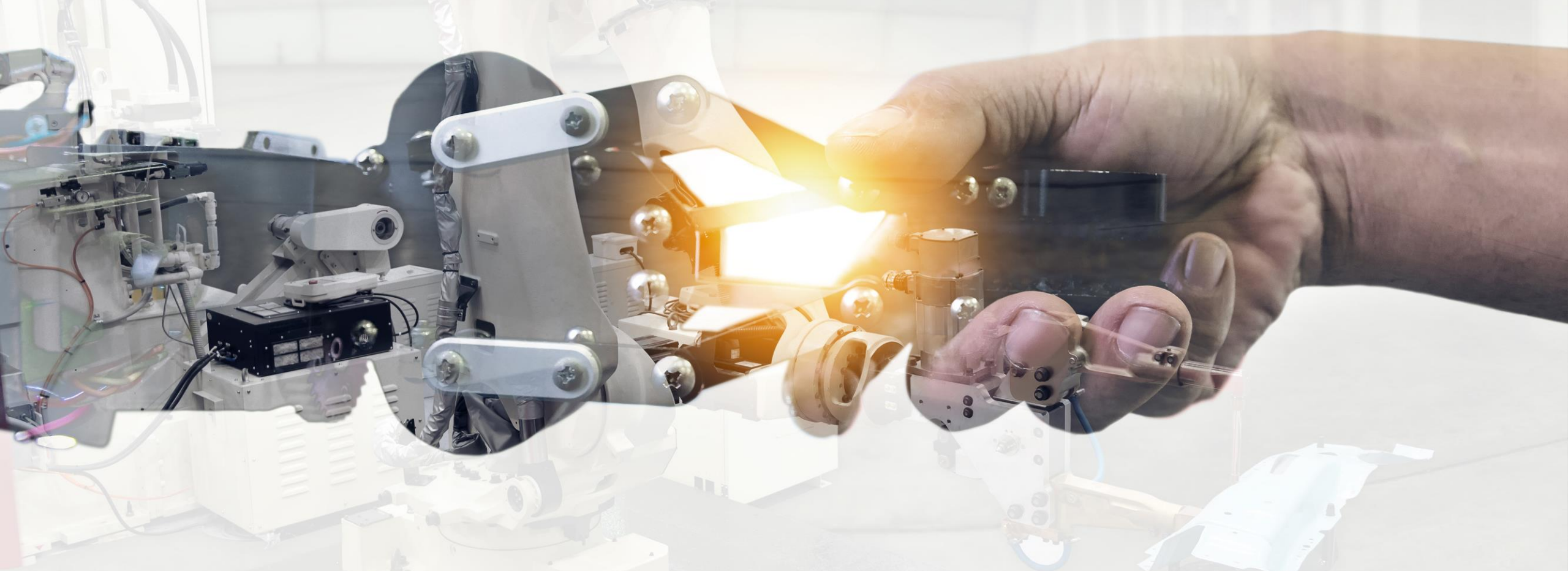

Collaborative visual-inertial localization of teams with floorplan extraction

Sándor Gazdag, Dániel Pásztornicky, Zsolt Jankó, Tamás Szirányi, András Majdik

2026. 01. 08.

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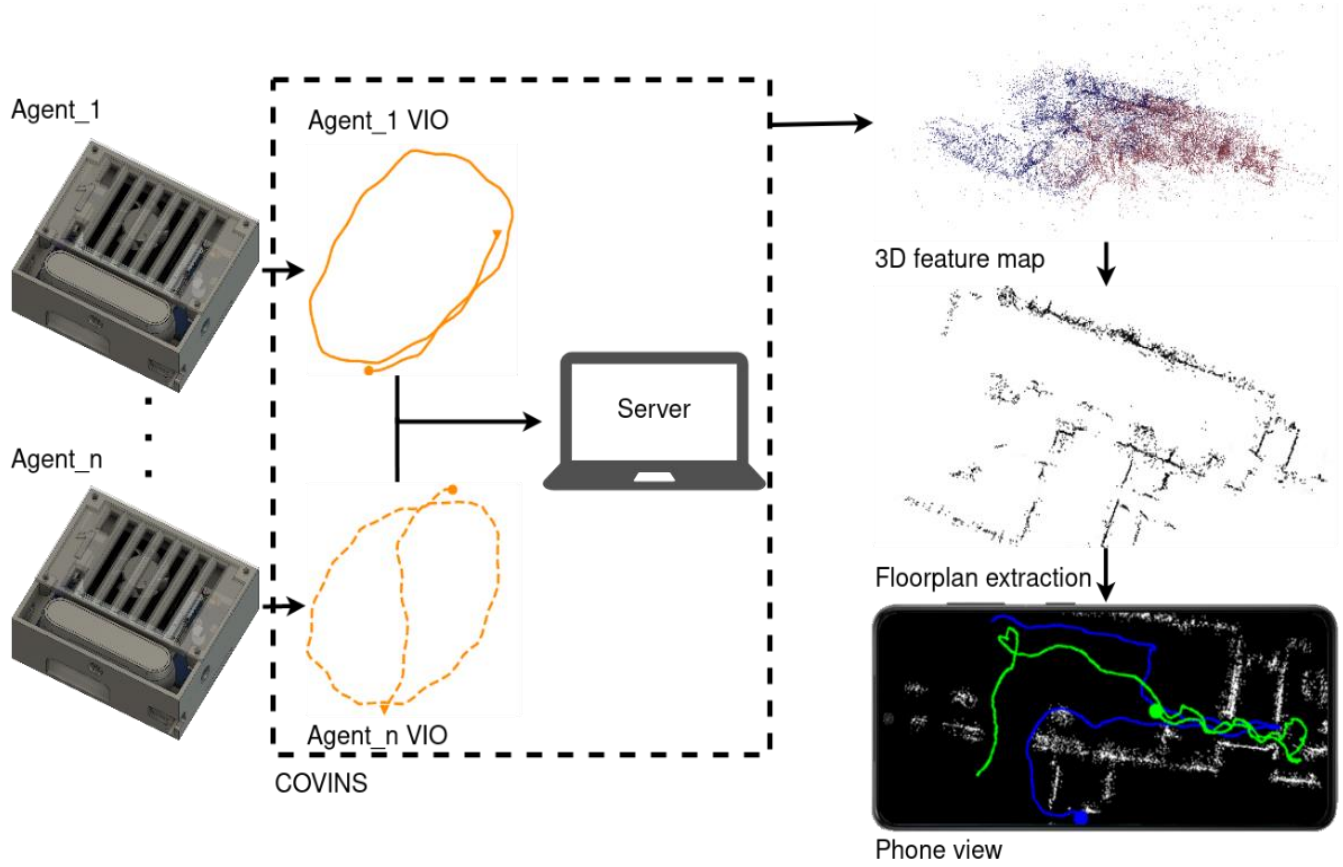
Motivation and contribution

Motivation:

- GNSS is unavailable or have large error inside
- Sparse feature maps are hard to interpret for humans

Contribution:

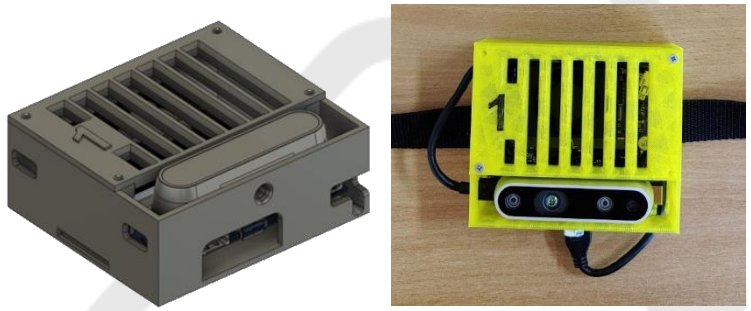
- Human-interpretable floorplan-like map in real-time
- Compact wearable hardware prototype for human or robotic agents



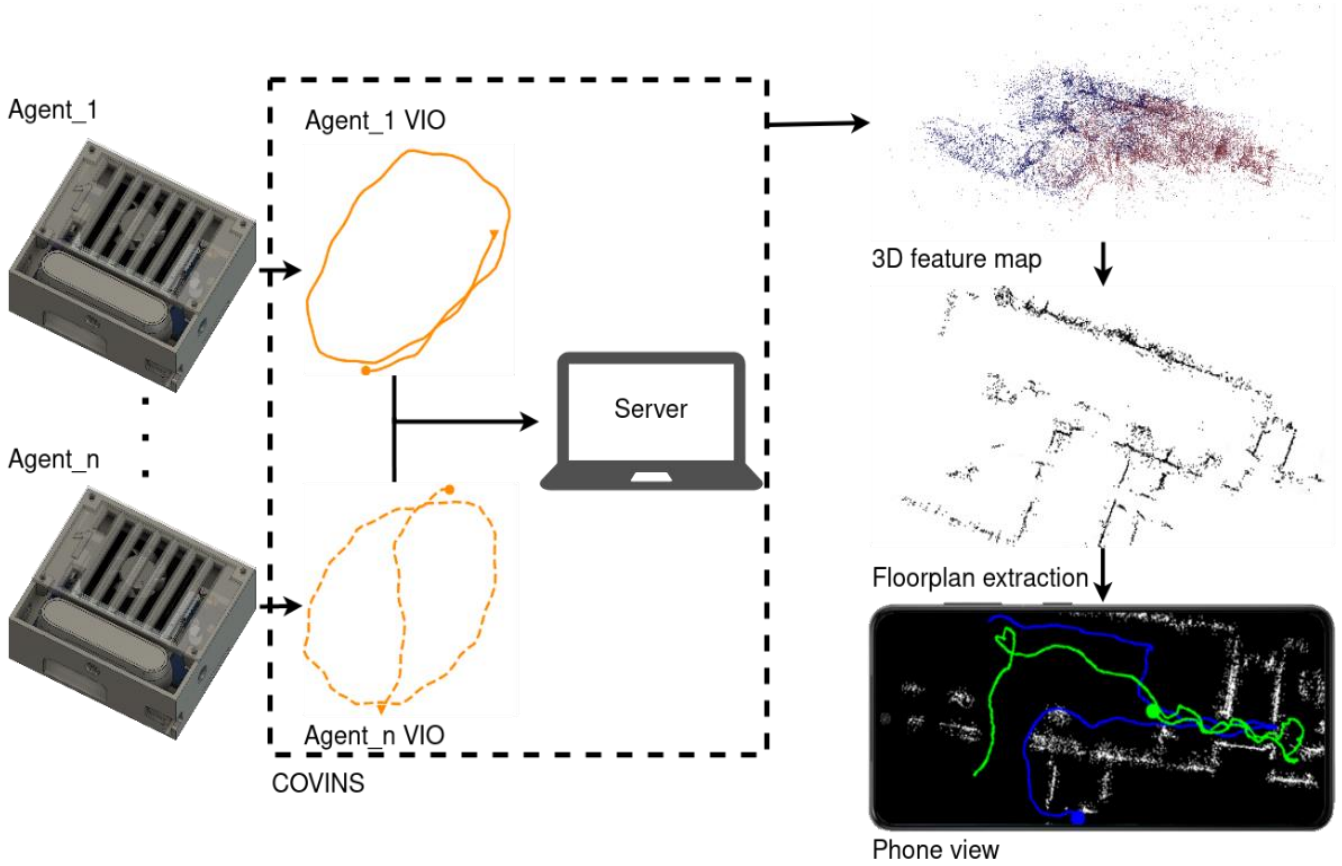
Flowchart of the algorithm

Architektúra

- Agents:
  - Local visual inertial odometry [1]
  - NVIDIA Jetson Xavier NX
- Server:
  - Centralized C-SLAM [2]
  - Floorplan extraction
- ROS + WiFi + Webserver + Phones



3D model and assembled hardware



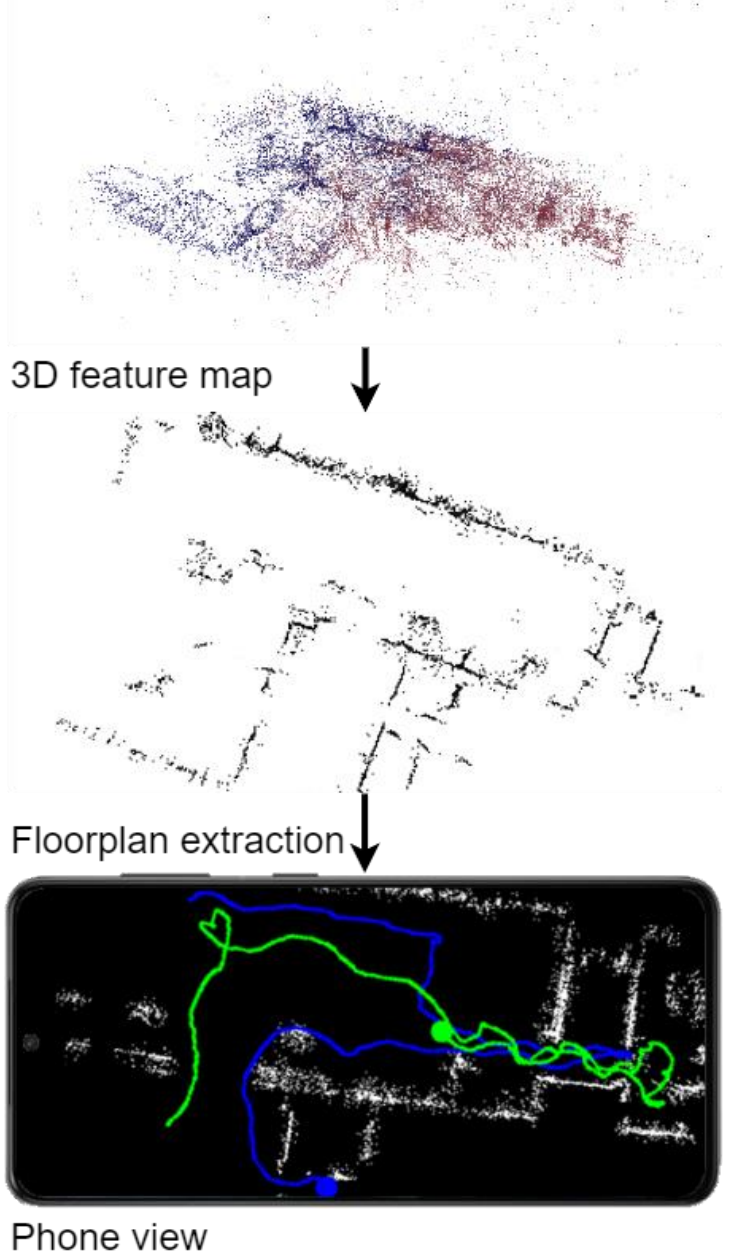
Flowchart of the algorithm

[1] Carlos Campos, Richard Elvira, Juan J. Gómez Rodríguez, José M. M. Montiel and Juan D. Tardós, „ORB-SLAM3: An Accurate Open-Source Library for Visual, Visual-Inertial and Multi-Map SLAM", *in IEEE Transactions on Robotics , 2021.*

[2] P. Schmuck, T. Ziegler, M. Karrer, J. Perraudin, and M. Chli, „Covins: Visual-inertial slam for centralized collaboration*", in proceedings of the 2021 IEEE International Symposium on Mixed and Augmented Reality Adjunct (ISMAR-Adjunct), 2021.*

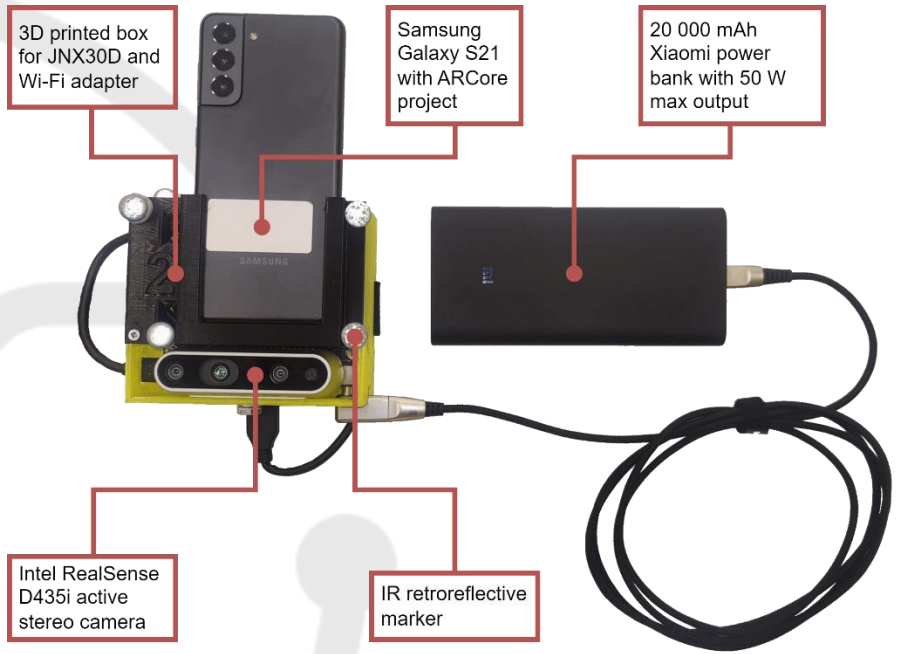
Real-time floorplan extraction

- Sparse feature cloud on server
- Statistical Outlier Removal
- Vertical histogram for floor and ceiling removal
  - Search for local maxima
  - Remove planes
- Orthographic projection
- Plotting trajectories
- Publish to webserver
- View on mobile

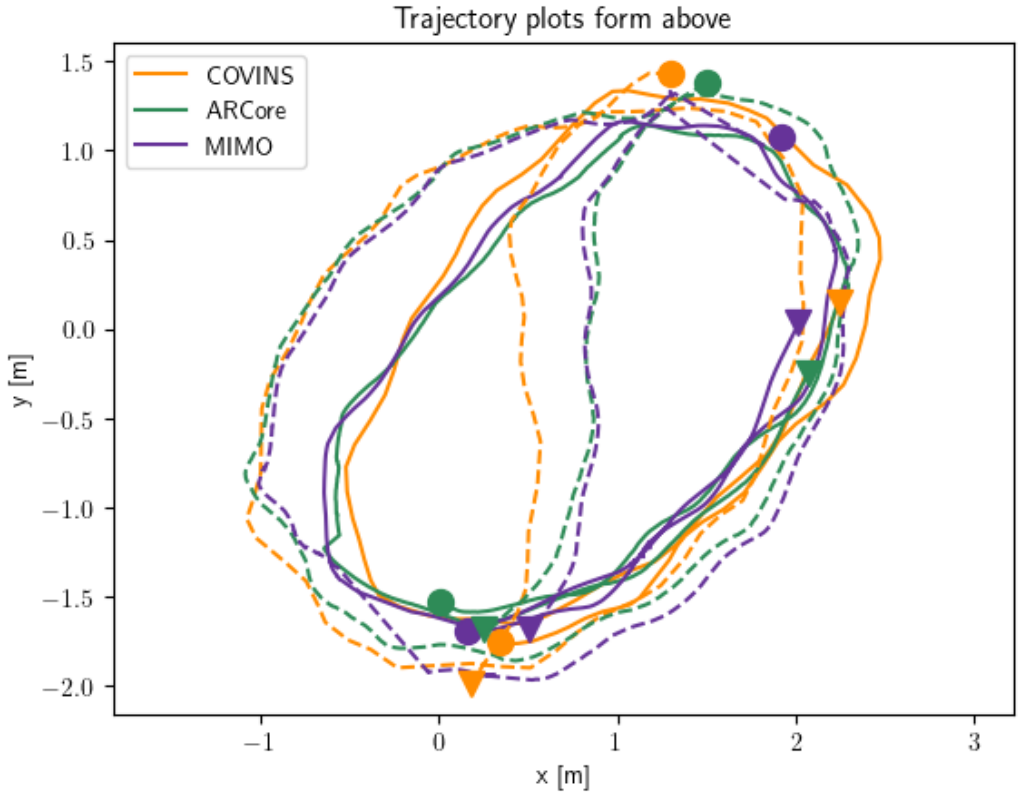


Results

- GT position from motion capture arena (sub mm accuracy)
- Similar accuracy to a solution based on Google ARCore
- Tested in real environment (video)
- Real-time



Test hardware



Comparison of trajectories



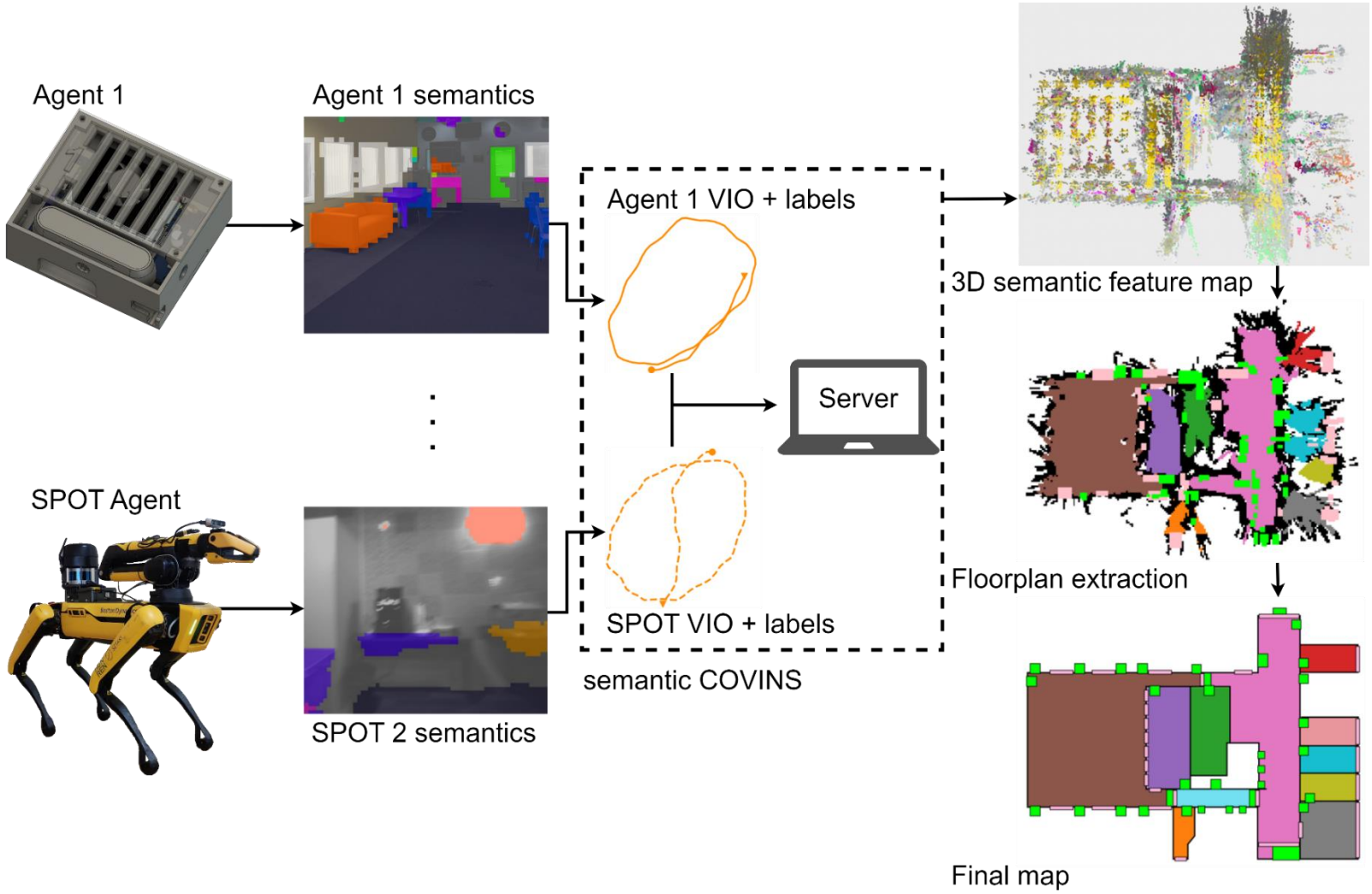
Current Research directions

SPOT as agent

- More sensor data
- Automated patrol

Semantic information

- Filtering features
- High level map
- Semantic loop closure



Sparse semantic map

Client 1

Client 2

No Image

Client 3

Thank you for the attention!

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Acknowledgements

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[3] P. Schmuck, T. Ziegler, M. Karrer, J. Perraudin, and M. Chli, „Covins: Visual-inertial slam for centralized collaboration*”, in proceedings of the 2021 IEEE International Symposium on Mixed and Augmented Reality Adjunct (ISMAR-Adjunct), 2021.*

[4] Carlos Campos, Richard Elvira, Juan J. Gómez Rodríguez, José M. M. Montiel and Juan D. Tardós, „ORB-SLAM3: An Accurate Open-Source Library for Visual, Visual-Inertial and Multi-Map SLAM”, *in IEEE Transactions on Robotics , 2021.*

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