High Frequency Deer Deterrent

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Abstract

The high frequency deer deterrent is a device that will be used to detect and deter deer from crossing into the path of oncoming traffic. In the United States, an estimated 1.33 million deer-related accidents occurred from July 2017 to June 2018, causing at least 200 human casualties. Given the expansion of housing developments, the number of these collisions will only continue to rise. The use of deer-crossing road signs has been around for decades on the side of the roadways, but with the number of accidents and fatalities still on the rise, this solution seems to be ineffective. [1][2][3]

Introduction

The objective of the device is to function as its own stand-alone source, being able to generate enough power from solar energy for ultrasonic speakers to deter deer away from traveled roadways. With the use of a mounted camera, the device should be able to detect and identify the deer or other large mammals moving within a certain distance, triggering the high frequency output in a beamed path.

Facts

- Average of 175 – 200 deaths and over 10,000 injuries occur yearly in the US
- Odds of hitting a deer are 1 in 116 in the US
- Accidents peak during mating season in the months of October – December [1][2][3]

Methods

Workflow
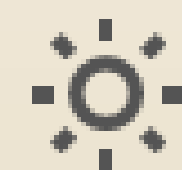
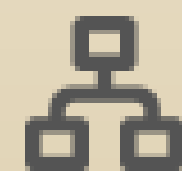- PV panel converts solar radiation to DC power
- Power from the PV panels is charged using a charge controller
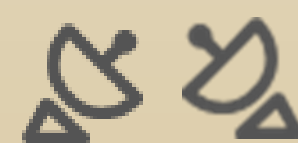- A timer circuit turns on a Raspberry Pi once every 5 min
- Raspberry Pi takes a picture via a camera
- Using Artificial Intelligence, it is determined if the picture contains a deer
- If a deer is detected, a high frequency signal is produced to deter deer
- Image in converted to an RF signal, transmitted, received, and then converted back to an image
- Image and data is stored at main location

Results

- A high frequency sound was achieved between 27kHz and 32kHz
- System is powered by solar and is able to work for up to two days without any sunlight
- Artificial Intelligence computer vison was able to successfully detect objects

Discussion

Even though the project was successful, one issue that arose was that although this device is currently only programmed to recognized deer, it will also label other large animals, such as dogs, as deer. This isn't a big concern, as it will still trigger the high frequency deterrent, but further programming will need to be done to be able to recognize a wide range of animals. Another design opportunity would be to increase the range of the device, so that not as many units would need to be used in remote areas. Further design evolutions could include a camera rotating in a 180 degrees arc in order to pick up anything next to it without having to rely on another unit. Lastly, transmitting the image via RF signal does work, but would be suspectable to interference or noise.

Conclusions

Project will continue focusing on the following:
- Board design
- Transmitting data via other methods
- Programming for a larger range of animals
- Increasing detection range

References

[1] "30 Surprising Deer Accidents Statistics", Petpedia, 2021. [Online]. Available: https://petpedia.co/deer-accidents-statistics/. [Accessed: 13- Nov- 2020].

[2] "Deer Crashes Down, But Be Alert in the Fall | State Farm", Deer Crashes Down, But Be Alert in the Fall | State Farm, 2021. [Online]. Available: https://newsroom.statefarm.com/2018-deer-crashes-down/. [Accessed: 08- Jan- 2021].

[3] iii.org. 2021. *Facts + Statistics: Deer vehicle collisions | III*. [online] Available at: <https://www.iii.org/fact-statistic/facts-statistics-deer-vehicle-collisions> [Accessed 17 February 2021].