Active Bird Defense Executive Summary

According to the Portland Audubon, “Up to one billion birds die each year in the United States due to collisions with windows and research shows that 54-76 percent of window collisions are fatal.” [1]. The reason this happens is “In daylight, birds … see reflections of vegetation or see through the glass to potted plants or vegetation on the other side. At night, nocturnal migrants crash because they fly into lighted windows”. [2]

The goal of our design project was to create a device capable of preventing these fatal bird-window collisions. When we started this project, two previous teams had already attempted to create such a device. This gave us some data about what worked and what did not. We decided as a group that we needed to thoroughly analyze the designs from the previous years, keep and improve what worked, and scrap and redesign everything else.

We spent the fall researching and testing both detection and deterrent methods. After a lot of analysis, we decided to keep using the previous year’s work with the OpenMV Camera ML identification module. We also decided to improve upon another previous year’s method of detection. One earlier group attempted to use an ultrasonic sensor to detect motion, but after implementation, they discovered that it was too slow and not sensitive enough for the application. We improved on the idea by transitioning from using sound waves to using light waves by implementing a radar motion detector instead of ultrasonic. We hoped this would give us the increased sensitivity and response time needed to detect the motion of birds in flight.

On the deterrents side we opted to continue the previous year’s idea of using a light deterrent. However, we also expanded the deterrents section to include a sound deterrent. After running tests on real birds, we discovered that birds were especially responsive to the warning calls of other birds, even artificially produced playbacks.

In the winter and spring, we took these ideas and the results of our research and implemented them in hardware and software. We tested our system by setting it up near an active bird feeder. During testing, we discovered that the radar method of detection was indeed more sensitive and responsive than ultrasonic. It could detect the motion of some birds before they landed on the bird feeder, though not all. We also learned that using bird warning call playbacks was far more effective in deterring birds from landing on the feeder than light alone.

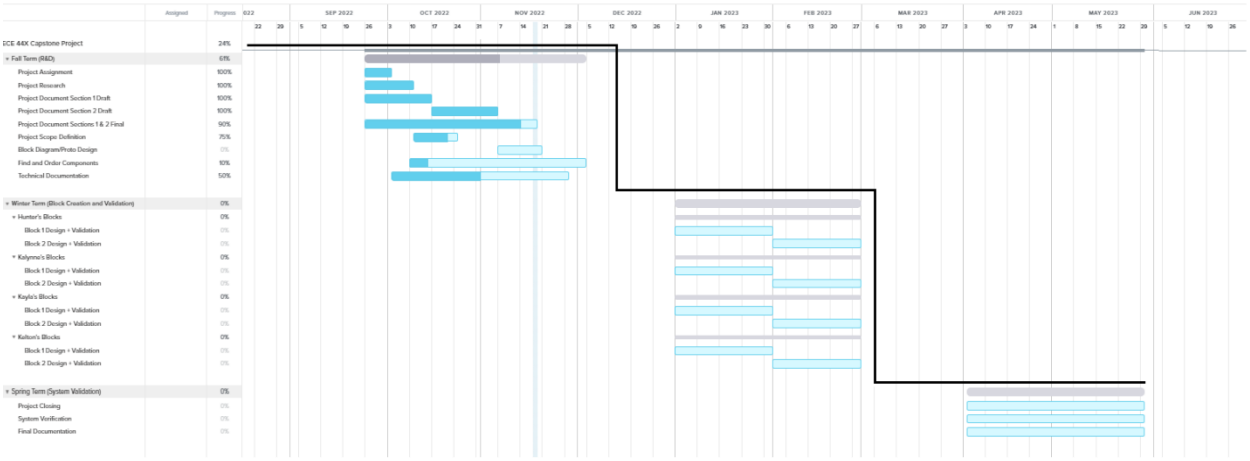

Figure 1: Timeline of Capstone Project Events

We learned a lot during this project. On the technical side we became more proficient at a number of skills including pcb design, soldering, creating and testing electrical and logical interfaces to allow different design blocks to interact with one another, programming, mechanical design tips and tricks, and much more. One the project management side we learned how to effectively and efficiently run meetings, delegate workloads, and integrate ideas and designs.

In the end we weren't able to reliably detect and deter birds, but one of the most important lessons we learned is that engineering is an iterative process. We took the work of engineers that came before us and improved upon it. Hopefully the next group will be able to improve upon our work, and eventually a design will be created that can reliably and effectively prevent the tragedies that are bird-window collisions.

[1] Audubon, Portland, "Birds and Windows", 5-April-2019. [Online]. Available: https://audubonportland.org/our-work/rehabilitate-wildlife/being-a-good-wildlife-neighbor/birds-and-windows/#:~:text=Up%20to%20one%20billion%20birds,a%20window%20after%20a%20collision. [Accessed: 10-Oct-2022]

[2] Powell, Hugh, "Why birds hit windows-and how you can help prevent it", All About Birds, 5-May-2017 [Online]. Available:https://www.allaboutbirds.org/news/why-birds-hit-windows-and-how-you-can-help-prevent-it/#:~:text=In%20daylight%2C%20birds%20crash%20into,they%20fly%20into%20lighted%20windows. [Accessed: 10-Oct-2022]