Electronic Pest Bird Repellent System

Siddhesh Sonar[1], Pritesh Vasani[2], Sanket Devanhalli[3]

Department of Electronics & Telecommunication Engineering

Maratha Vidya Prasarak Samaj's Karmaveer Baburao Ganpatrao Thakare College of Engineering, Nashik, India

Abstract: All around the world, domestic birds are a major threat in the field of agriculture causing damage to economic field crops, storage houses and also dirtying human life areas. Such most common pest birds in many countries are House crows (Corvus), Common myna, Jungle myna, Brahminy starling, White-cheeked bulbul, Acridotterestritis etc. In order to distract these birds away, many traditional methods such as Scarecrow models, Hawk kites, Colored lights, Flashes, Chemicals etc. are used which nowadays do not seem very effective. In addition to this some of these methods can be harmful to the birds. In this paper an effective bird deterrent technique i.e., Bird Scarer has been developed. Different sounds and visuals due to which different species of birds get deterred were also noticed and studied. Unlike other projects, our project includes a variety of techniques suitable for small as well as large areas.

Keywords: Pest Bird repeller, infrasound, flash, moving wand, laser.

I.   INTRODUCTION

Birds cause tens of millions of dollars of damage every year to Indian buildings, machinery, automobiles, roofs, ventilation systems and much more. Bird droppings and nesting materials which are allowed to accumulate pose a host of physical problems which can become very serious if they are not corrected immediately. As you all have seen birds especially 'pigeons' dropping dirty the buildings, it causes foul smell. It can also cause several problems such as damage to roofs, damage to machinery, ventilation system blocking, damage to food and other products etc. To avoid this, we will be developing a system which is uses Node MCU microcontroller. We are developing bird deterrent system suitable for short as well as long range application. Depending upon the area we want to protect we can use different methods viz. infra sound, continuous moving bird scarer or laser. The bird repeller system does not harm birds; it only forces them to find new place to land on. The system is fully automatic and can be set using an android application build specifically for our system. Bird deterrent products eliminate the need for harmful poisons, traps or pesticides. You can feel good about keeping pest birds at bay in a way that's safe.

II.   MOTIVATION

Pest birds repeller is the dispersal of birds using methods which make them uncomfortable while being completely harmless to them. A bird repeller is any of a number devices designed to scare birds, usually employed in places where pest birds cause harm. Electronic bird repellent devices produce extremely effective audio and visual threats that frighten, irritate, and disorient birds, forcing them to seek calmer, untreated areas. They are also used on airfields to prevent birds accumulating near runways and causing a potential hazard to aircraft. Electronic bird deterrents condition pest birds to stay away from treated areas for good. In order to protect these areas against bird damage, some electronic based mechanical methods are adapted for control.
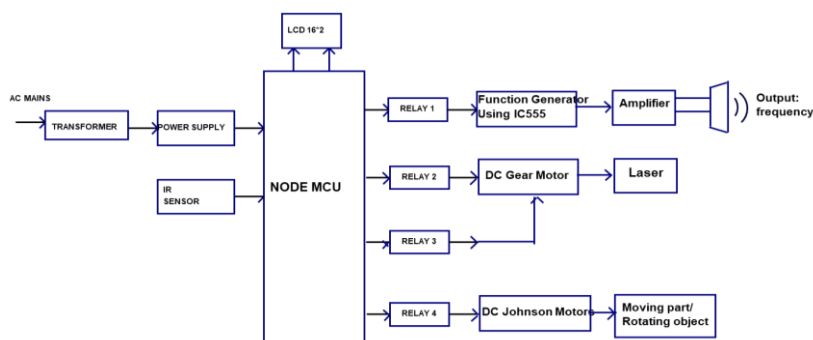
III.   BLOCK DIAGRAM

Figure 1: System Architecture

1.1 Block Diagram Explanation

- In this project our system uses NodeMCU microcontroller.
- To power the NodeMCU 5V power supply has been designed.
- IR proximity sensors are mounted at places where there is possibility of birds coming in.
- These sensors will sense arrival of birds and will send signal to relay 2.
- To repel the bird/s a high frequency is generated using crystal oscillator.
- Crystal oscillator is used since it is capable of producing high frequency output.
- Crystal oscillator output is amplified by an amplifier.
- This output is given to a speaker which produce the high frequency we want.
- In this work, we are using range of frequencies 0 Hz to 1.4 KHz.
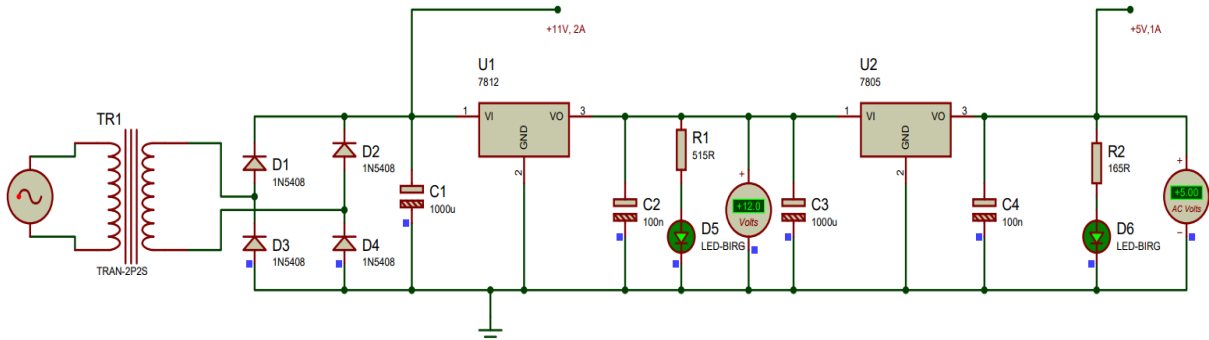
3.1   Power Supply Circuit

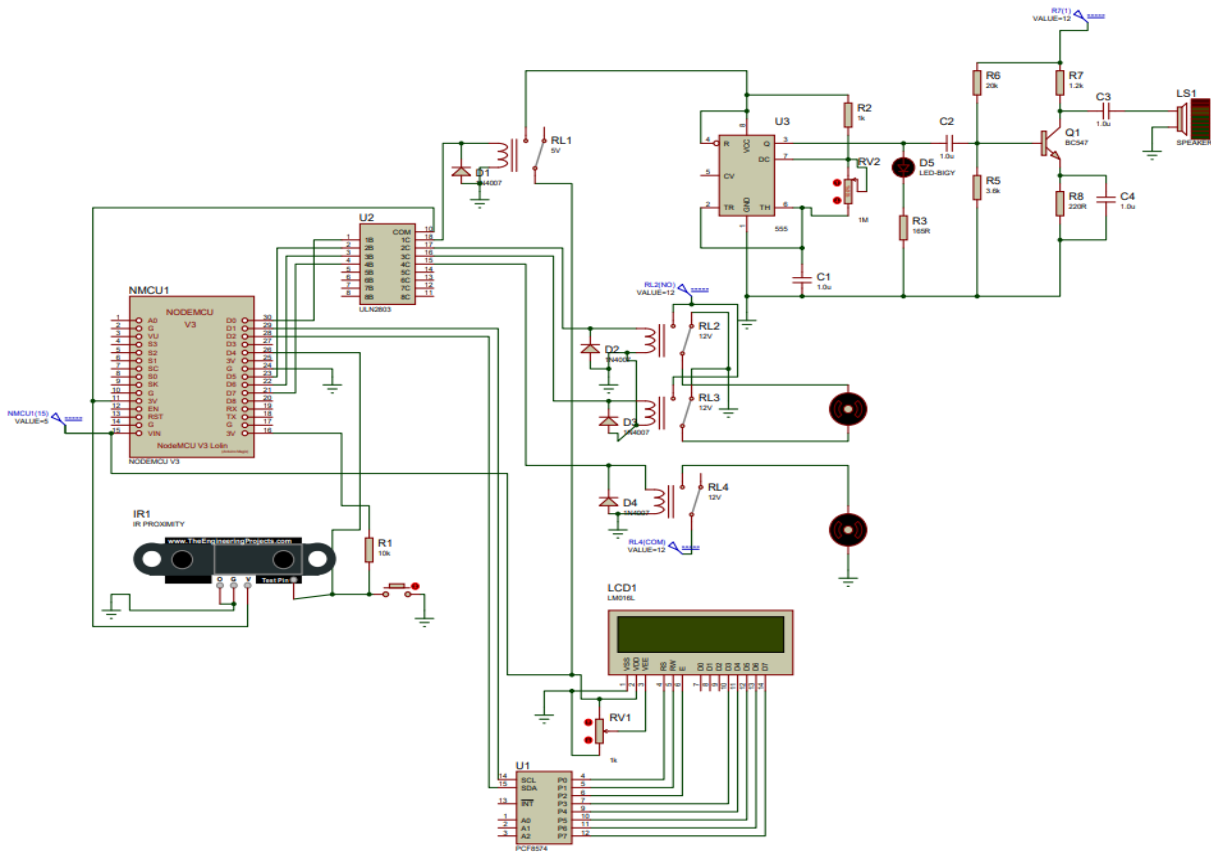**Figure 2:** Power supply circuit diagram

3.2   Circuit Diagram

Figure 3: Circuit Diagram

3.2 Circuit Diagram Description

For power supply we are using 18V 2A transformer. Bridge rectifier is built using IC7408 which is capable of handling maximum 3A of current across it. Capacitor filters of 1000u and 100n are used. From capacitor C1 12V, 2A supply is given to relay 4. 7805 and 7812 voltage regulators are used to get 12V-1A and 5V-1A outputs respectively. NodeMCU esp8266 is used here. It comes with the ESP-12E module containing ESP8266 chip having Tensilica Xtensa 32-bit LX106 RISC microprocessor. This microprocessor supports RTOS and operates at 80MHz to 160 MHz adjustable clock frequency. NodeMCU has 128 KB RAM and 4MB of Flash memory to store data and programs. Its high processing power with in-built Wi-Fi. NodeMCU is connected to IR proximity sensor, 16x2 LCD through IC PCF8574, one 5V relay and three 12V relays. NodeMCU takes input from IR sensor and accordingly turns the relays on. Relay 1 is connected to IC555 waveform generator. IC555 waveform generator is capable of generating frequencies up to 350KHz. It is then amplified by amplifier circuit and then given to piezo-buzzer. Relay 2 and 3 are connected to 100 rpm motor. It will allow to and fro motion of laser. Relay 4 is connected to 60 rpm Johnson's motor which is then connected to a moving wand. LCD is connected it is of 4-bit mode. For controlling brightness and contrast there are R8, R2, R4. There is reset circuit and also pull up resistor of 10K for current sinking and sourcing purpose.

3.3 Working

There are three methods used for repelling birds viz. physical bird deterrent, laser and using infrasound frequency.

Physical Bird deterrent system:
- Physical bird deterrent uses continuous motion to prevent large pest birds and from landing, nesting or roosting on protected surfaces. It has two 3 feet long arms mounted on top of the unit that spin continuously providing a total of 6 feet of coverage. Birds will be frightened by the movement and will avoid the area. The spinning and sweeping movement scares birds away from the treated area.
- The unit is portable and can be moved for different locations. The two mylar streamers get attached to the wands and create a frightening environment for birds.
- It is one of the most effective and humane way to get rid of birds without harming them.
- To save power instead of continuous spinning of wand we can use proximity sensors to sense incoming birds and turn on the motion of wands after they are detected.

Laser:
- A laser bird deterrent is one of the most effective and well-documented ways to repel pest birds.
- Bird repellent laser beams are able to keep pest birds (such as pigeons, blackbirds, ducks, sparrows and more) away without causing any harm to the birds or the environment.
- Additionally, our laser bird repellent doesn't produce any sound, so you can enjoy a bird-free space without the unwanted noise.
- It forces them to search for different landing areas. Bird-X laser bird deterrent systems can work day (in low-light areas) or night.
- This system can be modified for long range application of bird control like in farms by using constantly changing moving pattern as well as color patterns.
- Laser bird deterrent products eliminate the need for harmful poisons, traps or pesticides. You can feel good about keeping pest birds at bay in a way that's safe.

Using Sound:
- Ultrasonic bird deterrents are ineffective against most pest birds. They do not work because they generate high frequencies that are above the bird's hearing range. Bird's hearing is similar to humans, so if you can hear the sound, so can they.
- Ultrasonic sound waves bounce off objects, creating spots where pigeons can completely avoid the sound. Not only will you still be faced with a pigeon problem, these devices can also damage the hearing of cats and dogs.
- Study shows that homing pigeons could detect extremely low frequency sounds (infrasound) as low as 0.05 Hz in a sound isolation chamber. An audiogram of thresholds was determined for 13 frequencies between 0.05 Hz and 200 Hz. Below 10 Hz, the pigeons are at least 50 dB more sensitive than humans.
- Using infrasound in bird repeller system seems to give promising results.

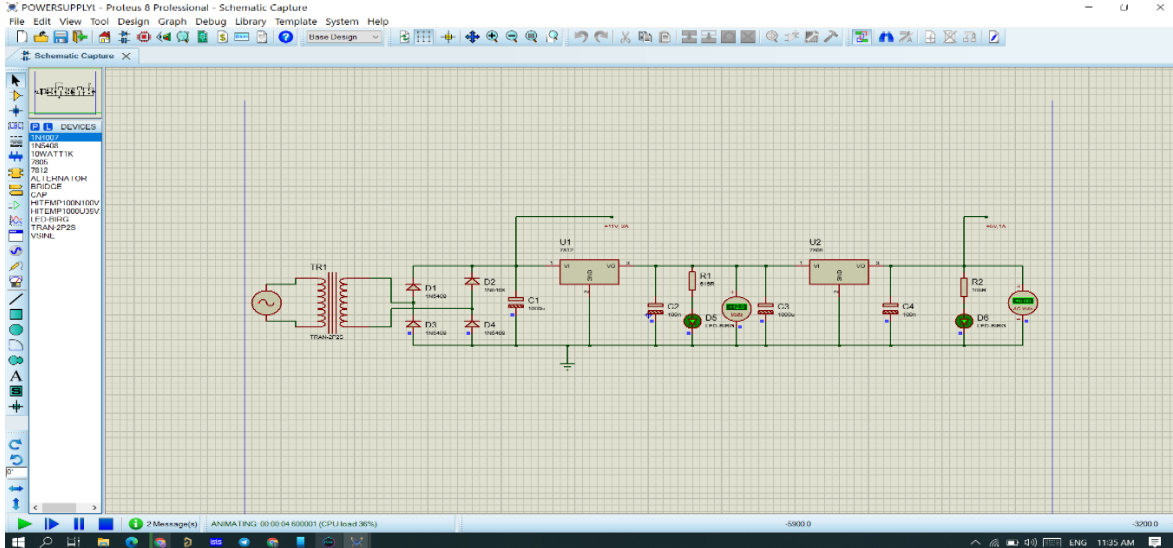## IV.   SIMULATION

4.1   Simulation of Power Supply

Figure 4: Power Supply Simulation

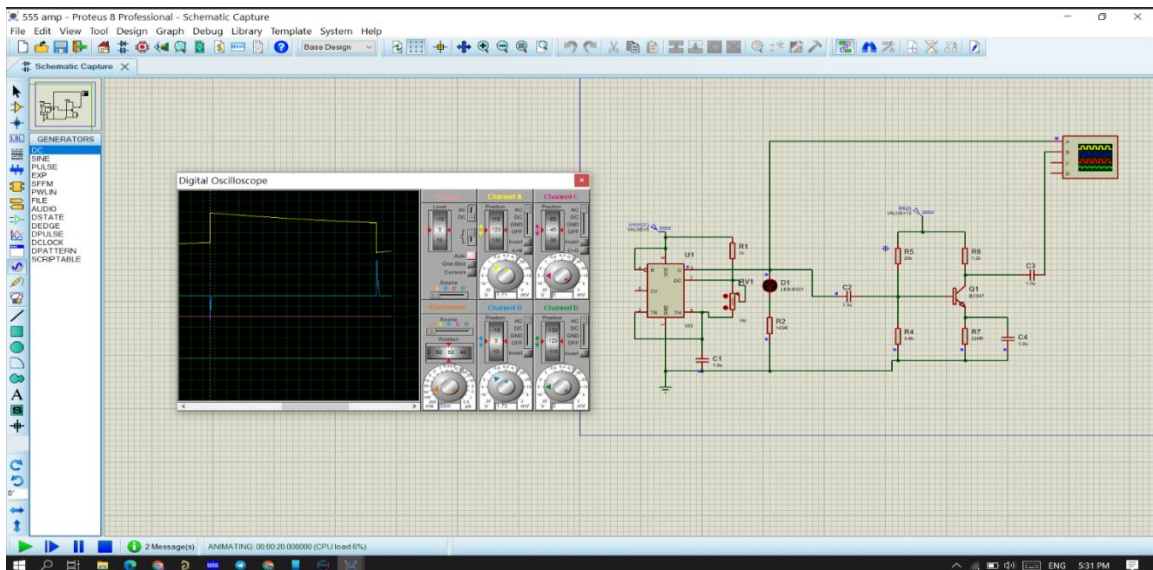### 4.2   Simulation Circuit Diagram

Figure 5: Simulation Circuit Diagram

V.   ADVANTAGES

1. Humane bird control solution! Will not harm birds!
2. No recurring clean-up or repair costs
3. Safety for your vehicles, buildings or equipment from unwanted corrosive bird droppings
4. Get protected from any health and liability hazards that comes along with pest bird infestation
5. Prevention against major diseases like Salmonella, E Coli, West Nile, Histoplasmosis
6. Adhere to Government and Safety guidelines during inspection.
7. Increase/maintain property aesthetics
8. Help your residents, workers or customers from any nuisance from pest birds.

VI. APPLICATION

Bird Repeller repels pest birds including pigeons, crows, sparrows and seagulls etc.
Recommended for use in outdoor areas, such as:

- Parapet Walls, Roofs & Ledges
- Signs & Streetlights
- Boats & Swim Platforms
- Air Conditioner units (AC indoor & outdoor)
- Chimney Caps & Skylights
- Docks, Boats & Patios
- Signboards & Billboards
- Parking garages
- Waterfront property & boat houses

VII. RESULT

This system was tested with all three methods viz. physical bird deterrent, laser and infra sound and also with combination in pair of two as well as three. The pest bird's incoming was reduced by about 98%. You can check out the results of this device in following folder link: https://cutt.ly/cnkAugj .

VIII. CONCLUSION

Electronic pest bird repeller system is effective solution for pest bird problems. The combination of different electronic mechanical methods used to deter birds are most effective when applied together. On contrary to the traditional pest birds control method which can prove harmful to the birds this electronic pest repeller has proven to be totally harmless towards birds' while being very effective as a pest bird controller.

VIII. ACKNOWLEDGEMENT

We take immense pleasure in expressing our humble note of gratitude to out project guide Dr. V. M. Birari Electronics and Telecommunication Engineering, MVPS's KBTCOE for his remarkable guidance in doing our project.

REFERENCES

[1]. R.E.R. Porter, M.R. Rudge , J.A. McLennan - Birds and Small Mammals: A Pest Control Manual
[2]. Johnson Stanley Animal and Bird Pest Management in Agricultural
[3]. A. Muminov, Y. C. Jeon, D. Na, C. Lee and H. S. Jeon, "Development of a solar powered bird repeller system with effective bird scarer sounds," 2017 International Conference on Information Science and Communications Technologies (ICISCT), 2017, pp. 1-4, doi: 10.1109/ICISCT.2017.8188587.
[4]. S. Lee, M. Lee, H. Jeon and A. Smith, "Bird Detection in Agriculture Environment using Image Processing and Neural Network," 2019 6th International Conference on Control, Decision and Information Technologies (CoDIT), 2019, pp. 1658-1663, doi: 10.1109/CoDIT.2019.8820331.
[5]. Blog on "The problems caused by birds on commercial properties" Written by Harry Wood
[6]. https://www.rentokil.com/blog/problems-caused-by-birds/
[7]. Clark, Larry. (1998). Review of bird repellents. Proceedings of the Vertebrate Pest Conference. 18. 10.5070/V418110214.
[8]. Kreithen, Melvin & Quine, Douglas. (1979). Infrasound detection by the homing pigeon: A behavioral audiogram. Journal of Comparative Physiology. 129. 1-4. 10.1007/BF00679906.