



Utilizing a swarm of drones for large-scale traffic measurements

A first of its kind experiment

Emmanouil Barmounakis, LUTS EPFL
Nikolaos Geroliminis, LUTS EPFL

Conference Paper STRC 2019

STRC | 19th Swiss Transport Research Conference
Monte Verità / Ascona, May 15-17, 2019

Utilizing a swarm of drones for large-scale traffic measurements

Emmanouil Barmounakis

Nikolaos Geroliminis

LUTS EPFL

LUTS EPFL

Lausanne

Lausanne

T: +41 +41 21 693 5397

T: +41 (0) 21 693 2481

E: manos.barmounakis@epfl.ch E: nikolas.geroliminis@epfl.ch

February 2019

Abstract

Congestion propagation is not an easy topic to be studied mostly due to limited data obtained from existing traffic experiments [1]. To overcome data limitations, Unmanned Aerial Systems (UAS) -or simply drones- have been proposed as a pioneer tool of the Intelligent Transportation Systems (ITS) infrastructure [2].

The utilization of a “swarm of drones” over urban areas has been proposed as an ideal mean of traffic monitoring and analysis and has intrigued many transportation related researchers or practitioners [3]. Nevertheless, existing experiments worldwide are at very small scale, usually flying one drone capturing one or two intersections or a specific part of a road arterial. Even though a swarm of drones could overcome a significant number of data related limitations, no such experiment had been conducted before for massive data collection.

In this paper, we describe our findings and the know-how acquired while conducting a first of its kind, large-scale experiment, aiming to record traffic streams over an urban setting. Specifically, a swarm of ten (10) drones was utilized over significant parts of the city of Athens, one of the busiest and most congested areas in Europe.

With this experiment, we provide significant insight on how drones’ unique characteristics can overcome existing limitations in traffic monitoring, recording traffic streams and their potential in becoming a viable part of the ITS infrastructure.

Keywords

Unmanned Aerial Systems (UAS), Drones, Traffic Flow, Control Strategies

1. References

- [1] M. Saeedmanesh and N. Geroliminis, “Dynamic clustering and propagation of congestion in heterogeneously congested urban traffic networks,” *Transp. Res. Part B Methodol.*, vol. 105, pp. 193–211, 2017.
- [2] E. N. Barmounakis, E. I. Vlahogianni, and J. C. Golias, “Unmanned Aerial Aircraft Systems for transportation engineering: Current practice and future challenges,” *Int. J. Transp. Sci. Technol.*, vol. 5, no. 3, pp. 111–122, 2016.
- [3] P. Garcia-Aunon, J. J. Roldán, and A. Barrientos, “Monitoring traffic in future cities with aerial swarms: developing and optimizing a behavior-based surveillance algorithm,” *Cogn. Syst. Res.*, 2018.