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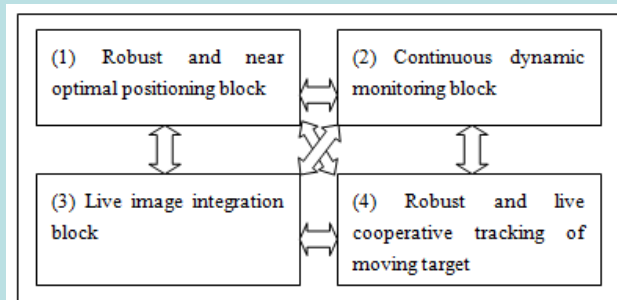
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Live and Wide Area Coverage of Urban Terrain using Multiple Small VTOL UAVs

Multiple small VTOL UAVs can be deployed over the urban terrain to stream live video of movement and activities on the roads, junctions and open areas over a wide area. They can also be deployed to stream live video of the facades of the buildings of interest, showing movement and activities visible at building entrances and through windows. The videos provide live and wide area coverage of the urban terrain to significantly enhance the situation awareness.

This proposition poses a few challenges. One is to provide the full coverage of the whole area given that tall buildings could block the UAV's view of the ground and to do so with a limited number of UAVs. Another is to seamlessly shift the coverage as the commander gradually shifts his area of interest. A third challenge is to track vehicles as they pass through the views of different cameras as well as become lost temporarily when they go under tree canopies.

(1) Robust and near optimal positioning block

(2) Continuous dynamic monitoring block

(3) Live image integration block

(4) Robust and live cooperative tracking of moving target

To address these challenges, we propose four corresponding algorithms for (1) robust and near optimal positioning; (2) Continuous dynamic monitoring; (3) Live image integration, and (4) Robust and live cooperative tracking of a moving target.

The objective of this project is to address the challenges mentioned above. The following algorithms would be developed:
• Placement of VTOL UAVs for robust and full coverage of roads, open areas, junctions and specific building facades.
• Trajectory planning for VTOL UAVs to seamlessly continue to provide robust and full coverage of roads, open areas, junctions and specific building facades when the area of interest is smoothly shifted.
• Tracking of vehicles across cameras and with sporadic loss of view.

The developed algorithms will be demonstrated in a laboratory mock-up. A scaled down urban terrain with buildings, open fields, tress and a few remote control cars will be used and cameras will be manually positioned and moved according to the algorithm solution over the mock-up to demonstrate that robust and full coverage can be achieved by the algorithm solution.

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