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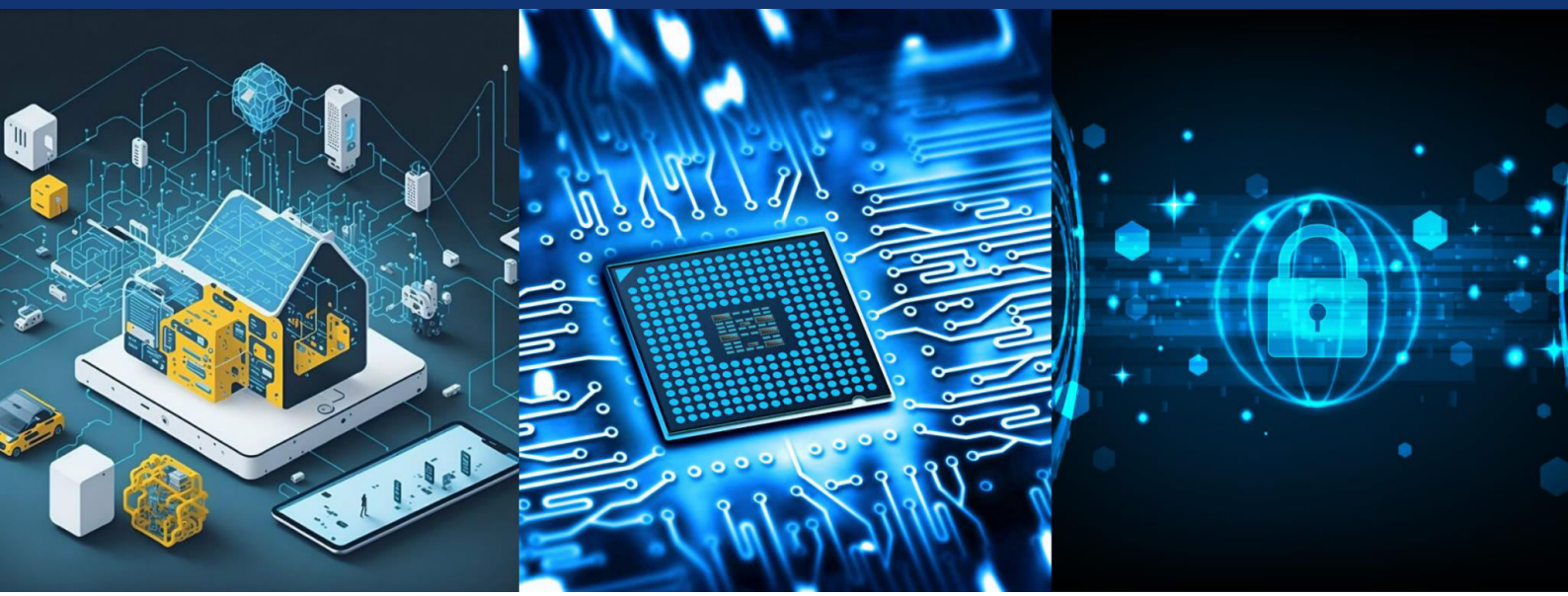

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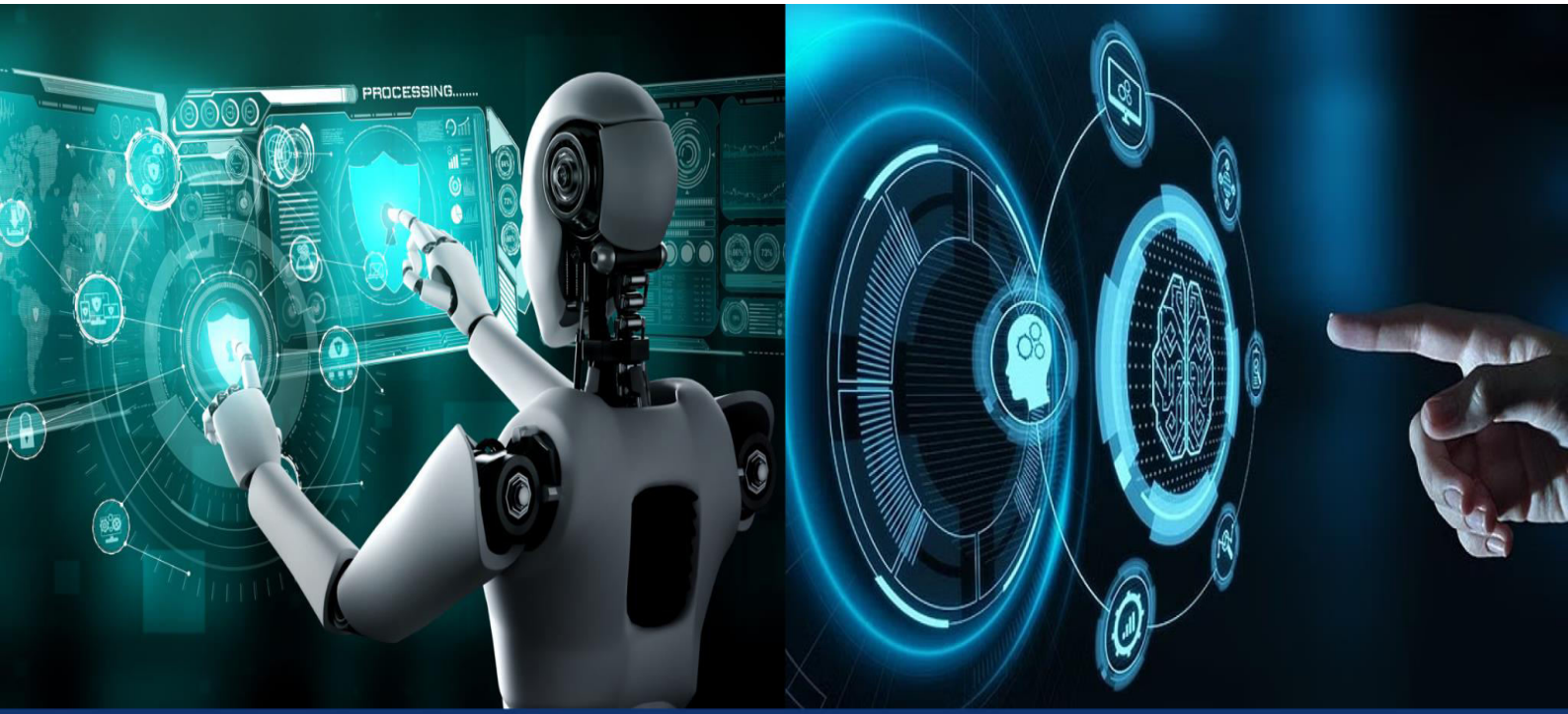

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An Integrated Eco-Friendly Bird Repellent System using IoT and Renewable Energy

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ABSTRACT: Agriculture is the main source of our food, which includes vegetables, oil seeds, fruits, cereals and even the dairy. Food provides us the required health supplements like fat, proteins, carbohydrates and the nutrients. Agriculture also plays an important role in improving the economy of the country like India, which provides the employment source, engaged in farming and many other agricultural activities. Protection of the crops which were cultivated carefully by the farmers is a big challenge. The most common type of attack is the birds attack. Birds will attack the crops in fields such as millets, oil seeds, maize, fruits, vegetables, sunflower etc. Farmers use many traditional methods to avoid bird attack but still they fail to avoid such losses due to lack of constant maintenance, lack of human resource and lack of technology and need of huge investments. The birds will damage much crops than they consume so this problem can be solved by using an Integrated, ecofriendly system that uses IOT, wireless sensor networks and renewable energy such as solar system. Acoustic Repellent, Water Sprinkler and a Laser scare crow are integrated into single system and used to create a discomfort in bird movement. This is the most effective strategy to avoid birds, and can gain crop yields. Also this technique requires less investment, low maintenance, eco-friendly and an automated system which does not require any human intervention. This can be used in both types of fields such as small and large scale fields.

KEYWORDS: IoT, Renewable Energy, Bird Repellent System, Solar Power, Smart Agriculture, Wireless Sensors, Eco-Friendly Technology

I. INTRODUCTION

The major problem faced by farmers during the harvesting season is the protection of crops from animal and birds attack. Birds will damage crops like sunflower, maize, ripened fruits, grains, millets and many vegetables which cause economic loss to farmers. This seems like a small issue but due to this birds attack, farmers faced big problems in many cases and lost much of their crops. The old techniques such as making loud noise using drums, balloons, fire crackers are not much effective and they always require constant human involvement which is not possible all the time. This problem requires a better modern solution using trendy technologies with low cost and low maintenance. This solution involves an integrated ecofriendly approach to reduce bird attack in farms. Here in this method, Internet of things IoT and wireless sensors are used to collect the information from fields during bird's movements and attacks if any. To avoid the attacks, three main techniques are working here using the renewable source of energy that is solar power system as the power supply unit. This solar power system will supply power to all appliances (1).

II. IOT AND WIRELESS SENSOR NETWORKS

Internet of Things with wireless sensor networks plays an important role in almost all areas of the present world like agriculture, business, education, science, researches, industry and automation. The main reason why IoT occupying all fields is, IoT is simple, best, automated and low cost solution to many real time problems when combined with wireless sensor networks. The wireless sensors are placed in many crucial and most sensitive areas where bird's movement is noticed. Once the sensors sense bird attack or any movement in observed areas, the actuators will be activated and they start working according to micro controller signals. The data collected will be transmitted wirelessly to a monitoring system. Here LoRaWAN, Zigbee, GSM/3G/4G can be used for communication purpose. The IoT gateway receives

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sensor data from nodes and further it will be sent to the cloud/server via satellite, cellular or Wi-Fi networks. This data will be uploaded to the IoT cloud platforms such as AWS IoT, Google cloud IoT or any other private clouds. The researchers will use these data to learn bird's habitat and their behaviors. This data can also be accessed via mobile apps, dashboards or websites. Movement of birds, their actions during day and night, type of birds, number of birds, and all the data can be observed and analyzed for further decisions and strategies. This system will send an automated alert through the SMS, email, or an app when bird movements are detected. The major power source used here is the solar energy which is renewable and needs no maintenance (2).

III. RENEWABLE ENERGY – SOLAR POWER SYSTEM

The IoT devices can be operated using solar system. This solar system provides an autonomous, low cost, low maintenance, remote operating system which is using photovoltaic panels, battery and an inverter. Solar panels will generate electricity with the help of sunlight. The battery which is an energy storage unit will stores power for the constant operation all the time. An inverter is used here which acts as the main component of solar system because it will convert the DC, direct current to AC that is stable alternate current which can be used for many appliances (4).

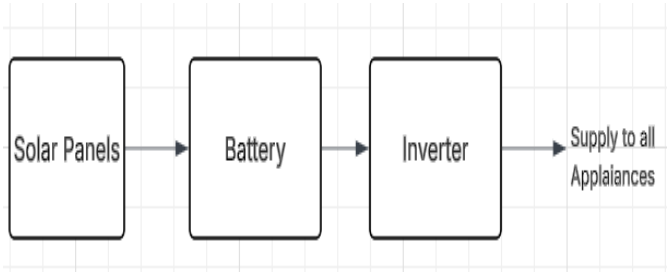

Figure: 3.1 Solar Power Systems

Most of the applications such as agricultural monitoring, automated irrigation, drones even drying crops, many machinery use solar energy. The main advantage of using solar energy is low cost operating system, self-operating, low maintenance, no intervention of humans and suitable for both large scale and small scale fields. The most important and main source of renewable energy is the solar energy , which is available in abundance and can be used in agricultural, residential, industrial, business, technology, manufacturing and other automation applications.

Using solar energy for agricultural sector is the most revolutionary advancement of technology. It will save the power costs, which is most suitable for real time monitoring applications since it provides constant power supply. Economically it is the best way to use renewable sources of energy for any applications. Uninterrupted supply of solar energy plays an important role in providing constant power requirement. Feasibility of solar panels depend on different area and even different climatic conditions. By understanding all possible conditions and analyzing all factors, the solar power system can be implemented and used for many agricultural applications.

IV. ACOUSTIC BIRD REPELLENT SYSTEM

Birds are scared of loud sounds and noise. They are very sensitive to unfamiliar, abrupt noises like drum sound, crackers burst, balloon blasts and screaming sounds etc. They hear the sound and perceives as threats, prey instincts or even the environmental disruptions. Unfamiliar sounds, new toys and peculiar constructions will cause panic and anxiety issues in birds, pets and wild animals. During harvesting days, different type of birds will come to fields and attack crops for their food. Birds will damage more crops than they consume because they sit on plants, flew away with force and come back again to eat crops. These abrupt movements will cause much damage to crops. So the farmers face many problems and experience economic loss. To avoid this attack, an ecofriendly acoustic bird repellent system is much needed (6).

This system uses the PIR sensor which senses the bird movements and attacks around the fields. PIR stands for Passive Infrared sensor which is an electronic sensor with high sensing capacity. After sensing bird movement, it will activate the NodeMCU microcontroller which in turn enables the audio amplifier. This will play audio via megaphones or

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buzzers. Sounds like some unusual, scary tunes, harsh sounds/tracks are played. Due to this feature, birds get scared and flew away from fields as this creates a sensitive distress in them. The audio amplifier and megaphones all units will work according to the instructions given by microcontroller. Power supply will be done by solar power system using suitable adapters. The audio will play for about 5 seconds and stops. The next when PIR senses pests, it will activate water sprinkler as a repellent system. If same type of deterrent is used to avoid birds, they become used to it and will not scare much about these actions. Hence 3 deterrents system are combined which creates confusion and stress in birds so that they stop attack and move away from fields. This acoustic deterrent is also called an eco-friendly approach as this will never harm any kind of birds. Making noise is just to scare them and move away from fields.

V. WATER SPRINKLER SYSTEM

After Acoustic repellent makes noise for 5 seconds it stops and then PIR sensor starts sensing the bird movement again, if it come across any such kind of movements, it activates the NodeMCU and starts the relay controlled water pump. The relay is acting as automated switch triggered by sensors. This will turn the water pump on and off without the human intervention. This also protects the system from dry run. Solar panels receives the sunlight, and electricity will be generated which will be supplied to this relay via an adapter. When PIR sensor senses the pests around fields second time, this will enable the NodeMCU to activate relay and the water pump will be switched on. Water pump draws water from a supply, and through the sprinklers, it will be sprinkled around the pests randomly through nozzles, which were located in some identified sensitive and strategic areas where the bird movement is observed much. Once the water sprinkler starts working birds get scared of this water sprinkles and then they try to escape from these water attacks. Water sprinkling creates an uncomfortable, unusual stress among birds. Water sprinkling system also helps to get more yielded crops as the water sprinkler supplies water to plants hence dryness can be avoided in fields. This approach is also called eco-friendly because it will not cause any harm to birds and helps in retaining soil moisture content in farms. Water sprinkler runs about 5seconds duration and then it will automatically stops. This time duration is enough to scare birds. After this, the PIR sensor again starts working and will continue sensing for bird actions. Once it senses pests for third time, NodeMCU will activate Laser Scare Crow and it will also works for about 5 seconds. Further the cycle repeats when the PIR activates NodeMCU to scare birds and avoid attacks.

VI. LASER SCARE CROW

An Acoustic bird repellent runs about 5 seconds once the PIR detects any pests around the fields. After that, PIR continues sensing birds if there exists any, then it enables water sprinkler system for 5 seconds again. To confuse the birds, third time when PIR senses any birds, it will enable the Laser Scare Crow which scares the birds most by using green light beam. Laser scare crow contains mainly 3 components, namely first laser module which uses green light beam which is very sensitive and scares almost all type of birds. It also has motor which moves the light in various patterns and covers all the angles. So it is easy to scare birds and save crops. Second unit is Micro controller unit. The devices are connected to Microcontroller circuitry which makes the laser light move randomly in all 360 degree. And third is the power supply unit which is required to operate all devices. The power supply uses solar energy. The solar energy will generate electricity and then the energy will be stored in batteries. Excess energy will be used during night and cloudy days when sunlight is not available. This laser scare crow is also called an ecofriendly approach as the laser beam will not cause any harm to birds. Use of this technique will scare the bird rather harming them (6).

This is an Integrated, Eco-friendly approach for Bird Repellent System using IoT, wireless sensor networks and the renewable energy. The sensor data which is collected by the sensors can be sent via wireless networks like WiFi, Zigbee or the internet. Then gateway uploads data to cloud platforms if required. The researchers and many scientists use this data to learn bird movements, habitat, their behavior against deterrents and their actions.

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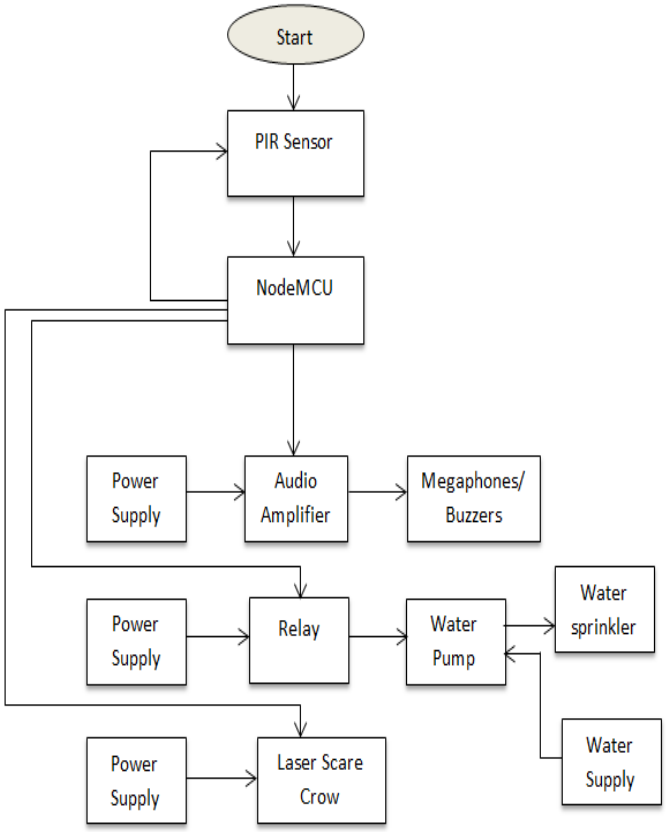

Figure 6.1.Flow chart for Bird Repellent System

The main advantages of this approach are, first it uses the solar energy for power supply. As the solar energy is renewable source and it is available in abundance, it can be stored and can be used when sunlight is unavailable. So the constant power supply can be provided to all devices of bird repellent system which does not involve any human involvement. Using solar energy as power source is economically the best way for farmers.

Second advantage is that this system integrates 3 approaches to avoid bird attack. Acoustic repellent as the sound tracks played creates distress in bird and make them they flew away from farms. Water Sprinkler system uses water sprinklers to scare pests and last is Laser scare which is also an effective way to scare birds using green light beam. All three systems are combined in a single microcontroller unit. This will enable all three systems one by one for about 5 second in a cyclic fashion. This technique is to confuse the birds with abrupt movements like, once sound, once water drops and then laser beam will create disturbances in them so make them flew away from fields (8).

Third and most important approach is that the system will not create any harm to birds and it will not affect their health conditions. So this can be called as Eco-friendly approach. Another advantage is, this system needs low cost, low maintenance and auto operation which does not involve any human resource. The whole system data can be obtained and accessed through the mobile app or any other platforms. Sensor data can be uploaded in clouds and can also be used further (9).

VII. CONCLUSION

The Agriculture plays a vital role in development of many countries. Introducing the new technologies to improve the agricultural activities and solving many problems is most important. Along with the introduction of technologies, there is a need to concentrate on the conservation of environment and avoid the adverse impact towards birds and animal kingdom. Harvesting season is most important for farmers as they must protect their crops from animal and birds attack. Many traditional techniques which were used, do not have any effective impact on attacks. They always need

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human involvement during both day and night to observe the birds movement and avoid them, which is most difficult problem faced by farmers. The system introduced here to avoid birds attack, uses 3 ways to scare birds like an acoustic repellent, Water sprinkler and a laser light beam. Because when birds hear the repeated sound, it does not pose any danger and they ignore it over time, so to avoid this habitual action and confuse birds, 3 different techniques like once sound, then water and also a laser beam of light are used in cyclic manner one after the other. Renewable energy like solar energy acts as a constant power supply unit and made the system as cost-effective. This eco-friendly integrated system avoids bird attack in both small and large farms.

REFERENCES

1. An IOT Solar Bird Repellent System with image processing. Gizel, Dael, Benjie C,Shaira E.coronel & Joy Camille R Lbon.
2. Smart Agriculture System Using IOT and AI/ML: A survey. Dr. Dattatray sambhajirao waghole, vol.13 Issue5, May 2024.
3. IOT based crop protection from animals, M. sai Ganesh, K Avinash sekhar, ch. Kalyan Kumar, M. Yashwanth, A Kavya
4. Design and fabrication of solar powered bird scarer. B Mano, and Sandhya R.
5. Internet of Things Based Digital Bird Repeller , Sharifnawaj Inamdar, Abhijeet Mane, Mayuri yadav, shivani jadhav, Rohit jagpat.
6. IOT based Smart Bird Repellent. Vijay Gaikwad, Sujal Kandgave, Soham Kahe, Parth Kaware, Krish Kawrani.
7. IOT Based Tracking Cattle Health Monitoring System Using Wireless Sensors. Madhukara S, Bhargavi A S.
8. Birds Pests: Damage and Ecofriendly Management. Mani Chellapan, M T Ranjith, Vipin chaudhary, K A Sreejeshnath.
9. Smart Agriculture Technologies: Integrating IoT and AI for Processing Farming. Yashwanth Nimmagadda, Saikiran Boddu, Richa Adlakha.
10. Smart Farming using IoT, a solution for optimally monitoring farming conditions. Jash Doshi, Tirthkumar Patel, Santosh Kumar Bhartu.

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