Privacy Concerns about UAS Missions

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Introduction: The purpose of this study was to determine what variables predict privacy concerns. In other words, do political affiliations, location, or gender affect a participant's emotions toward their privacy?

Abstract

Unmanned aerial systems (UAS), also known casually as drones, have changed the ways in which many industries conduct business. One prevalent example would be their use by police organizations (local patrols, SWAT, etc.) to revolutionize their surveillance capabilities. Many major city police commissioners have stated their interests in welcoming the use of UAS. Past studies have analyzed citizen's emotions in regard to privacy concerns focusing on the amount of time the drones spent patrolling-- either twenty-four hours a day or in mission-only conditions. The purpose of this study was to determine what variables predict privacy concerns. In other words, do political affiliations, location, or gender affect a participant's emotions toward their privacy? Two hundred participants were surveyed through Amazon's Mechanical Turk (MTurk). They were presented with hypothetical scenarios involving police issued UAS patrols occurring near their residence. Following the scenario, they were asked to rate statements from a validated UAS privacy scale and then complete a set of demographic questions that served as potential predictors. A linear regression analysis revealed two significant predictors. First, females were more likely to express privacy concerns during the UAS missions compared to their male counterparts (B = .31). Second, people who rated themselves are more conservative also expressed more privacy concerns compared to people who rated themselves as more liberal (B = .30). These two variables accounted for 19% of the variance in the data. When conducting UAS missions in public or near housing residences, it is important to take note of the privacy concerns raised by residents and other citizens in the area. These findings reveal that females and conservative-leaning people tend to have more privacy concerns about UAS missions than male, liberal-leaning people

Background

Current use of UAVs
- The introduction of UAVs has exponentially grown to the state of a phenomena and has been integrated in multiple industries. UAVs are being implemented across multiple industries due to the creative exploitation of its features that can get some companies the cutting edge they need to stand out. At the moment the UAV market is expected to exceed $8.35 billion by the end of this year.[1]
- The police use of UAVs is becoming a more popular issues due to many local governments seeing the potential of utilizing the unique features a UAV can bring. This has paved the way for government agencies support of the use of UAVs by police officers with the state of North Dakota being the first state to allow police to equip drones.[2] Soon to follow are states like Tennessee and South Carolina which are both in the legislative process to soon follow.[2]

Privacy Concerns
- The current literature emphasizes the dire need to take into consideration the privacy of those affected. Especially how these concepts should be considered in the design process, this is especially highlighted through Anderson's principles of Privacy by design.[3]
- Past studies have looked at the public's perception of UAVs and the privacy concerns that come along with their use in aiding police officers. It has been highlighted that for the public both fear and disgust mediate their relationships.[1]

Hypotheses

H$_a$: In general, at least one of the following demographic variables (age, gender, income, number of children, number of vehicles that pass by the participant's residence per day, number of vehicles owned, political affiliation, and relationship with local police) would be a significant predictor of privacy concerns.

Figure 1. An example of the scenario presented to the participants along some of the questions on the previously validated privacy scale.

Methods

Participants
- 92 Males & 110 Females
- M_{age} = 36.88 (SD = 12.15)
- Participants were recruited through Amazon's © Mechanical Turk © (MTurk)

Methods
- Participants were first presented an informed consent form and after signing electronically they were presented with the instructions on completing the survey
- The following section of the survey was a hypothetical scenario that read
  "Imagine a situation where your local police department announces plans to use unmanned aerial vehicles (UAVs) to patrol the skies of your neighborhood 24/7 (day and night) every day of the year in order to assist with police activities. These UAVs would fly at various altitudes and provide aerial coverage with video feedback of the entire neighborhoods at all times."
- In the next section of the survey, participants were then asked to respond to questions focusing on the demographics of the participants, with things such as:
  Age, gender, income, number of children, number of vehicles that pass by the participant's residence per day, number of vehicles owned, political affiliation, and relationship with local police
- Participants were debriefed and paid upon completion

References

1. Winter, S. R., Rice, S., Tamilselvan, G., & Tokarski, R. (2016). Mission-based citizen views on UAV usage and privacy: an affective perspective. *Journal of Unmanned Vehicle Systems*, 4(2), 125-135.

2. Spallanzzani, Nicolette, "For When the Sky is not the Limit: Non-Lethal Drone Use by Law Enforcement" (2017). *Law School Student Scholarship*. Paper 872.

3. Anderson, S. 2014. Privacy by design: An assessment of law enforcement drones. Master's thesis, Georgetown University. Available from:
http://hdl.handle.net/10822/709737

Results

- We ran a linear regression analyses on the results gathered from our participants in hope to understand the relationships our selected predictors had on UAVs privacy concerns
- The regression analysis allowed us to create a regression equation that would help determine what predictors were key in predicting a participant's score on the UAV privacy scale.
- All eight predictors (age, gender, income, number of children, number of vehicles that pass by the participant's residence per day, number of vehicles owned, political affiliation, and relationship with local police) were ran through the regression, with the score on the UAV privacy scale being the dependent variable.
- The output of the model extended our preliminary data and contained three significant predictors which were: age, number of children, and and the number of vehicles that pass by the participants residence in a given day.
- The regression equation can be found below:

$$Y = 0.754 + 0.010X_1 + -0.121X_2 + 0.00007109X_3$$

- In this equation Y is the predicted score in the UAV privacy scale, and X_1, X_2, and X_3 are age, number of children, and the number of vehicles that pass by the participants residence in a given day respectively.
- A backward stepwise regression was used to eliminate statistically insignificant predictors

Conclusion

- When conducting UAV missions in public or near housing residences, it is important to take note of the privacy concerns raised by residents and other citizens in the area.
- These findings reveal that a person's age, number of children, and the number of vehicles that pass by the participants residence in a given day are key predictors in determining a privacy score.
- As a participants age increase there privacy concerns increases as well, showing that the aging population are not as comfortable with police usage of UAVs as the younger generation. One opinion on these results is that they can be attributed to the stereotype that older adults are against modern technological advances
- The correlation shows that the more kids in a participants family then the lower there privacy concern score are. Therefore those in smaller families do not feel as comfortable with police usage of UAVs. One possibility behind this is due to the fact that participants in big families are used to being in scenarios where there privacy is limited therefore it is possible that they no longer threatened by scenarios where the privacy is being threatened.
- The predictor "number of vehicles that pass by the participants residence in a given day" was used to help infer if a participant lives in a rural area or in a metropolitan area, with the logic being if you live in a rural area less cars will pass by your residence in comparison to someone living in a metropolitan area who one could expect would have numerous cars passing by the participants residence.
- Future studies should look more into the findings of this study and see if a more concrete explanation of why these predictors had there recorded effects on participants privacy score than those loosley theorised. This should be emphasised due to the fact that this study's participant pool was collected using a convenience sample due to nature of Amazon's MTurk which prevents us from making generalizable claims and should be accounted for in future studies.