Visualizing aviation safety studies and insights

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Abstract

This research focused on visualizing aviation safety insights by analyzing cooccurrence and connections in journal articles on aviation safety. Tools and software packages used for this research include VOSviewer, a software tool for constructing and visualizing bibliometric networks (van Eck and Waltman 2010) to analyze the published articles for co-occurrences of most common terms used for aviation safety.

Background

VOSviewer is a software tool for building and visualizing bibliometric networks. For example, these networks may include journals, researchers, or individual publications, and they can be based on citations, bibliographic coupling, co-citation, or co-authoring relationships. VOSviewer also provides text mining functions, which can be used to construct and visualize co-occurrence networks of important terms extracted from scientific literature. (van Eck and Waltman 2014). VOSviewer can be helpful for analyzing large amount of qualitative data and yield important insights and trends from those massive amount of data, which can be helpful for understanding trends and the relationships among important metrics of aviation industry.

Research Questions

To Demonstrate:
1. How VOSviewer assists in providing insights in aviation safety studies?
2. What aviation safety subjective areas have been frequently researched per VOSviewer process?

Methodology

Web of Science was used to download all "aviation safety" related to papers. These papers were transformed into .txt format and input into VOSviewer. The output of VOSviewer included (1) the "count of the number" of occurrences across all papers that had resulted in for various terms as well as a network mapping of the paired terms; (2) different weights are assigned to each pair of terms in the map; and (3) the clustering of the terms maximizes a function based an association strength normalization of the link weights (van Eck and Waltman 2014), which indicates the frequency and weight of the generated clusters.

Finding

After searching on Web of Science, 388 downloaded papers were processed by VOSviewer. The extracted findings are shown in Figure 1, 2, and 3.

Figure 1
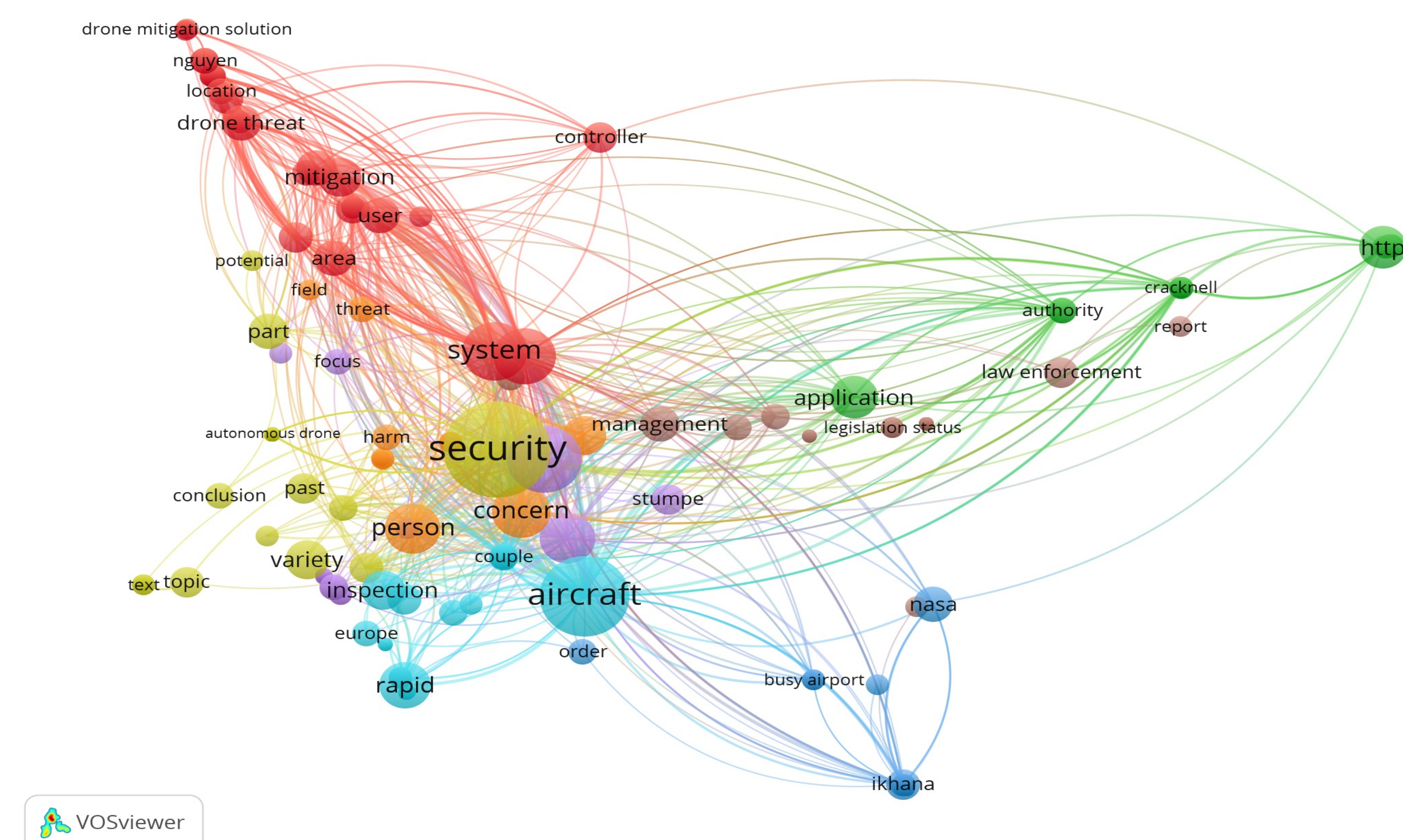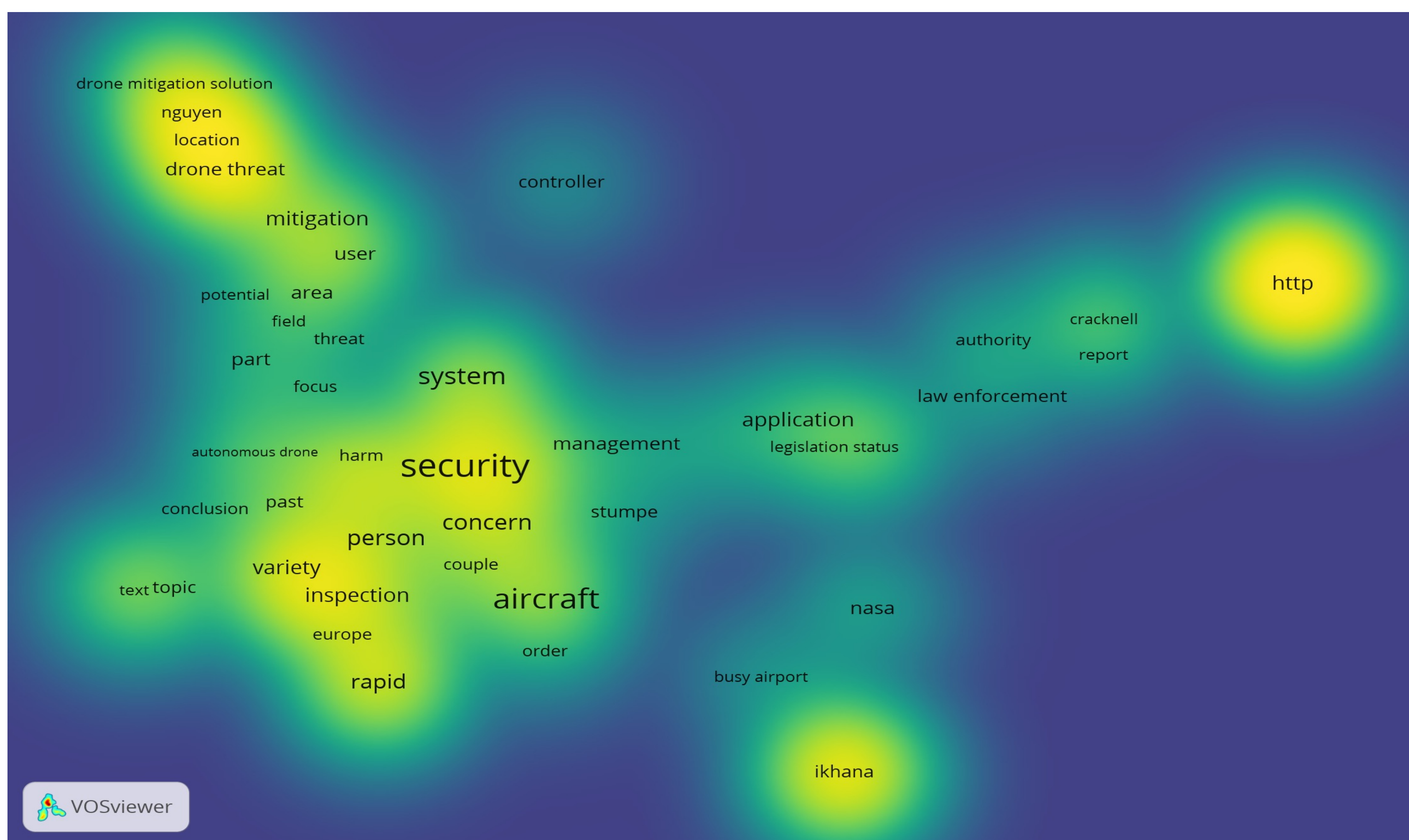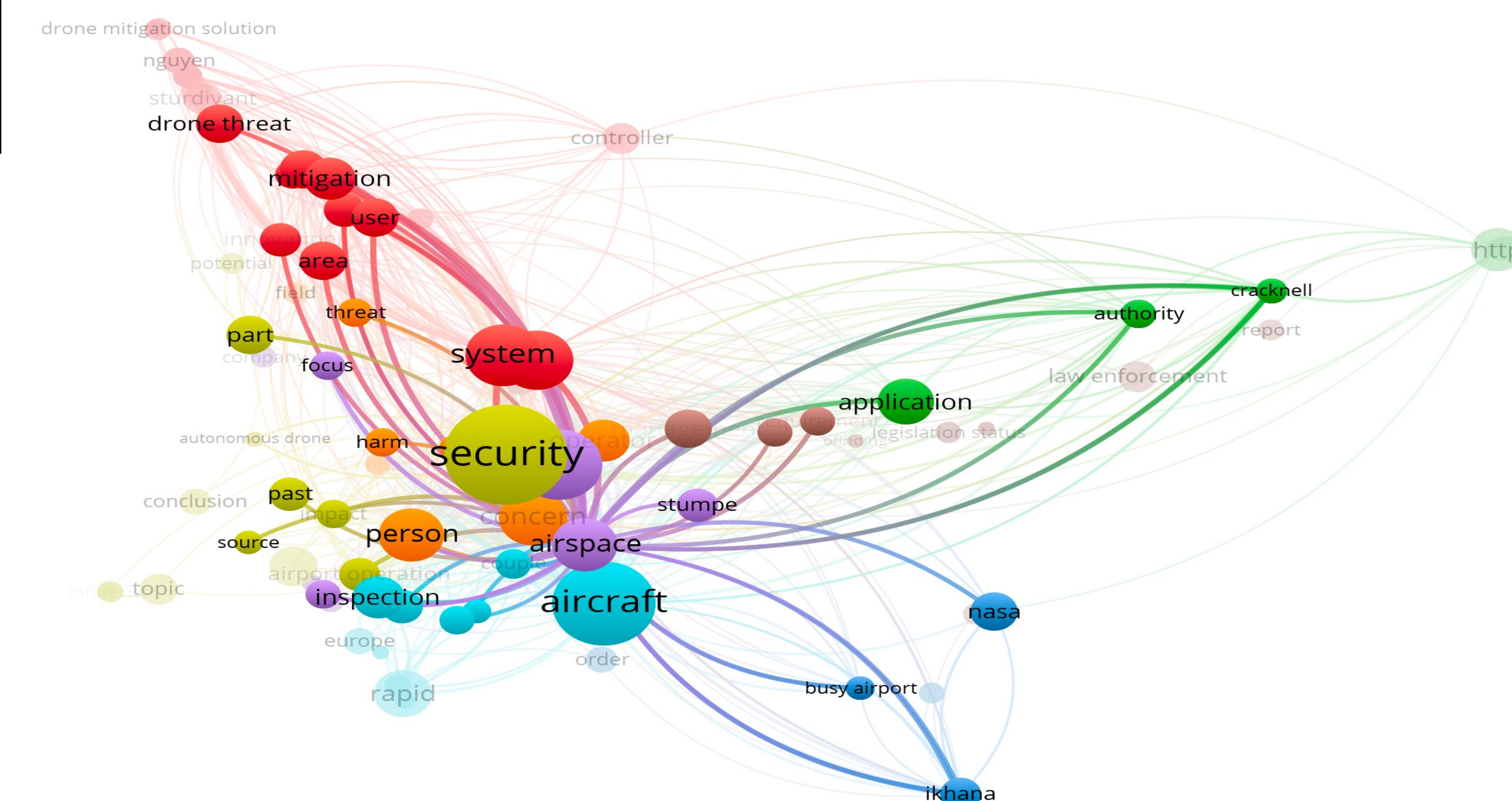*VOSviewer Network visualization*

Figure 2
VOSviewer Density visualization

Based on VOSviewer analytical result, security has been the most popular research topic. Aircraft, system, airspace, concern, http, application, law inspection, drone threat, http, Nguyen and Ikhana were frequently studied.

Figure 3
VOSviewer clusters interconnection visualization

The network visualization could also show key authors and projects, such as the cluster of "Nguyen" is shown in the network who worked on a RF based localization of drones and controller, as a safety technology. Another cluster "Ikhana" was shown in the network as a NASA project regarding integrating UAS into the NAS. Clusters enable further analysis and understanding of the network.

Conclusion

As the VOSviewer outputs have shown, the interconnections between clusters demonstrate important connections between key aspects of aviation safety, and the VOSviewer output is easier for people to identify important subjects, trends, and key relationships in the network. The VOSviewer method can be applied to aviation safety and other content-analysis research projects as it helps visualizing the research and provides an easier way of convening qualitative and meaningful information.

References

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