Using pigeons as an alternative to drones

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Introduction

Drones are unmanned vehicles that can carry out a multitude of functions including observing and recording aerial footage. Increased recreational and commercial use has introduced large security threats. As a result, there is a need for airspace that can regulate and remove drones. Drone jammers solve this issue by restricting and blocking drone usage in specific airspace by using techniques such as frequencies and lasers (What are drone jammers?, 2025). Over time these technologies have improved, with modern drone jammers being as small as walkie talkies and creating inoperable airspace. Messenger pigeons are pigeons that have the ability to fly back to their home over long distances no matter the release location. They have been historically used to send messages during wartime, or for spy missions. The purpose of this project is to use pigeons as an alternative to drones in capturing and interpreting aerial footage in the event of inoperable airspace.

Methods and Materials

Messenger pigeons were borrowed from the HydroFarm, and preliminary flights were conducted at a field 6.5 miles away from the farm. The HydroFarm has pigeons of varying ages and flying experience, these differences were indicated with wrist bands. However, capturing the same types consistently posed to be challenging. Additionally, most pigeons were unable to make the flight back in under 48 hours, and due to time constraints, this led to the decision for the release location to be done at the farm where they returned to their coop in less than hour. To ensure the camera and harness fit the pigeons, an enclosure was made where pigeons were housed and measured to be fitted with the harness. Testing fittings were essential to ensure the pigeons could carry the camera despite its weight (Figures 1, 2 and 3), and that it was snug and wouldn't move during flight. Fittings were done to ensure pigeons had full range of motion and could fly with the harness on (Figure 4).

Figure 1 (right): Measurements taken were wingspan, breast circumference, length of their underside and back.

Figure 2 (right): In initial fittings, the camera was too big, resulting in restricted movement.

Methods and Materials (continued)

Improvements were made on the harnesses based off how the pigeons interacted with them, such as hiding seams to prevent tangles, adjusting the camera's position and holder to improve stabilization. Using PyCharm, videos were able to be run through and analyzed by software for marker detection (Figure 5). Which was programmed to detect the cones in a field from an aerial view based off color codes. Pictures of the cones were taken with different lighting allowing for greater accuracy. By instinct pigeons fly up and into a circle, surveying the field and their surroundings to orient themselves before flying off. Over several trials an average flight path was determined, where cones were laid out with a grid ten feet apart, numbers were assigned to allow for consistency when analyzing footage. Changes for data collection were improved not as parts, but as a whole based on observed and calculated decisions. As a result, they were marked as phases and evaluated with every test cycle. Alongside harness and cone manipulation, code was updated for better detection, and cameras were swapped out if technical issues occurred.

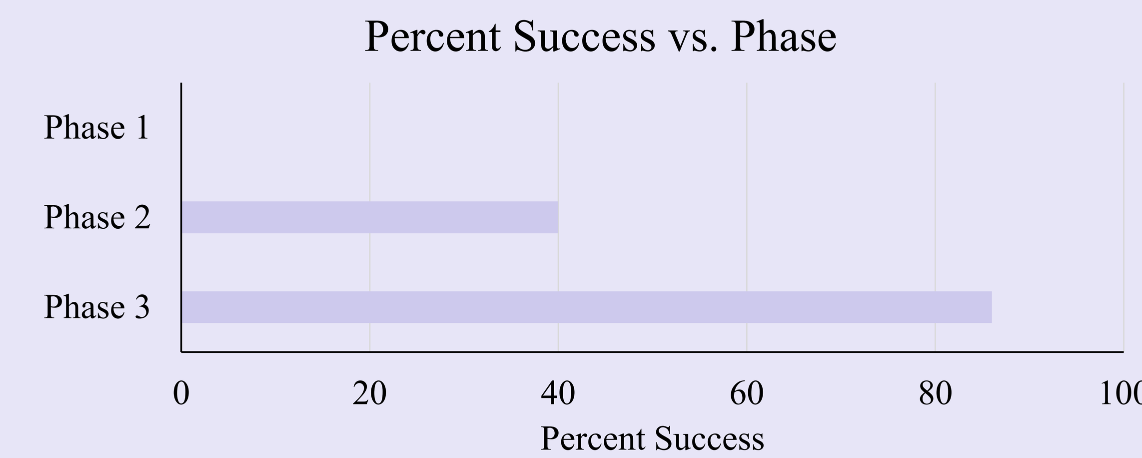
Figure 3 (above): During fittings, a leash was attached to the harness to keep the pigeons from flying away.

Figure 4 (right): This is an image of a pigeon wearing one of the prototype harnesses from phase one.

Figure 5 (right): Video footage was taken off the camera's SD card and uploaded into the software, once processed, cones detected on video were highlighted by a green box around them.

Results

A successful trial was determined if most markers placed in the field are detected by the software after aerial footage is recorded. To prove this with every iteration, the success rate was recorded based on how many cones were detected versus how many cones were laid out. At the end of data collection, the final iteration had a success rate of 86% while the first iteration had a success rate of 0% (Graph 1). In total an hour of aerial footage was analyzed, with each phase averaging 20 minutes.



Graph 1 (left): The graph represents each phase and its respective percent success rate. A phase represents when a series of changes are done to each variable and are tested.

Conclusion

Due to the unpredictable nature of the pigeons, it cannot be determined that pigeons can be used as an alternative to drone technology if there is restricted airspace consistently. However, it can be shown that with every progression, it showed greater performance than the last. It is recommended that future research, training and development be carried out to have a definite conclusion. Potential applications of this project could include changing the software to detect different types of targets including people, vehicles, or nearby livestock. Pigeons have a history of being trained for memorization or in taking different flight paths, which could be tested to see if training specific flight routes and to see if they can fly over specific areas would be possible. This could be beneficial in war or spy missions.

References and Acknowledgments

What are drone jammers? (2025). Keda Jammer. https://kedajammer.com/drone-jammer-blogs/what-are-drone-jammers/WHAT-ARE-DRONE-JAMMERS

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