Drones and the Design of Public Outdoor Spaces

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Summary

Recent regulatory changes allowing for the use of unmanned aerial vehicles (drones) in enterprise, have led to an explosion in the use of hobbyist drones. As a result, there are increasing reports of illegal drone use in public space, presenting a risk to people on the ground and to commercial drones legitimately flying in public spaces. This presentation offers a framework for site design guidelines to improve public safety opportunities and reduce vulnerabilities under these circumstances. The framework is derived from two sets of data: 1) public space visitor surveys; and 2) public space visual assessment. The resulting guidelines are the first of their kind in this area of research.

Problem description

Public outdoor spaces occur in many combinations, the more so the larger the city. Parks are one type of public space, and are excellent sites for drone experiments. Because it is similar to a park, the Sarah Duke Botanical Garden was selected as a site for visitor surveys, and landscape visual assessment about drone use.

While our public space surveys examined visitor attitudes and behaviors in significant depth, the responses most pertinent to the development of design guidelines to reduce potential conflicts were related to visitor: 1) landscape use preference; 2) landscape feature preference; 3) attitudes about garden comfort, safety and privacy; 4) awareness of drones and their use in public space; and 5) attitudes about the use of drones in public space.

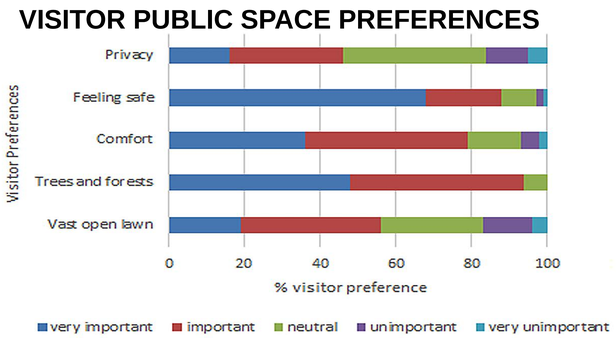

Figure 1. Botanical garden visitor preferences.

Survey responses related to garden user preferences show that visitors utilize all areas of the garden with most visitors coming on weekends. Most visitors use the garden for active recreation, for enjoying nature, relaxation/mediation or socializing. Visitors prefer three kinds of garden spaces: *open space with clear views, semi-open space near sheltered areas, and secluded private forest areas*. In their use of these garden areas, visitors most appreciate the trees and forest, and feelings of comfort and safety. Nearly half desire feeling a sense of privacy.

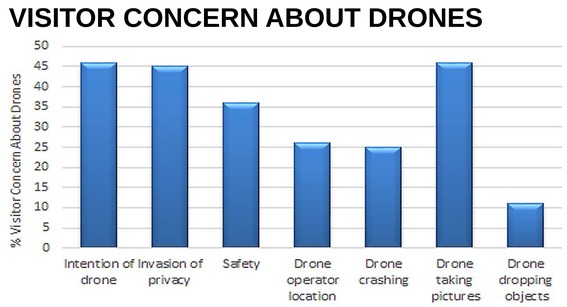

Figure 2 Nature of visitor concerns about drone use in public space.

Survey responses related to visitor awareness of drones and the use of drones in public space show that 98% of visitors are aware of drones, and hear about drones flying in public spaces through multiple sources on a regular basis. 11% of visitors own drones. 65 % of garden visitors would be concerned seeing a drone in public space, primarily because of loss of privacy or safety, being photographed or worrying about the intention of the drone's pilot. While the majority of visitors would not change behaviors in the presence of drones, 41% would reassess their activities or move away from the drone. 47% of visitors believe public open space should be designed to deter drone intrusion.

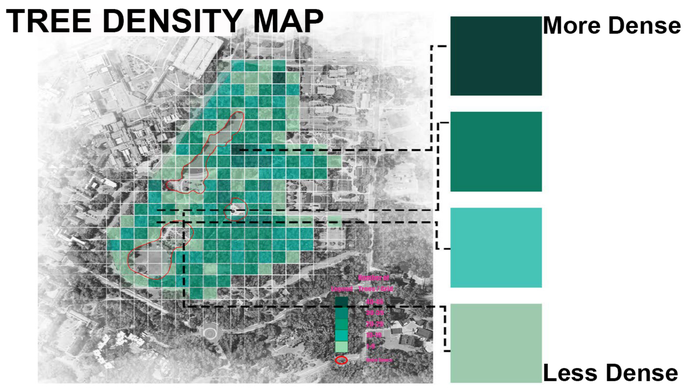

Figure 3. Tree densities from 40 – 0 trees per 10,000 sq. ft.

Because visitors prefer combinations of open and forested garden spaces, and have concerns about the use of drones in public space, related to privacy, safety, and being photographed, our assessment framework was selected to determine the extent of visual access between drones and visitors within the garden. The garden was divided into 100 ft. grids to measure visual access based on the SOPARC: System for Observing Play and Recreation. Tress were counted in each grid square to determine the extent of visual access based on density of canopy cover. Four tree densities were defined: from least to most dense. Open lawns are assumed completely visible. Mapped results indicate the extent of visual access throughout the garden (see Figure 3).

Four representative squares of tree densities were selected for further analysis based on: 1) trunk and canopy outline; 2) ground design features (ex. pathways); 3) aerial photo; 4) 3-D perspective; 5) 3-D aerial view; 6) 3-D view to sky; and 7) percentage of visual access. The sampled squares indicate what visitors might be doing based on features (ex. moving on pathways, resting), where they have the most visual privacy (ex. under a tree), preferred garden features (ex. views to nature), where drones have visual access to visitors, and where visitors can best see the drones.

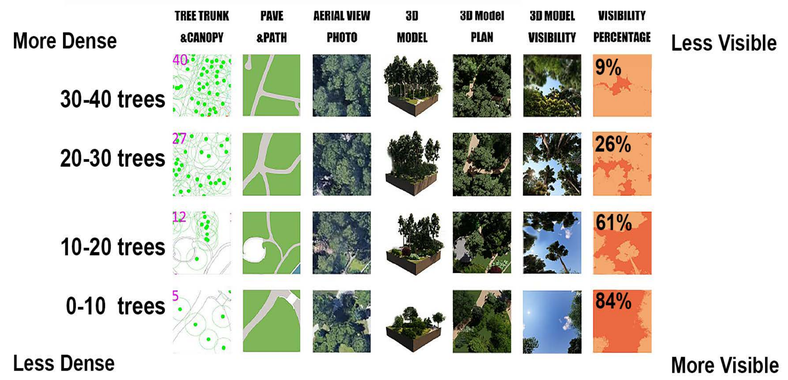

Figure 4 Visual assessment matrix for public space

Conclusion

Employing SWOT analysis utilizing this guideline assessment framework in consultation with garden or park management not only offers a range of viable design options for the resolution of existing or potential conflicts between park visitors and drone users, but also provides managers a means of improving visitor perceptions related to the safe use and enjoyment of public space including drone use. Expanding this method of analysis to include, for example, drone noise assessments and attenuation, public space camouflage, drone sensor assessment and attenuation is clearly needed to further understand public space and drone users attitudes and behaviors. Expanding design guideline assessment frameworks to other public spaces, such as civic plazas, important public building sites, transportation facilities, scenic areas, recreation areas, national parks, streetscapes, and marinas is also clearly a priority, as hobbyist drone use continues to increase, as conflicts in the use of public space continue to be reported, and if visitor concerns for drone use in public space are to be addressed.

References

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