Probabilistic Robotics Course

Projects

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Rules

- Projects are individual
- The project has to be linked to a *private* git repo shared with the “staff”.

- **No admission at the exam without having choosen a project**

- For each project we provide:
  - ground truth solution
  - data of the problem

  Evaluation
  - The evaluation of a project consists in running the system on different data (but similar to the one used for testing)
  - Project accounts for small (+/-1) grade adjustments.
  - Special situations that require immediate registration of the exam (e.g. erasmus) and do not hand in the project in time will incur in a penalty of 4 points.

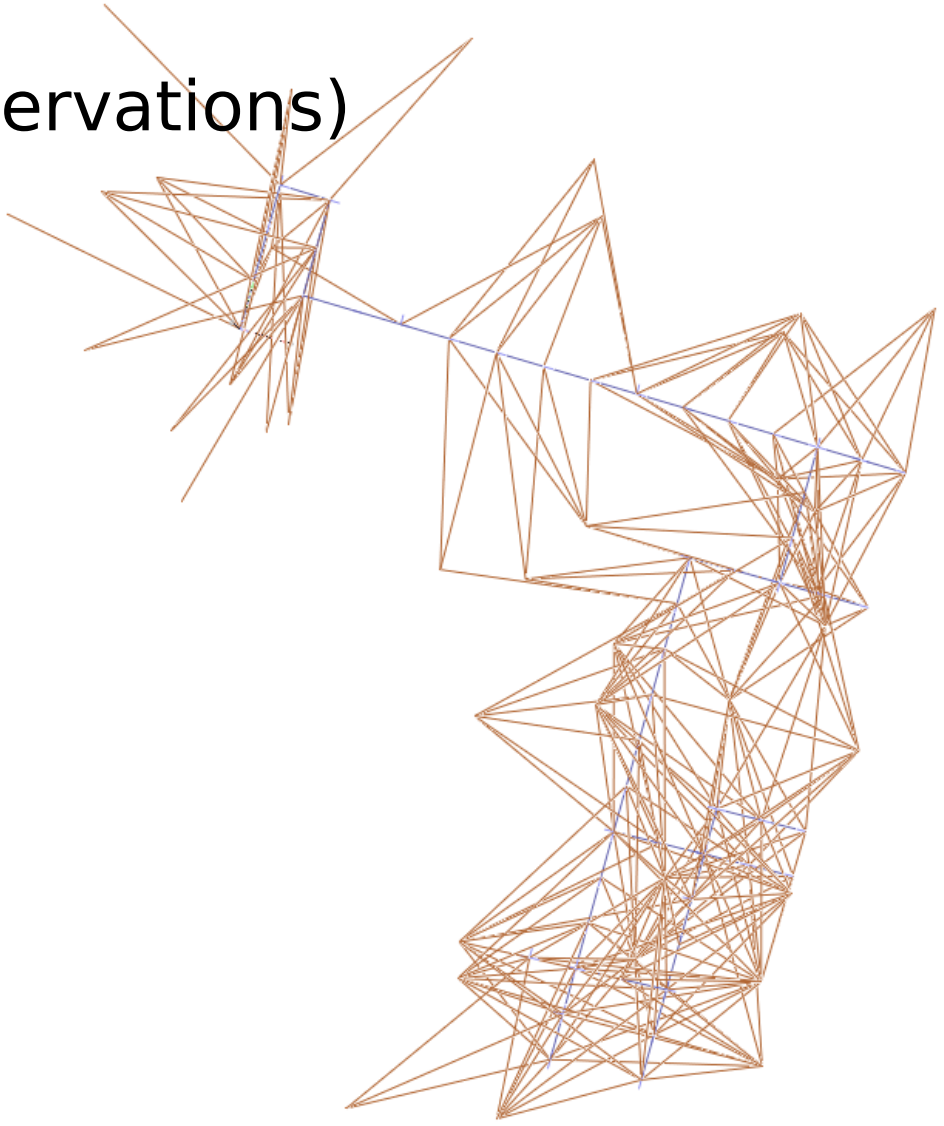
#1 Beacon Calibration

- Input:
  - Range measurements between a set of 3D points in the space (beacons)
  - No initial guess

- Output:
  - Position of the beacons in the space

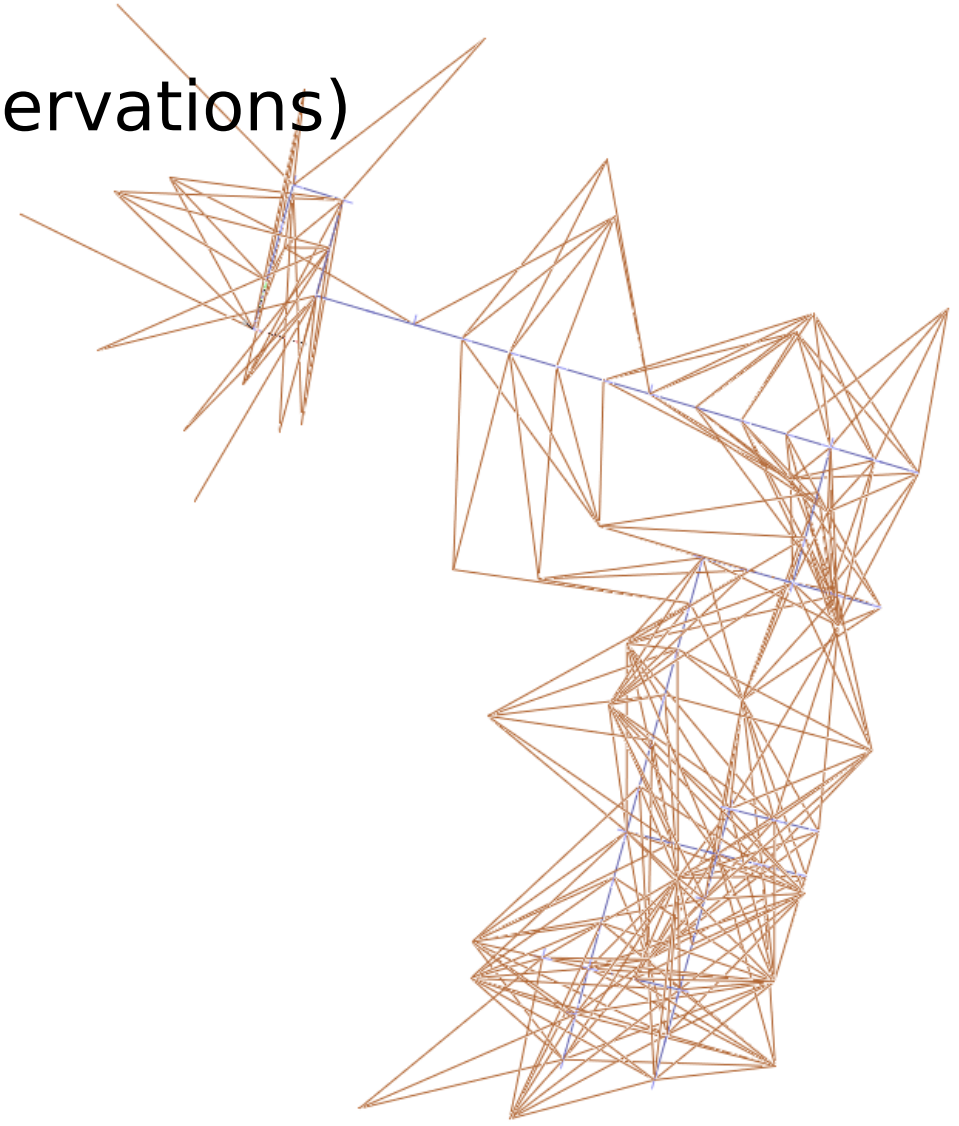
#2 2D Bearing Only SLAM

- Input:
  - 2D Bearing (labeled observations)
  - Odometry
- Output:
  - trajectory and map.



#3 2D Range Only SLAM

- Input:
  - 2D Ranges (labeled observations)
  - Odometry
- Output:
  - trajectory and map.



#4 Visual Odometry

- Input:
  - Camera parameters
  - Image sequence where each image is described by a sequence of keypoint-id pairs <u,v,id>

- Output
  - Trajectory
  - 3D points
- Hint
  1. Register the first pair using epipolar geometry
  2. Triangulate the initial points and impose a scale
  3. Incrementally add a new
     a) Determine the position using Projective ICP
     b) Triangulate the missing points
     c) Update the camera pose
  4. BA at the end

#5 Planar Monocular SLAM

Differential Drive equipped with a monocular camera

- Input:
  - Integrated dead reckoning
  - Stream of point projections with “id”
  - Camera Parameters
    - Extrinsics (pose of camera on robot)
    - Intrinsics (K)
- Output:
  - Trajectory and Map
- Hint
  - Bootstrap the system by triangulating the initial set of points with the odometry guess

How to get a project

Send an email asking for a project (name and number) to

- guadagnino@diag.uniroma1.it
- bazzana@diag.uniroma1.it

1) Use as Subject: **[ProbRob][ProjAss]**
2) Write at least your Student ID
3) Wait for instructions