



# CPS: Small: Trajectory-Based Cyber-Physical Networks (TCN): Theoretical Foundation and a Practical Implementation

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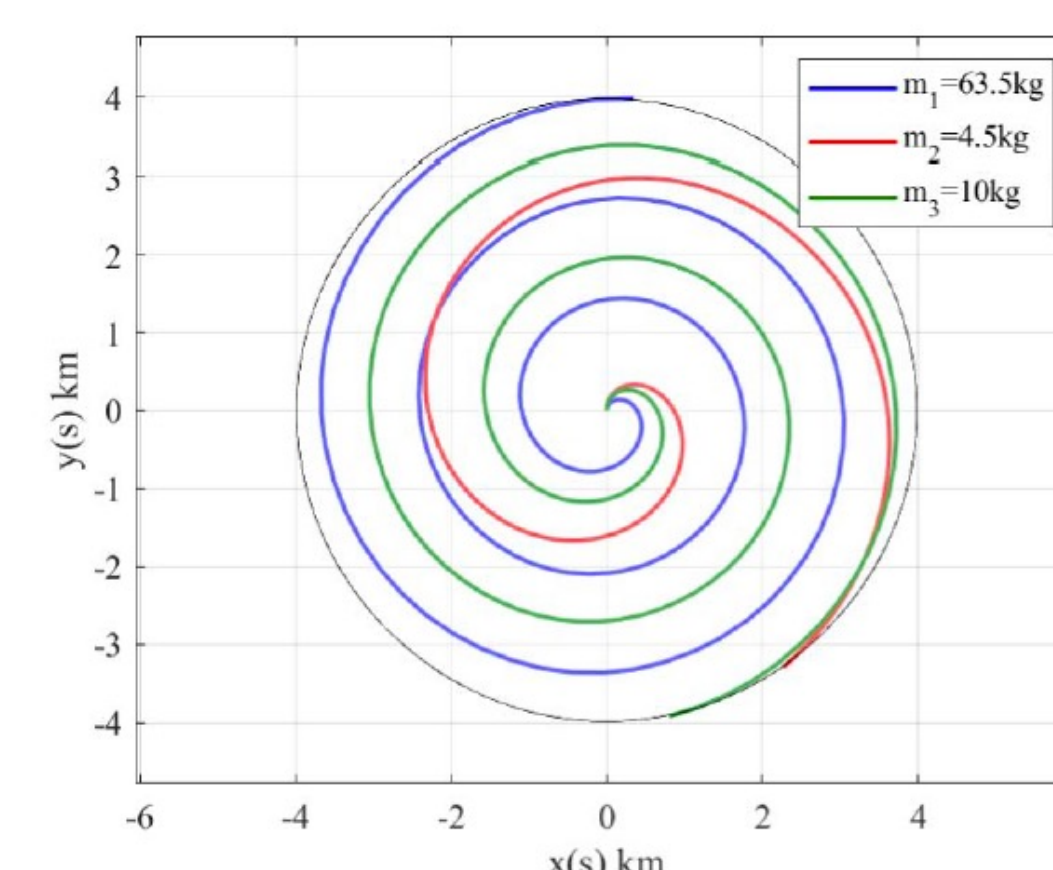
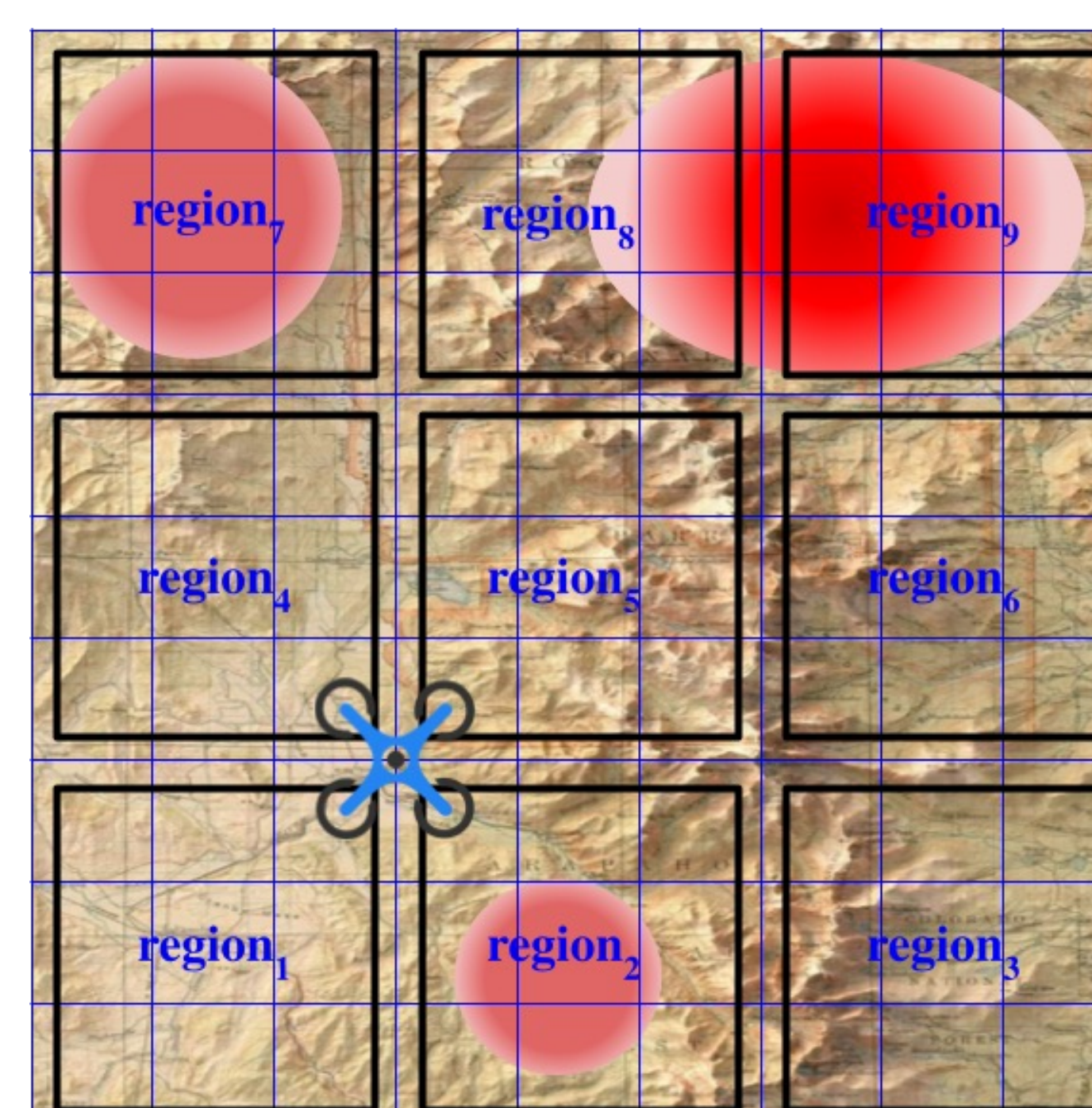
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## Challenge:

- Develop methods for simultaneous multi-application UAV deployment.
- Optimize search and rescue (SAR) operations with uncertain target location.

## Solution:

- Advanced Trajectory and detection
- Bayesian Algorithm and dynamic pathfinding
- Machine learning for enhanced object detection
- Multi-purpose UAV network design
- Spiral Planning for Coverage: Integrates spiral path planning to achieve uniform coverage and peak power efficiency in UAV surveillance operations
- Efficient Surveillance Paths: Combines surveillance optimization strategies with energy management to enhance the effectiveness of SAR missions



## Scientific Impact:

- Enables multifaceted UAV utilization for communications, transport, and surveillance, maximizing drone versatility
- Advances SAR operations with UAVs, employing trajectory algorithms for improved target identification in uncertain scenarios
- Transportation and monitoring
- Benefits analogous technologies, such as robotics, through adaptable trajectory optimization techniques

## Broader Impact:

- Deepens UAS network design understanding, aiding in complex network management
- Supports cooperative task frameworks, enhancing UAV and mobile robot interactions
- Networks of UAVs flying in the sky for communications.
- Propels efficient UAV-based search and rescue operations with novel algorithm application