# UAV deployment in disaster scenarios

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# Objectives

-There is a lot of works about the use of UAV in disaster scenarios. The majority of the works are focused on finding the optimal placement of **UAVs as a Basestation** (UAV-BS).

-However, there are very few works that talk about the use of UAV in other missions inside the disaster site. For example, in **search and rescue (SAR) missions**. In a search and rescue mission, a drone can be used to take photos or record videos of the disaster area or be used to deliver some supplies to the affected victims. Therefore, maybe not all the optimal placement for UAV as a Basestation must be used for UAV in Search and Rescue missions.

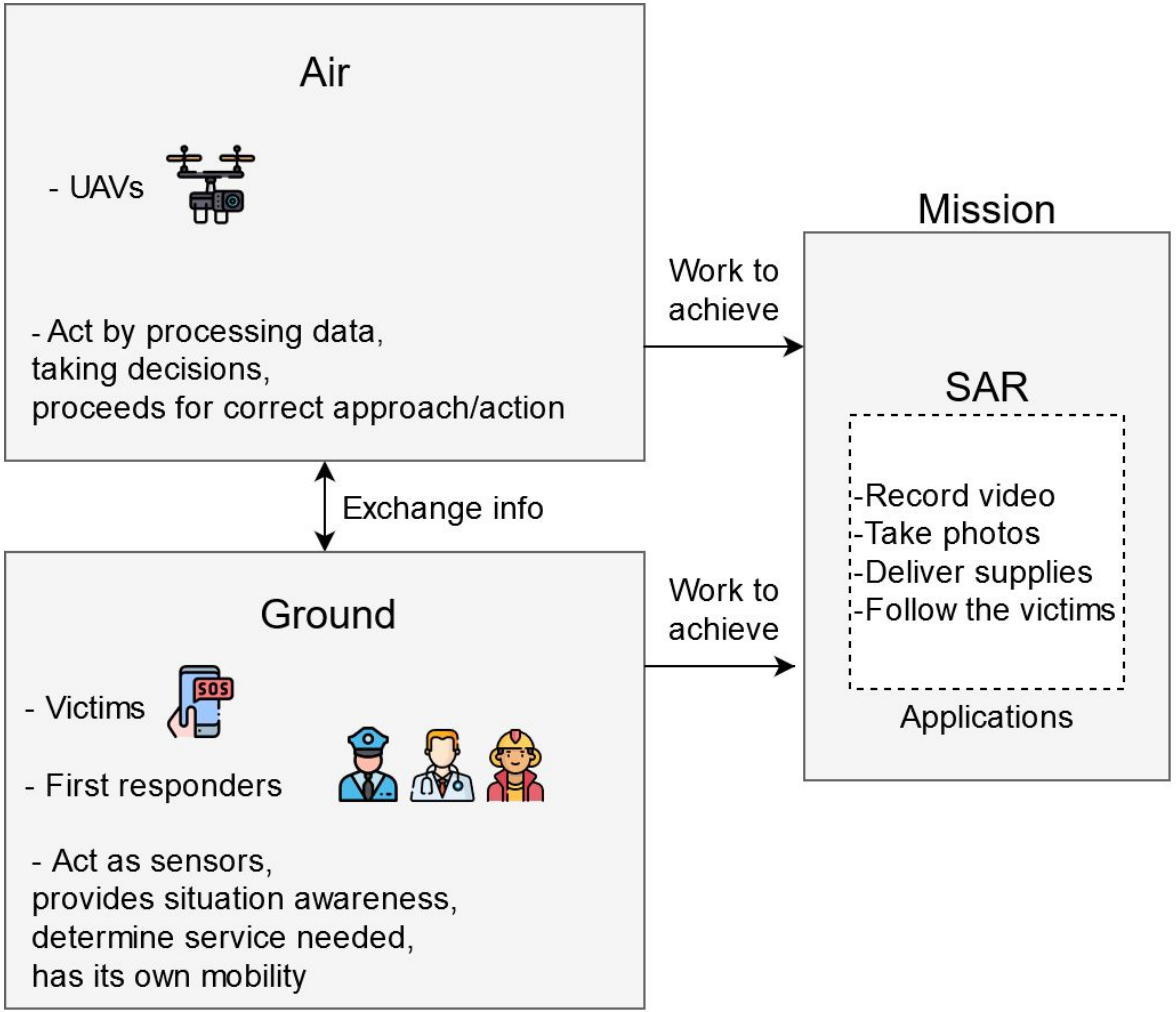
# Objectives

-The UAV-BS is more a **statical** placement UAV, usually flying high, and usually positioned on the center of the area to give good coverage for the people in the disaster area. However, drones in SAR missions have a more **“aggressive”** behavior, by searching and continuously trying to find all the people in disaster areas to inform the rescue team.

-Given that, I believe there’s space to investigate the optimal placement/strategy for the use of UAVs in SAR missions.

# Motivation

-There are very few works related to UAV in search and rescue (SAR). They are more investigated around UAV-BS. **Not all optimal locations are adequat**e for drones employed in the disaster field. Given the distinct missions, the drone must have distinct optimal locations. Given that, we believe there's an empty space regarding the study of UAV in SAR missions. Another thing is that few works investigate drone placement in distinct missions (more than 1).


Air
- UAVs
- Act by processing data,
taking decisions,
proceeds for correct approach/action
Exchange info
Ground
- Victims
SOS
- First responders
- Act as sensors,
provides situation awareness,
determine service needed,
has its own mobility
Work to
achieve
Work to
achieve
Mission
SAR
-Record video
-Take photos
-Deliver supplies
-Follow the victims
Applications

# Table

| Work | Objective | Description | Metrics | Disaster |
|---|---|---|---|---|
| 2019 - Post-disaster - Li et al. | UAVBS | Evaluates UAV-bee colony with genetic algorithms | Runtime, throughput, throughput X different heights, throughput x interference, UE coverage (%) | Yes |
| 2019 - A multi-UAV - Wu et al. | FANET | Propose a clustering algorithm to implement cooperative control. | Communication link x number of iterations, velocity x iterations, area x iterations | Yes |
| 2019 - Real-Time - Nguyen et al. | UAVBS, relay | Propose a UAV as relay during disaster, by using K-means. | Throughput rate | Yes |

# Table

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|---|---|---|---|---|
| 2019 - Social-aware - Wang et al. | Mobile crowd sensing | Propose a multiple-waitlist based task assignment algorithm to find stable matching in a time-varying environment. | Average payoff x number of subregions | Yes |
| 2019 - Edge-Prior - Qin et al. | UAVBS | 3D placement using Edge-prior placement algorithm | Coverage radius x UAV height, UAV x number of ground users | Yes |
| 2020 - Clustering - Montero et al. | UAVBS as offloading | Propose a UAVBS as offloading to congested base stations using a DBSCAN algorithm. | Average throughput per user, average packet delay, packet loss ratio | Yes/No |

# Pseudocode (Cluster determination)

-The **k-means** algorithm represents each cluster (partition) by a single mean vector. **Good:** O(n) complexity. **Bad:** defining the number of clusters. **Finish:** when the assignment of instances to clusters (partitions) no longer changes (converge).
-The **mean shift** algorithm: it has a sliding-window-based algorithm that attempts to find dense areas of data points (mode). **Good:** Doesn't need to define the number of clusters. **Bad:** define the window/radius/bandwidth. O(n2). **Finish:** when the assignment of instances to clusters no longer changes (converge).
-The **DBSCAN** (density-based spatial clustering of applications with noise) defines clusters as connected dense regions in the data space. Uses ε distance to register the points as core points or classify as noise. **Good:** Doesn't need to define the number of clusters. **Bad:** for clusters of varying density (definition of ε and min_points). **Finish:** when all points are visited or analyzed.
- **HDBSCAN**

# Metrics

-Centroid speed determination
-Quickness of drone to reach the area
-Energy stored
-Throughput
-Packet delivery ratio (PDR)