Jet Propulsion Laboratory
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ROBOTICS & PERCEPTION GROUP

Data-Efficient Collaborative Decentralized Thermal-Inertial Odometry

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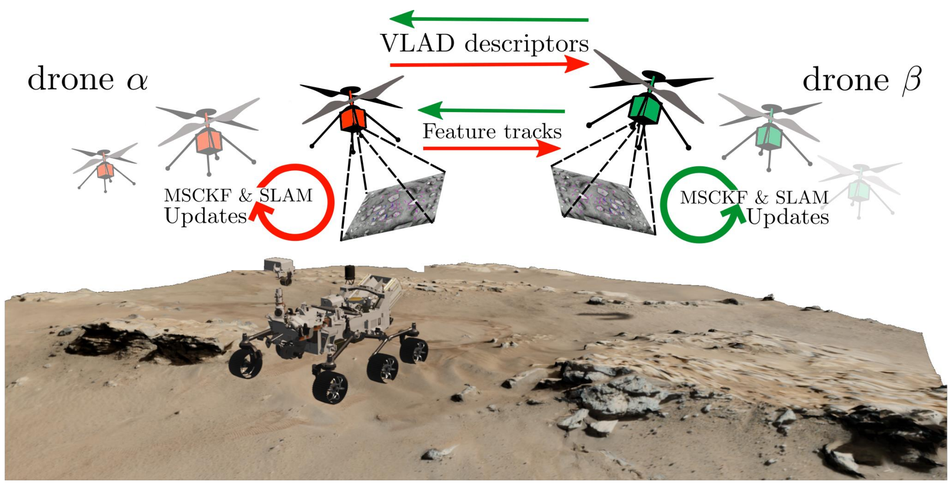
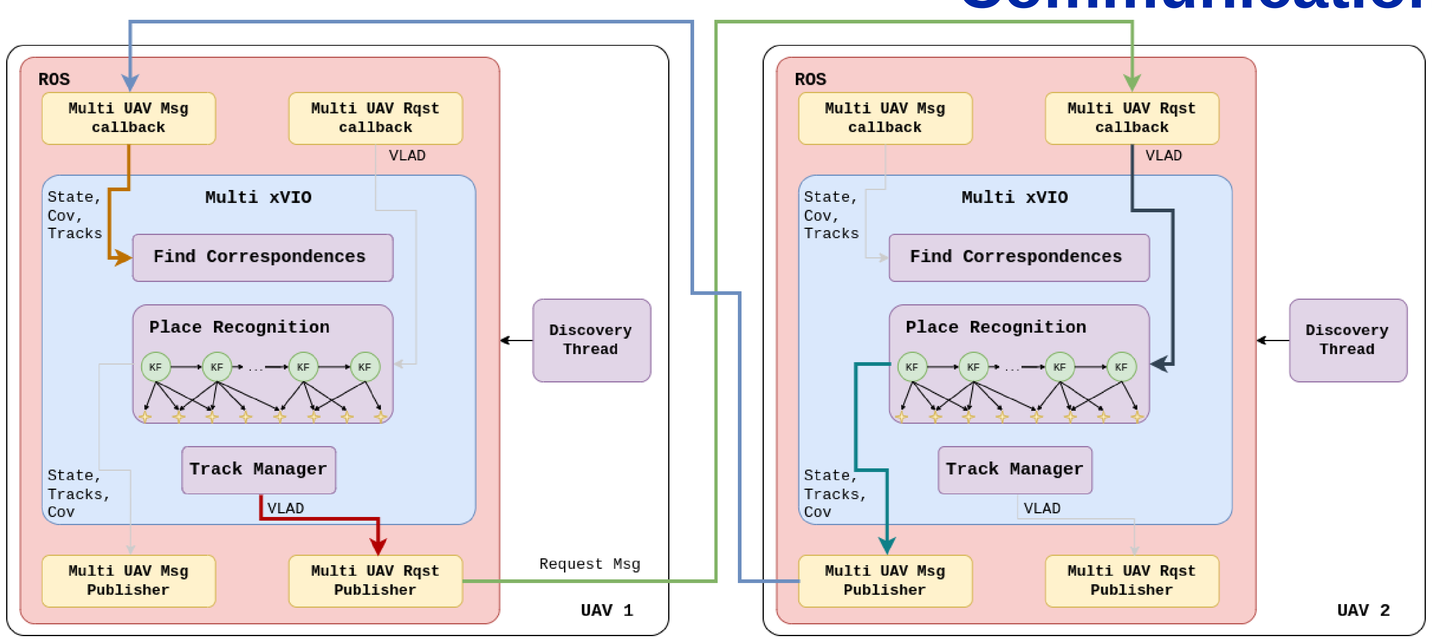
Contributions

Goal: allow autonomous vehicles to collaborate in all types of light conditions in an efficient and scalable manner.

Works	Collaborative	Decentralized	Data-Efficient	Thermal data
Previous VIO	✓	✓	✓	✗
Previous TIO	✓	✗	✗	✗
Our	✓	✓	✓	✓



Communication

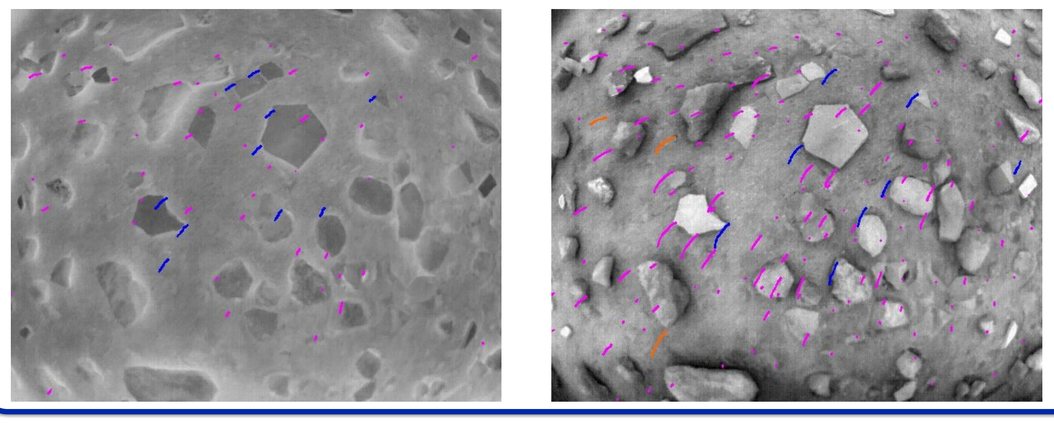


- Generate a BVLAD
- Send the VLAD as a Request Message
- Seek for a similar VLAD in the keyframes' history
- If a loop closure is found wrap the data in a message
- Send the message
- Match the received and the current tracks

Thermal Data

Tracking & matching

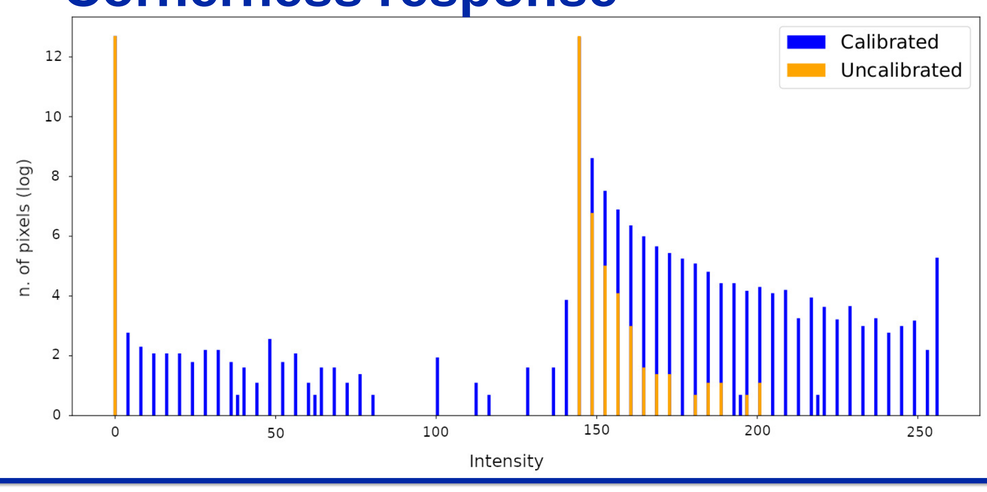
Photometric uncalib. Photometric calib.



- Tracks
- Matches
- SLAM tracks

3.5x matches

Cornerness response

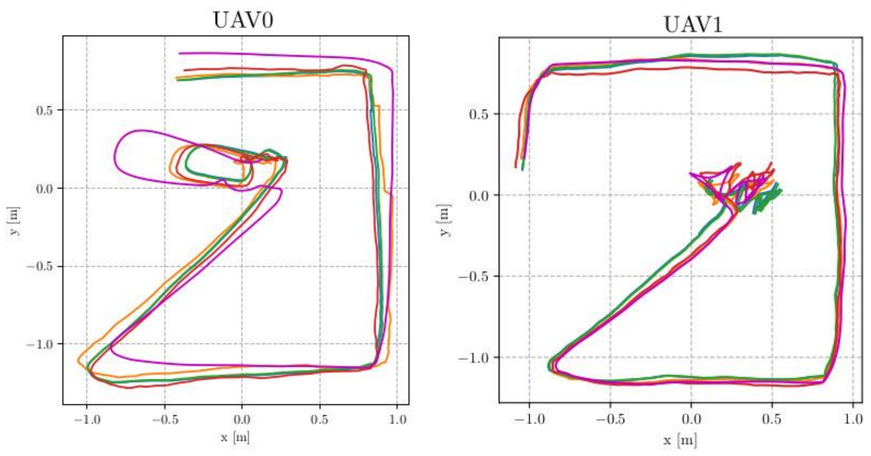


Results

Absolute Trajectory Error

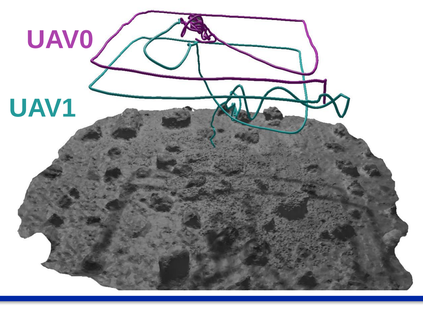
	Calibrated	Collaborative	Results [m]	
Partial system [**Ours**]	✓	✗	UAV 0	0.19±0.09
			UAV 1	0.06±0.02
Partial system [**Ours**]	✗	✓	UAV 0	0.19±0.09
			UAV 1	0.08±0.04
Full system [**Ours**]	✓	✓	UAV 0	**0.16±0.07**
			UAV 1	**0.04±0.02**
xVIO	✗	✗	UAV 0	0.18±0.09
			UAV 1	0.08±0.04

Trajectories visualization

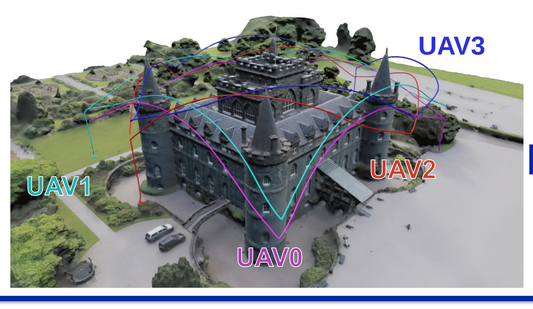


Datasets

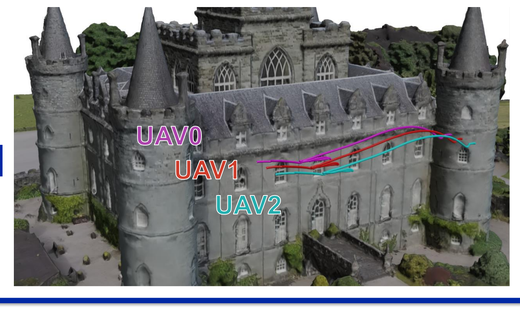
JPL Mars Yard



Inverary Around



Inverary Parallel



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