

A Review on Auto- Mechanized Scarecrow for Agricultural Purpose

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Abstract: Automatic Scarecrow Technology is an easy and reliable way to control major avian crop harmers like birds & animals. This Scarecrow decreases crop damage by dispersing birds in a safe and human way. The main aim of the project was to design and construct a bird repellent prototype that is dynamic and play sounds of distress to disperse off the birds. Two wireless communicating devices being controlled by an Amega328P microcontroller were developed with the help of RF modules consisting of sound producing system, rotating system and a motion sensor which were used as inputs to the microcontrollers when motion is detected, and the servo motors and the buzzer are activated. When the system design was powered the servo motors rotated, and a sound of distress was produced after motion detection. In conclusion, the technology of this modern scarecrow has many applications which include reducing financial loss due to crop damage caused by birds, reliable, human and safe agricultural bird dispersal, and the chosen bird control system for farming industry.

Keyword: Flapping mechanism, Linear Motion, Buzzer. Bird Repellent.

I. INTRODUCTION

Automatic scarecrow technology is an easy and reliable way to control major avian crop harmers like birds and or animals. This Scarecrow decreases crop damage by dispersing birds in a safe and human way. The nature-inspired technology uses bio-acoustics to protect farmland and agricultural areas. The technology of scarecrow has many applications which include reducing financial loss due to crop damage caused by birds, reliable, human and safe agricultural bird dispersal, and the chosen bird control system for the farming industry.

II. PROBLEM STATEMENT

Hungry birds have always been a problem for farmers. Sometimes the birds could eat so much corn or wheat that a farmer and his family would not have enough food to last through the winter. So for more than 3000 years, farmers have been making scarecrows. Due to physical damage of paddy fields as a result of hungry birds feeding on them, farmers are facing a considerable loss in their paddy yield harvest in terms of quantity, quality, and monetary gains they expected to acquire from their harvests because the current traditional techniques employed by these farmers such as the use of static scarecrows are only effective for very small fields.

Large commercial rice farmers also faced extensive labor requirements for bird scaring which is very expensive and sometimes it may not be available when needed. The lethal methods used for bird control such as treatment of paddy fields with Avicides 3 (chemical substances lethal to certain bird species) are not environmentally friendly since they can also be dangerous to human beings.

III. WORKING METHODOLOGY

1. The system makes use of a CONTROLLER, a DC motor, Battery, Solar Panels, Gears and Linkage, Joints, a mic for sound sensing along with the pole and model frame to develop the system.
2. The scarecrow is mounted using its metal pole in a field. It can be mounted anywhere in the open as it doesn't require any external power supply. The solar panels constantly charge the battery of the system during day time.
3. The mic in the system constantly monitors sound level in environment. As soon as a spike in sound levels is detected in the environment this signal is monitored by the controller and it triggers an action. The DC motor is powered which rotates and so does the entire arm mechanism.
4. The rotation of motor shaft rotates the gear connected to it which sets in motion the Linked arm mechanism. The mechanism allows for moving the arms in a human like motion vertically to imitate a human presence. Also the controller operates a speaker module to make some noise so that birds and animals in near the field too are scared.

3.1 Flapping Mechanism

The aim of the flapping mechanism is to convert the rotary motion of the motor into the linear motion of flapping hands when the crank rotates, the connecting rods push the hand up and down. The flapping mechanism consists of crank, connecting rod, flapping arm, support structure, nut and bolts. Crank is joint with one end of connecting rod and second end of connecting is joint with flapping bar, when crank rotates the crank push the connecting rod and connecting rod push the flapping rod up and down.

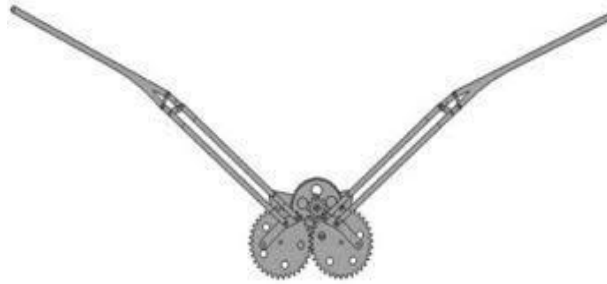


Fig: 3.1-Flapping Wing Mechanism

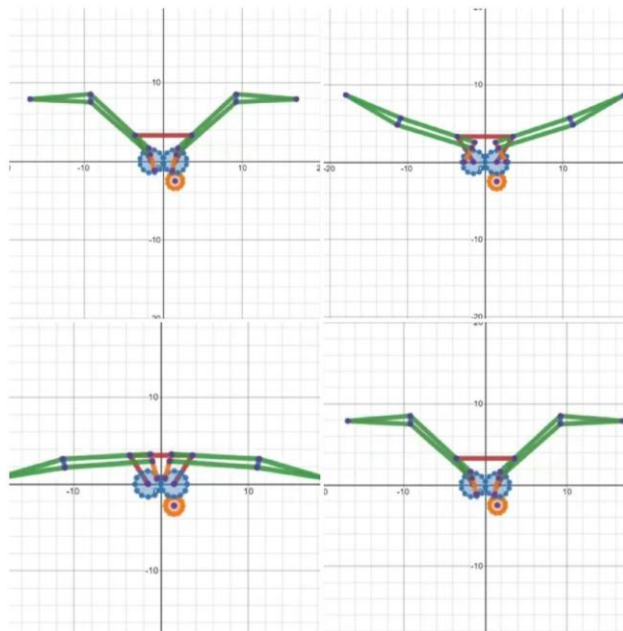


Fig: 3.2- Motion of Mechanized Arm

IV. COMPONENTS USED

4.1 Mechanical Components

a) **Metal pipe:** We have used Round hollow section mild steel pipe for making Scarecrow's structure. Which provide strength to the structure of scarecrow.



Fig: 3.3- Metal Pipe

b) ACP (Aluminium Composite Panel) Sheet: We have used ACP sheet for making our project's mechanism (Flapping mechanism). ACP sheet is used to provide support to the mechanism, and to make flapping hands, crank and connecting rod.

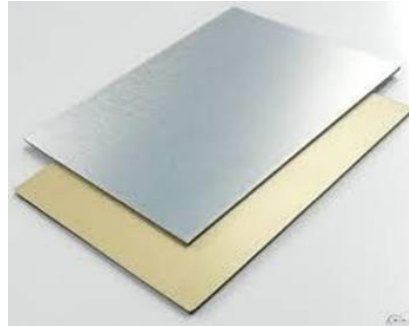


Fig 3.4: ACP sheet

c) Nut and Bolts, Screws: Nut and bolts, Screws are used to join the components into the structure and mechanism, Nut and bolts are used for temporary joint in the flapping mechanism to easily flap the scarecrow arms upward and downwards. Screws are used for permanent joint of the structure and the mechanism.



Fig 3.5: Nut and Bolts

d) Plastic Gears: The flapping mechanism uses a set of gear reduction to achieve the correct frequency of flapping from a high-speed motor. During the downward stroke which produces both lift and thrust the wings are fully stretched to displace maximum air beneath the wing to produce a thrust.



Fig 3.6: Plastic Gear

4.2 Electrical and Electronic components:

a) Arduino UNO: Arduino UNO is a Microcontroller board used to read the signal of the sensor and control the motor driver and buzzer.

**Fig 3.7: Arduino UNO**

b) Motor, Motor Driver: Motor driver is used to control the motor directions and motor (DC Gear motor 12v) is used to drive the flapping mechanism.

**Fig 3.8: Motor and Motor driver**

c) PIR Sensor, Buzzer: PIR Sensor is used to detect the motion of the birds and animals. Alarm is used for produce noise to scare the birds and animals

**Fig 3.9: PIR Sensor and Buzzer**

d) Battery, Connecting Wires: 12v Battery is used to give power supply to the Arduino and Motor driver. Connecting wires are used to connect all the electrical connections.

**Fig 3.10: Battery and Connecting Wires**

V. WORKING

In mechanism working, Flapping mechanism is used to move the Scarecrow arm in upward and downward direction. A crank rotates and is connected to the connecting rod with movable joint and this connecting rod is further connected to the two arms by the movable joint, which moves in upward and downward direction. A T-shape joint is used to provide support to the mechanism. In Circuit working, A PIR Sensor detects the motion of the birds and animals, it sends signal to the microcontroller (Arduino UNO), where motor driver and battery is connected to the Arduino. Further Arduino send the signals to the motor driver from where it sends signals to the motor and Buzzer.

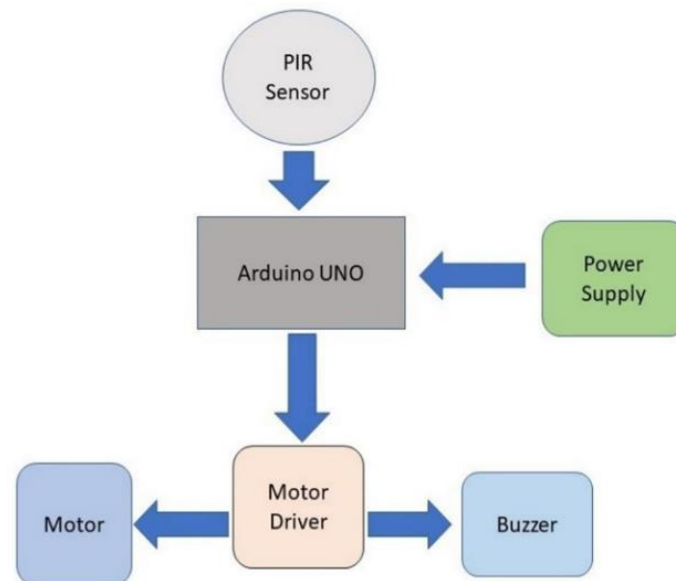


Fig 3.11: Circuit Block diagram

VI. CONCLUSION

The automatic scarecrow is a very loud and dynamic device with the strong potential to scare off avian birds & animals from the gardens and farms. The device has the potential to work all by itself. The system can also be used to chase away birds from airports, roofs of residential and commercial buildings, learning institutions, and offices that cause sound or noise pollution when they are in large flocks, or cause a problem of sanitation where they drop their excreta.

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