Literature Survey of Pre-Evacuation planning

**By: Yousuf Khalid and Jayanth Pandit**

Autonomous UAV path planning optimization using Metaheuristic approach for pre-disaster assessment

Z. Qadir, M. H. Zafar, S. K. R. Moosavi, K. Le and M. A. P. Mahmud, "Autonomous UAV path planning optimization using Metaheuristic approach for pre-disaster assessment," in IEEE Internet of Things Journal, doi: 10.1109/JIOT.2021.3137331.

<https://ieeexplore.ieee.org/document/9659824>

This paper, linked above, is a review of several distinct types of algorithms that could be used along with drones to search paths of evacuation before and during a disaster. While this paper specifically writes about forest fire evacuations, we believe the algorithm and its accompanying hardware could be expanded such that it can be used in several other disaster and evacuation scenarios. The paper describes its approach as “a first step towards a pre-disaster assessment and possibilities to save the survivors in minimal time.” The approach described in the paper can be summarized into three distinct sections. The first tests various algorithms, like PSO, WOA, and DGBCO, to optimize the drone’s path finding capabilities. The second step involves understanding the scenario that the drone is analyzing and determining where obstacles are and will be. Lastly, the drone determines the optimal path. After the researchers ran several tests with multiple different algorithms, they found that the DGBCO algorithm was the most effective at planning out a safe evacuation route in a dynamic environment. It had less computational time and less encounters with obstacles than other algorithms. Therefore, this algorithm could be used to optimally plan evacuation paths during a disaster or evacuation situation. We believe that this algorithm should be further explored so that it can be fully optimized for safe path seeking prior to a disaster or evacuation. Therefore, the path will be preset and can be distributed beforehand so that the general populace will be aware of it if an actual emergency is imminent.

# Decentralized Control Synthesis for Air Traffic Management in Urban Air Mobility

S. Bharadwaj, S. Carr, N. Neogi and U. Topcu, "Decentralized Control Synthesis for Air Traffic Management in Urban Air Mobility," in IEEE Transactions on Control of Network Systems, vol. 8, no. 2, pp. 598-608, June 2021, doi: 10.1109/TCNS.2021.3059847.

<https://ieeexplore.ieee.org/document/9354994?fbclid=IwAR1SjixmmaanGgh1267yXXDytFr8OBgv6RtCShaZmLy5yjjpD85H8XaCAk4>

The paper above underlines the management of air traffic, along with its current shortcomings. The points brought up in this article on not only coordination of drones in the air, but also the advantages of utilizing a decentralized, hierarchical approach to drone traffic and coordination would sync perfectly with the objective of our project. We will utilize some existing UAM ATM architecture to allow for scalability in high traffic areas through dividing control authority. Vertihubs may be utilized for real time drone to drone communication, with data from drones dictating optimal air paths for each drone based on several factors.

Our general plan for a pre-evacuation scenario, which would also depend on the magnitude and type of disaster, would follow this guideline:

1. Drones used as a warning system of a certain natural disaster
2. Drones point citizens towards areas with the most safety
3. Depending on the disaster, drones may be used to help with sending supplies (Blizzards, Floods)