

# Multi Drone Task Allocation

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# Overview

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# Background

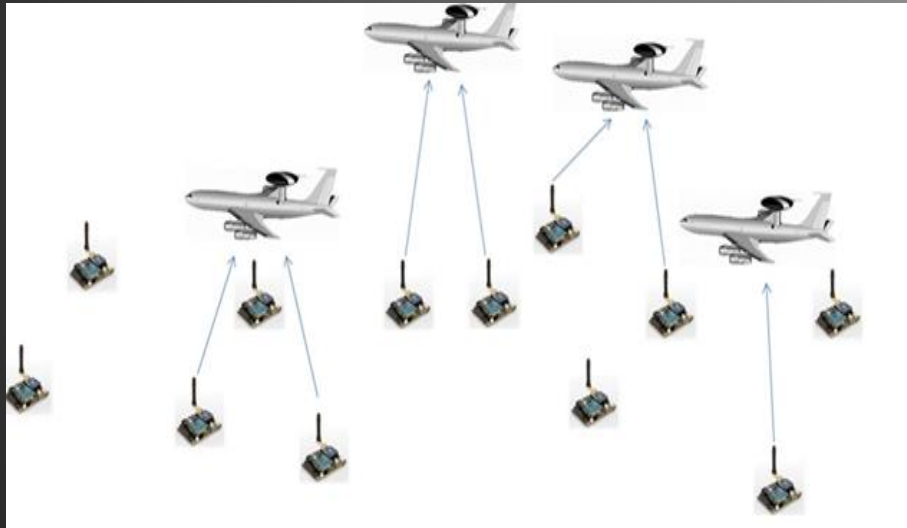
- ▶ **Multi drone task allocation (MDTA)** deals with the problem of coordinating a team of drones and assigning them tasks
- **This includes the following subtasks:**
  - ❖ **Target search**
  - ❖ **Task allocation**
  - ❖ **Drone monitoring**

# Project Motivation



# Our Application of Drones

## ➤ Data Collection



## ➤ Surveillance



## ➤ Data mule

# User Requirements and Requirements Analysis

- Path Planning:
  - Target locations
  - Restricted Areas
- Task allocation
  - Avoid task repetition
- Drone monitoring:
  - **Collision avoidance**
  - **Restricted area avoidance**
  - **Power Monitoring**

# Drone Monitoring

- **Collision avoidance**
  - Track distance between the two drones
  - If the distance is increasing, the drones won't collide
  - If distance between drones is 2.5m or less, they will most likely collide
- **Power Monitoring**
  - Retrieve power level
  - Task reconfiguration

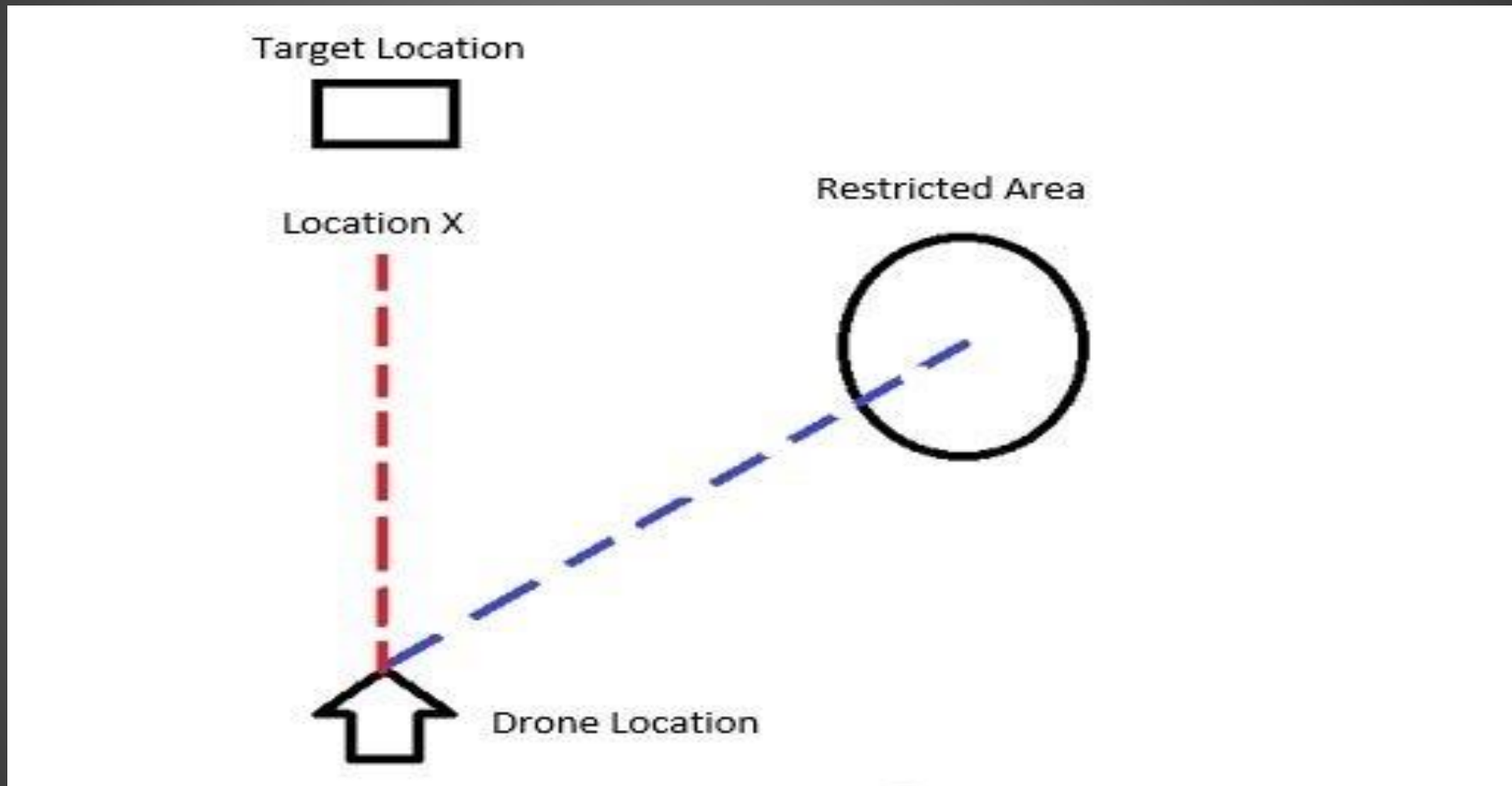
# Drone Monitoring

## ➤ Restricted area avoidance

- Calculate distance ( $d$ ) to restricted area
- Move distance  $d$  in the direction of target area
- If the point we end up at is within the radius of the restricted area,
  - ❖ Move the drone to a location ( $L$ ) outside of the radius of the restricted area first
  - ❖ Move the drone from the  $L$  to the target coordinate



# Drone Monitoring



# Testing

➤ Travelling salesman performance

Number of inputs	Dynamic Travelling salesman	Greedy Travelling Salesman
5	0.000132s	6.69956207275e-05s
10	0.015s	0.00012s
15	1.324s	0.00022s
20	1 min 36s	0.00036s
25	stopped	0.000481s
50	stopped	0.0020s
100	stopped	0.0080s

# Testing

➤ Forward movement

Input distance (meters)	Actual distance travelled (meters)	Percentage Error
20	18.2	9
19	19.7	3.7
18	19.5	8.3
17	16.8	1.1
16	18.1	13.1
15	13.7	8.7
14	15.3	9.3
13	15.1	16.2
12	12.6	5.0
11	11.2	1.8
10	10.4	4.0

# Testing

- Destructive and stress testing
  - Range testing
  - Fault injection
- Integration testing
  - Single Thread testing
  - Master Thread testing

# Tools

- ▶ Parrot Bebop
- ▶ Parrot 2.0
- ▶ Wasp Mote
- ▶ OpenCv
- ▶ Python
- ▶ EDIMAX nano USB Wi-fi Adapter

# References

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