THE USE OF DRONES TO ENHANCE SAFETY ON A UNIVERSITY CAMPUS

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KEY TERMS

- Drones
- Unmanned Aerial Vehicles (UAVs)
- Surveillance
- Campus Safety
- Robot Operating System (ROS)

Figure 1: AR Parrot Drone 2.0

OVERVIEW

Background

Related Work

Problem Definition

Objectives

Methodology

Preliminary Results

Work to be Completed

References

Acknowledgements

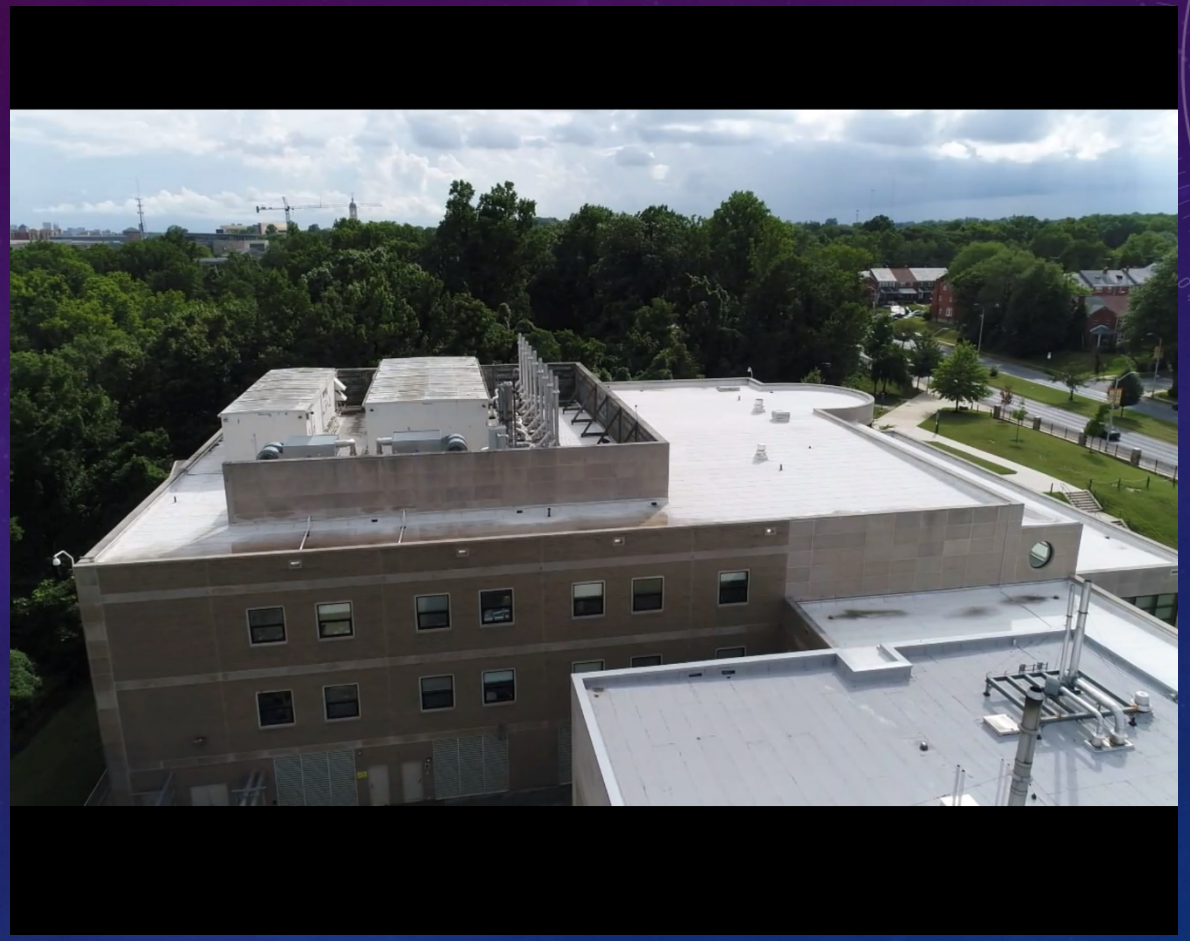

Figure 2: William Donald Schaeffer Engineering Building (Back View), taken with DJI Phantom 4 Advanced, Retrieved from DJI GO 4 App

BACKGROUND

- Drones have historically been used by the military for combat training and active combat situations (Cook, 2007)
- Drones are utilized by the military to act as a force multiplier (Cook, 2007)
- The availability of drone technology has allowed for amateur and commercial use to skyrocket over the last 6 years (Rouse, 2016)

Figure 3: MQ-1 Predator on patrol. (Pratt, n.d.)

LITERATURE REVIEW

Table 1: Various research performed using drones

Article	Synopsis
Cook (2007)	Gave a history of drone use in the military from the 1916 up until 2007.
Dasilva, Jiménez, Schiller, & González (2017)	Used drones to scan and identify license plates in a parking lot
Huang, Long, Yi, Yi, Zhang, & Lei (2017)	Utilized automated flight and route planning to investigate geo-hazards.

LITERATURE REVIEW CONT'D

Table 1 cont'd: Various research performed using drones

Article	Synopsis
Pace, Aloi, Caliciuri, & Fortino (2016)	Used multiple unmanned automated systems that work together to collect information and identify objects of interests.
Pack, S. J., & Rowe, D. C. (2014)	Utilized drone to discovery weaknesses in network security and rogue network access points on a college campus.

PROBLEM DEFINITION

- College campuses face an evolving problem when it comes to safety and security
- Drone technology provides a unique opportunity to augment crime deterrence and prevention programs
- Drones can be used to help make a college campus more safe and secure

OBJECTIVES

- To learn how to pilot multiple types of drones
- To compare the three available drones in order to best select one for implementation into the campus safety program
- To create a safety program, with drones, that helps police and security forces on the university campus to minimize crime

METHODOLOGY

1. Research literature on the history and applications of drones
2. Learn to pilot various drones (see Figure 4)
3. Compare drones to determine the best drone for the research project
4. Preliminary comparison of using app (DJI GO 4) vs. programming (ROS)
5. Develop and test safety plan based on crime reports for the campus

Figure 4: Various drones utilized in the IRAM Lab at MSU

PRELIMINARY RESULTS

- Drone research showed that the DJI Phantom 4 Advanced should be purchased for the project
- Flight tested 3 types of drones: CoDrone, AR Parrot Drone 2.0, DJI Phantom 4 Advanced
- Preliminary flight tests show that the DJI Phantom 4 Advanced outperforms the other drones

Table 2: Drone comparisons

	Avg. Flight Time	Avg. Charge Time	Max. Speed	Camera Resolution
CoDrone	7 minutes	40 minutes	<5 MPH	No Camera
AR Parrot Drone 2.0	12 minutes	1 hour, 50 minutes	25 MPH	1 Mp
DJI Phantom 4 Advanced	23 minutes	1 hour, 20 minutes	40 MPH	20 Mp

Figure 5: Screenshot of virtual drone, Adapted from DJI GO 4 Simulator

PRELIMINARY RESULTS

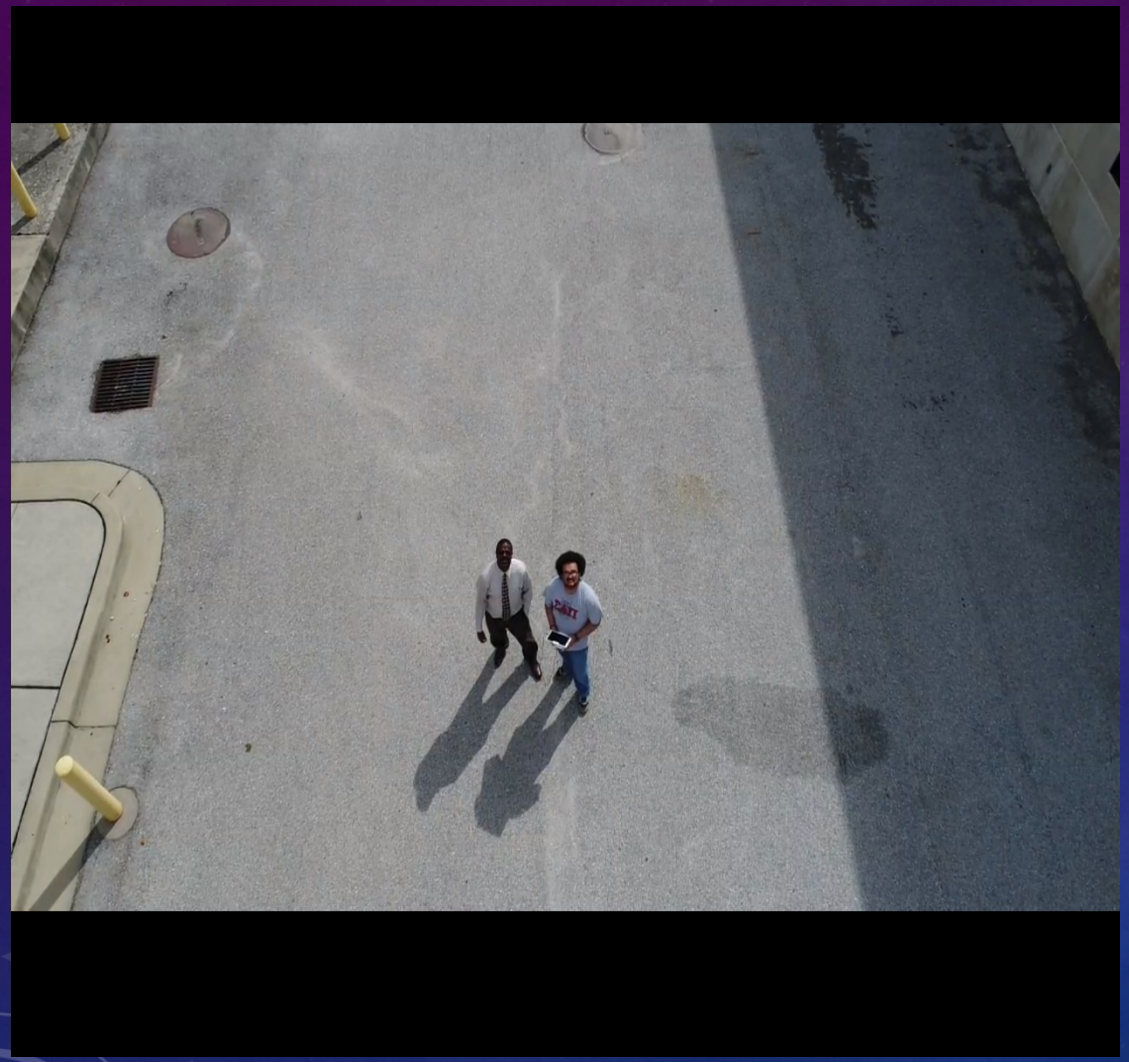

Figure 6: Aerial view shot from DJI Phantom 4 Advanced (Approximately 25 ft high)

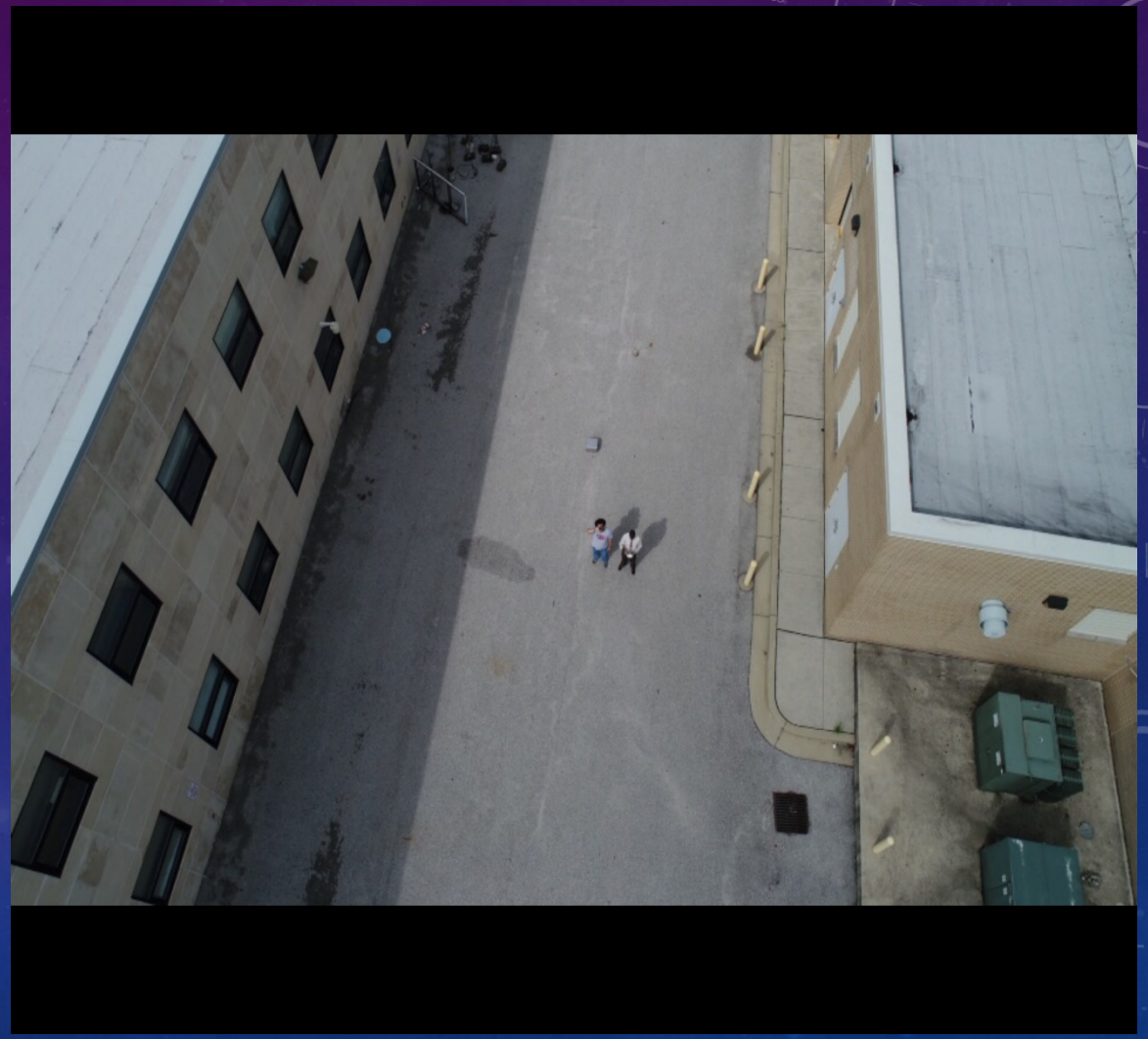

Figure 7: Aerial view shot from DJI Phantom 4 Advanced (Approximately 80 ft high)

WORK TO BE COMPLETED

- Development and continuous improvement of ROS programming code for comparison to DJI GO 4 app
- Modification and continuous testing of the campus safety program to be presented to Morgan State administrators to determine viability on the university campus

Figure 8: DJI Phantom 4 Advanced

Figure 9: Aerial View of Engineering Campus with preliminary flight path plan, Adapted from Google Earth Pro

CHALLENGES, LESSONS LEARNED, AND INTERESTING EXPERIENCES

- Hardware and software need to be researched for capabilities before considering them to be featured in the project
- Learned how to find other research sources for scholarly articles
- Learned how to present the same information to different groups (middle schoolers and college freshman) that have varying levels of understanding of the topic

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