A Review of Multi-Camera Tracking Systems Based on Reconfigurable Devices

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Abstract

Multi-camera target tracking requires real-time video processing, tracking objects between overlapping and non-overlapping field of views (FOV), considering occlusion, fast computation, etc. Real-time video image processing requires video compression techniques with efficient Motion Estimation (ME) and Motion Compensation (MC) algorithms and their successful hardware implementation. Work on developing and implementing efficient ME and MC algorithms for multi-camera systems is ongoing. The low power consumption yet high speed of heterogeneous reconfigurable devices such as Field Programmable Gate Arrays (FPGA) can be suitable for implementation of the real-time optic flow computation of multi-camera systems.

Objective

To review the state-of-the-art in multi-camera tracking systems and find new scopes based on reconfigurable devices.

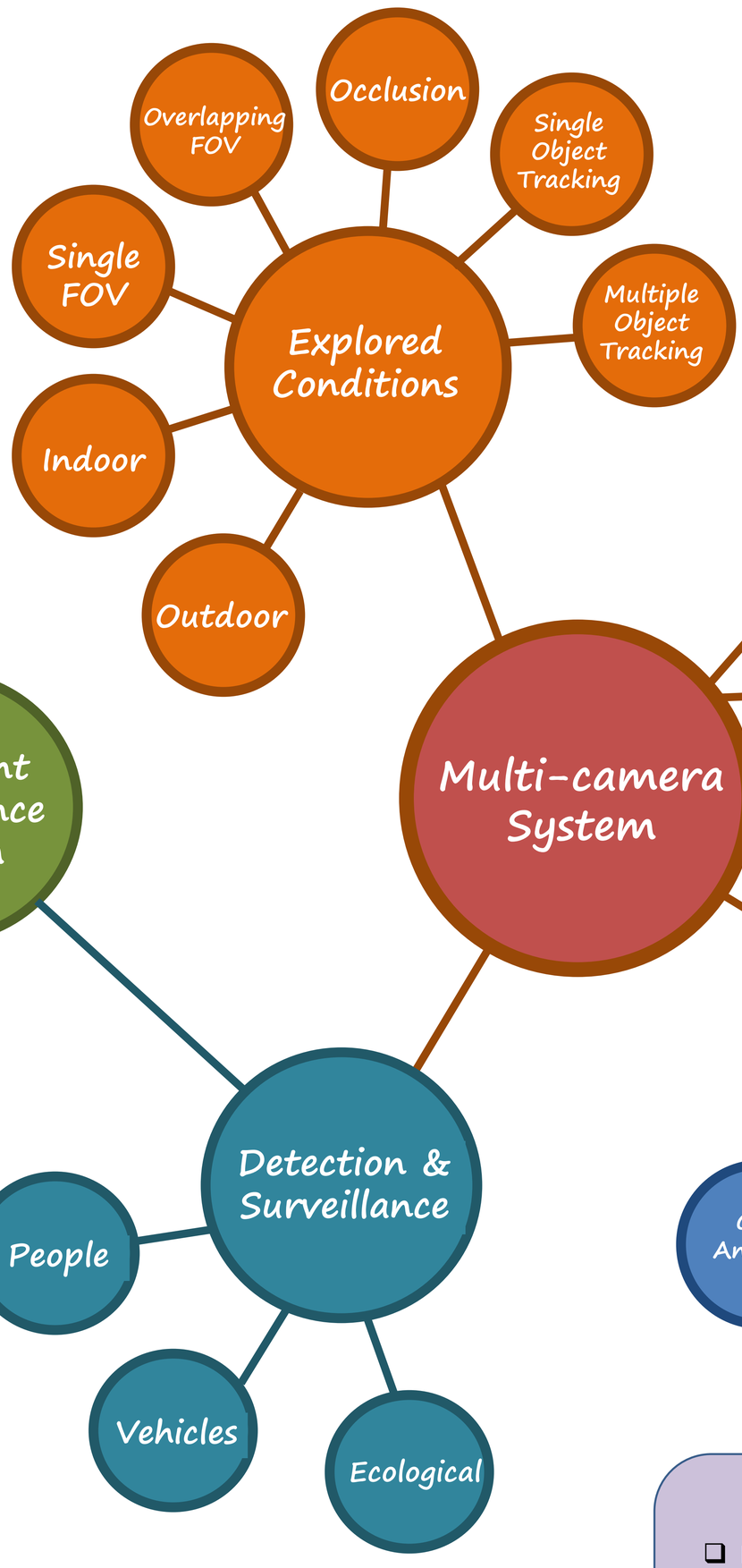
Multi-camera Tracking Systems

Broadly categorized under:

- Surveillance
- Healthcare
- Ecological surveys of small targets.

▪ More cameras in a multi-camera surveillance system also mean more complexity in the topology of the network.

▪ Calibration and topology problems are often jointly solved when they are interdependent.



Possibilities in Healthcare

- Patient monitoring
- Respiratory motion tracking
- Gait analysis
- Gaze analysis
- Assistance with disability --- obstacle avoidance, improvement of wheelchair movement, etc.

But these areas hold further research possibilities.

Motion Optimization

- Most techniques are based on the common Block Matching Algorithms (BMA).
  - The BMAs require complex calculations.
- Reconfigurable device implementation of BMAs are problematic due to
  - Limited available memory
  - Restricted memory access mechanism limiting fast computations.
- Adaptive low-complexity algorithms using logic operations hold possibilities for more efficient memory use and faster computation.

Future Scope

- ❑ Implementing RGB-D camera systems onto reconfigurable devices in the medical fields mentioned above.
- ❑ Using multiple RGB-D cameras to track respiratory motion.
- ❑ Implementing low complexity algorithms in respiratory motion tracking with multi-camera tracking systems.

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