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Motorized Scarecrow

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ABSTRACT - This paper presents a new concept of motorized scarecrow which is a device used to scare birds or other animals away from crops or other areas where they may cause damage. Unlike traditional scarecrows, which are stationary and rely on visual cues to frighten animals, motorized scarecrows move and emit sound to simulate a predator or other threatening presence. The device typically consists of a motor, a battery or power source, and a series of arms or other appendages that move in a random or unpredictable pattern. Motorized scarecrows are often used in agriculture and horticulture settings to protect crops, but they may also be used to deter animals from entering residential or commercial properties.

KEYWORDS: Motorized scarecrow, Automated Scarecrow, Scarecrow with sensors, Automatic Scarecrow, etc

I. INTRODUCTION

One of the great dilemmas of our era is the increasing conflict between wildlife farmers and crop raiding. It has been around since beginning of agriculture. Recently Tamil Nadu reported a total of 7,562 incidents of crop-raiding by wild animals in the last three years. There are many different situations and reasons where wildlife-farmer come into conflict. Some of the reasons for that is in search of water, livestock predation, increase in human populations, increase in agriculture and reduction in forest land, the availability of palatable and nutritious foods near farm edges [1]. For that farmers utilize strategies and traditional methods that are often cruel and ineffective. While arbitrary killing, trapping or poisoning of suspect may provide short-term satisfaction but it fails to address long-term needs. So we must seek to understand sociological, economic and cultural aspects to find solution. Researchers suggest managing pastures to reduce competition for forage between wildlife and domestic livestock. In addition, shifting from farming system with perennial crop may reduce losses [2]. But this cannot be the proper solution for the problem. In general, crop damage by monkey and wild-boar is more serious in northern part especially in lower altitude areas. So, farmers usually adopt some crop protection strategies guarded their crop by spending night out in field, wood fencing whereas wealthier farmers used imported barbed wire, trapping, hunting are popular. Use of plastic flags, brightly coloured objects, scents and fireworks works sometimes but again that are marginally successful. Some make system consists of sound clips for different animals and red lamp connected to stick which is not durable [9]. There are smartphone-controlled systems but here was no provision of movement [5]. For birds unmanned aerial system (UAS) is used to deter birds. To detect birds, background subtraction algorithms have been used [6]. For security and detection some use sensor cloud-based architecture implemented using IOT [11]. Many systems developed which detects the intruders, monitors any malicious activity and then reports it to the owner of the system but these are unable to fear the wild animals and primates [8]. There is by no means an easy solution to this problem. Wild-animals now a days are smart enough they learn to overcome obstacles such as fences and scarecrow. So, there is need of automation system in agriculture field which can avoid man animal conflict and crop raiding. So, one of the technological solutions for this problem is smart scarecrow system which uses motion sensor, sound sensor, arm movement to fear the animal as well as birds. The common form of scarecrow is a humanoid structure dressed and placed in open field to discourage the birds and animals from disturbing and feeding on recently cast seeds and growing crops. This system consists of PIR sensor for detection of the object then servo motors present here performs the motion operation of scarecrow arm and firecracker sound buzzer is used to demotivate the animal as well as birds to keep animals away from farm field. Also, the system consists of locking arrangement that enables to set it at different heights accords to the size of crop. At the first after switching on the system, PIR sensor gets activate that is connected to the microcontroller once the object is detected by sensor the message is send to controller depending upon this controller activates the servo motors, connected to the gear mechanism that swings the arms in a human like action. Next is the activation of buzzer, as soon as a motion is detected in the field a sound is produced that scares the birds and animals. As per 2018, agriculture employed more than 50% of the Indian work force and contributed 17–18% to country's GDP 70% of country's income is from agriculture and rank 2nd world wide in farm output so the technological advancement is needed in this sector too. The rest of the paper is



structured as follows. Section 2 gives the information about proposed scaring methodology for animal detection and prevention of farm along with height adjustment in detail. Section 3 provides the specifications of the system components. Section 4 provides flow chart and algorithms next section gives experimental results and discussion on the results. Finally, last section presents the conclusion of the proposed work.

II. LITERATURE REVIEW

In this paper, smart scarecrow system uses irritating sound, high intensity lights and arm movement to fear the animal as well as birds and automatic height adjustment mechanism to increase accuracy in the object detection. The flow diagram of the proposed system is shown in Fig. 1. This system consists of PIR sensor for detection of the object after detection other three peripherals are activated servo motors present here performs the motion operation of scarecrow arm and firecracker sound buzzer is used to demotivate the animal as well as birds and for the night time high intensity lights placed on head is used to keep animals away from farm field. Simultaneously message of detection is instantly send using IOT cloud platform on smartphone of the farm owner. Ultrasonic sensor presents here for detection of the height of crop depending upon different seasonal cropping pattern based on that scarecrow height gets automatically set using pulley and motor mechanism. Now a days, wild-animals are smart enough they learn to overcome obstacles such as fences and scarecrow. This system uses available technology to reduce manpower. The automatic height adjustment concept is used here to detect the object clearly varying height of the crops should not be the barrier for detection. And this is achieved smoothly by using pulley arrangements. Main body of the system is⁰ made up of hollow metallic box in which controller circuit is placed so system can work in worst whether situation. There are different scarecrow systems available but these are very specific to particular animal or birds but in present system we try to make a scarecrow by taking consideration of most of the animals and birds. The whole operation is controlled by peripheral interface controller (nodemcu ESP8266) which is feed by input power supply. Controller always monitors PIR and Ultrasonic sensor on for surveillance of field. When PIR sensor detect any type of infrared energy then give instructions to the controller to active the successors such as buzzer, high intensity light and servo motor. IOT inform the owner that object is detected further buzzer will make a loud noise to scare the animals, light will be highly intense so that able to visible even in a fog and finally servo motors attached to the two sides of model so that it will rotate at certain angle which will looks like an arm of the scarecrow (movement purpose only). When ultrasonic sensor detect any increase in crop height it get activated and it will turn on the DC motor to rotate at certain angle to align height of bot higher than the object (crops).

III. SYSTEM COMPONENTS & SPECIFICATIONS

The system components required for the implementation of the system and its specifications are given in Table 1.

Table 1

Component	Parameter	Specification
DC motor	Rated Voltage Shaft Diameter Motor Length Rated RPM Motor Diameter Shaft Length	12V 6mm 63mm 100rpm 35mm
Solar Panel	Nominal Voltage No. of cells Max Power Volts	12V 36 18V
Battery (Lead Acid Battery)	Rechargeable Max Charge Current Nominal Voltage Capacity	Solar 24A 12V 80AH
PIR Sensor	Input Voltage Static Current Output Signal Sensing Range	DC 4.5 to 20V <50uA 0V/3V 7m & 120° cone
Controller	Microcontroller Operating voltage	ATmega328P 5V



	Input voltage Digital I/O pins Analog I/O pins Flash memory SRAM Clock speed	7 to 12V 14 6 32KB 2KB 16MHz
Buzzer	Operating voltage PCB Dimension	3 to 12V Dia. 32mm

IV. FLOWCHART

Here first step shows initialization of the system by switching on the supply. Next step after that is controller it takes decision depending upon sensors detection. The step ahead defines the two operation depending upon sensor activations different peripherals connected to controller in this step after PIR four operations are performed that are intensive blinking light, buzzer, servo motor and firebase data change and message is conveyed no farmer mobile application step after this is activation of DC motor for automatic height adjustment of scarecrow after ultrasonic sensor detection which shows the completion of the operation whereas the last step shows the termination of the process.

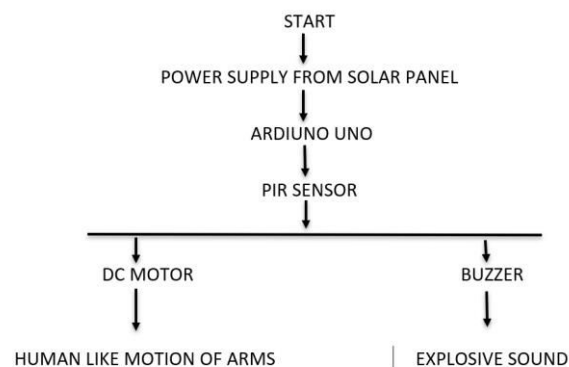


Fig. 1: work flow chart of motorized scarecrow

V. CONSTRUCTION & WORKING

Construction: -

- 1) Solar panel is connected to the lead Acid Battery; a voltage regulator is fixed between battery and Arduino for regulated power supply as Arduino works in range of 7v-12v.
- 2) The output wire of sensors is given to the digital pins of Arduino and relays are connected to the motor and buzzer.
- 3) One relay is connected to buzzer and other to motor.
- 4) Coming to the mechanical side, the base frame consists of 2 square poles of 100mm and 80mm sides, which interlocks using a M8 bolt and nut of 30mm length, which enables multiple height adjustment. This height can be adjusted as per the farm it is being used in.
- 5) A hollow square bar is connected with ahead at the distance of 1 foot from the top of base frame. On which a plate with two shafts of 10mm is connected.
- 6) 2 spur gears, and 1 pinion for driving the gear. The gear ratio is 1:4 for a motor of 100rpm.

Working: -

- 1) Solar panel charges the Lead acid battery, and further power is provided to Arduino, buzzer and motor.
- 2) When the motion is detected by the PIR sensor, it sends a signal to Arduino which further sends a signal to relays. (Relay is an electronic component which acts as a switch).
- 3) Motor and buzzer are connected to relay, so when the relay receives the signal from Arduino ,its gets activated, and motor and buzzer gets turned on.



4) As the motor starts, it causes the rotation of gears which further provides motion to the arm. It is human like motion.

VII. REQUIREMENTS & ADVANCMENST

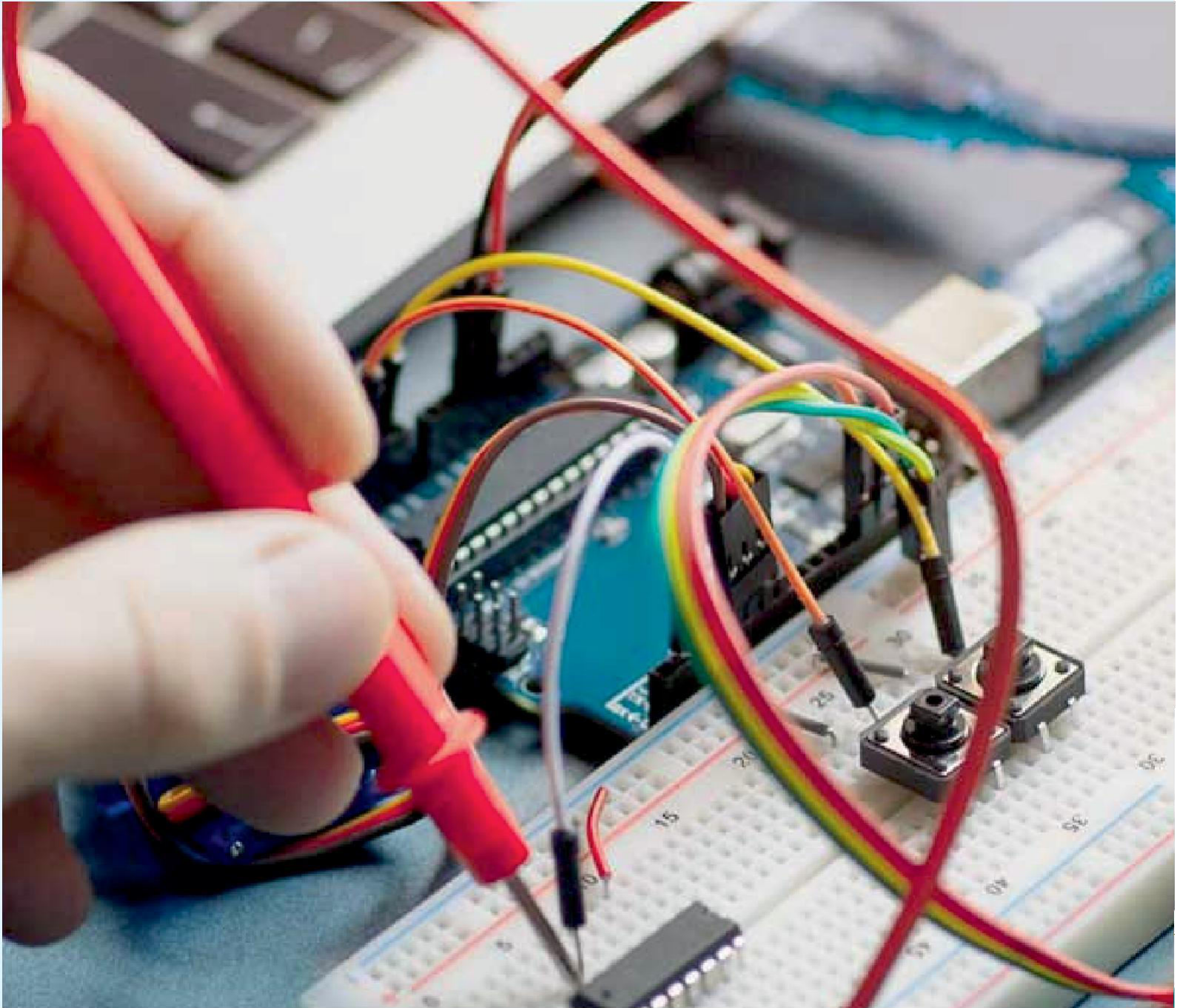
As per the requirement the range and motion requirement can be increased or decreased. In case the farm covers a very large area, then using a Wi-Fi module we can connect multiple sensors across the farm fence and available spaces. Similarly, to achieve high sound levels, multiple buzzers can be connected. Also, it can be used with some advancements into the storage areas of grains to save it from rats and cockroaches.

VIII. CONCLUSION

The technology brings changes in the agricultural sector in India. Scarecrow system can minimize the loss in the farm ultimately provide safer growing condition, no any night out spending in farm is required for crop protection. Detection from distance and preventive detection is possible using this system. Height adjustment with help of pulley in the proposed system helps exact detection of object. All the sides of the farm can cover by connecting two PIR sensor to the controller. Outer part of the system is made up of metallic box and rod so not easily damageable by wild-animals. It will be more efficient and cost effective than traditional guarding methods. In general, crop damage by wild-animals is more serious in northern part epically in lower altitude areas. And traditional methods of fencing are ineffective so at such situation Smart scarecrow system can resolve the problem. But in summer and monsoon efficiency slightly lowers in summer due to high temperature sensors range reduces and intensive climatic conditions affect system performance in monsoon. This is the man-animal friendly system can resolve conflict.

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