security etc.

Dr. Binay Kumar Mishra is an Assistant Professor in University Department of Physics. He is also working as Coordinator, College Development Council V K S University, Ara. He has total 55 Research Publication. He has attended 28 International Conference and 33 National Conference. He has 33 years of Research Experience. He has Supervised 14 Ph.D student and 5 M.Phil. Student. He is also Reviewer of International Journal's (Springer etc).