**HW3 – SLAM Solvers**

1. **Linear model**
2. Default: Time to solve: 0.029s

A graph of a line graph

AI-generated content may be incorrect.

Fig 1: 2d\_linear.npz with default solver

1. Pseudo Inverse: Time to solve: 2.07s

A graph of a line graph

AI-generated content may be incorrect.

Fig 2: 2d\_linear.npz with pinv

1. LU: Time to solve: 0.019s

A blue line with numbers on a white background

AI-generated content may be incorrect.

Fig 3. U (upper triangular) Matrix from LU decomposition

A graph of a line

AI-generated content may be incorrect.

Fig 4: 2d\_linear.npz with LU

1. LU-COLAMD: time to solve: 0.032s

A blue and white graph

AI-generated content may be incorrect.

Fig 5: U (Upper triangular matrix)

A graph of a line graph

AI-generated content may be incorrect.

Fig 6: 2d\_linear\_npz with LU + COLAMD

e) QR: Time to solve: 0.39s

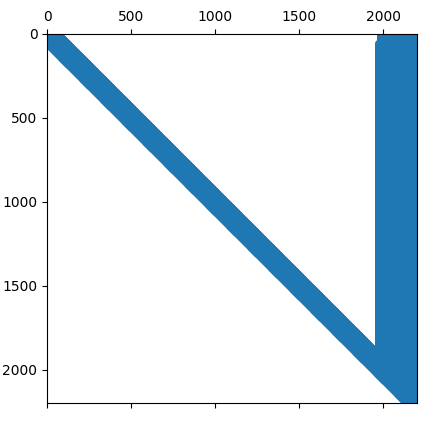


Fig 7. R matrix from QR factorization

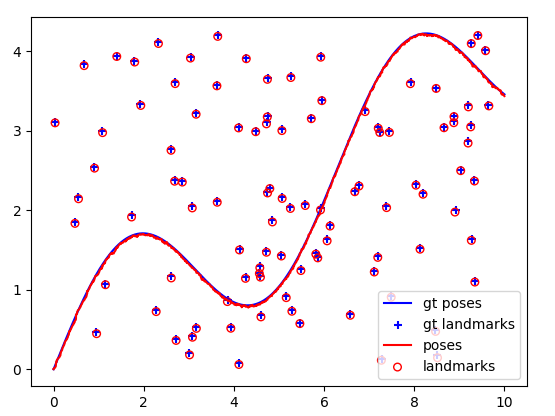


Fig 8. 2d\_linear\_npz with QR factorization

d) QR with COLAMD: Time to solve: 0.33 s

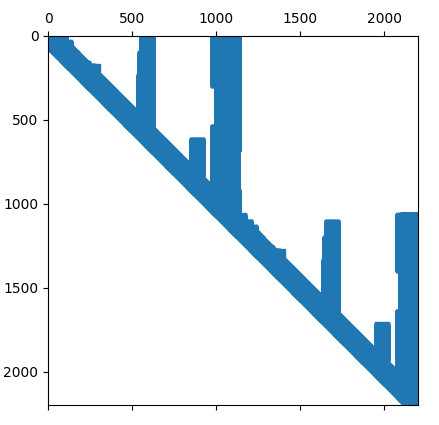
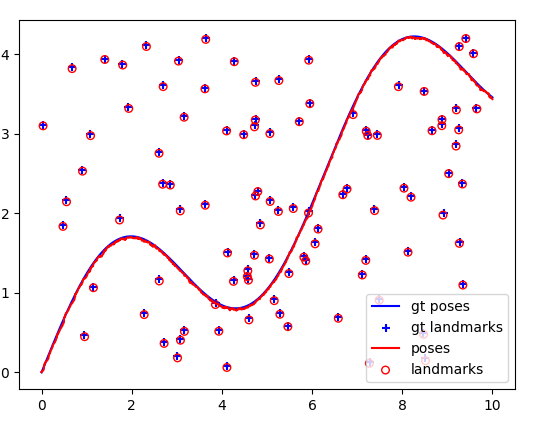


Fig 9. R matrix from QR factorization + COLAMD

Fig 10. 2d\_linear\_npz with QR factorization + COLAMD

1. **Linear model with loop data**
2. Default: Time to solve: 0.016s

A diagram of a circle with red and blue circles

AI-generated content may be incorrect.

Fig 11: 2d\_linear\_loop.npz with Default solver

1. Pseudo-inverse: Time to solve: 0.45s

A red and blue circles with white text

AI-generated content may be incorrect.

Fig 12: 2d\_linear\_loop.npz with Pseudo inverse solver

1. LU: Time to solve: 0.04s

A blue and white graph

AI-generated content may be incorrect.

Fig 13: U (upper triangular matrix from LU decomposition)

A diagram of a circle with red and blue dots

AI-generated content may be incorrect.

Fig 14: 2d\_linear\_loop.npz with LU solver

1. LU-COLAMD: Time to solve: 0.009s

A graph with a blue line

AI-generated content may be incorrect.

Fig 15: U (upper triangular matrix from LU-COLAMD decomposition)

A diagram of a circle with red and blue circles

AI-generated content may be incorrect.

Fig 16: 2d\_linear\_loop.npz with LU-COLAMD

e) QR: Time to solve: 0.25 s

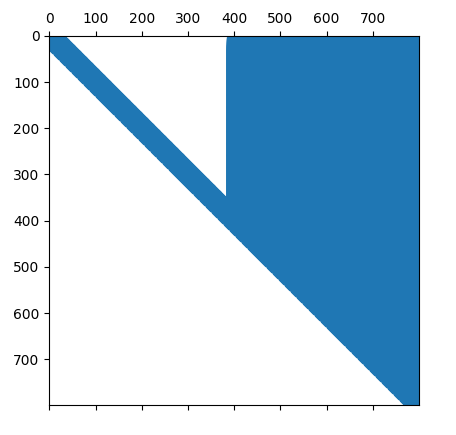
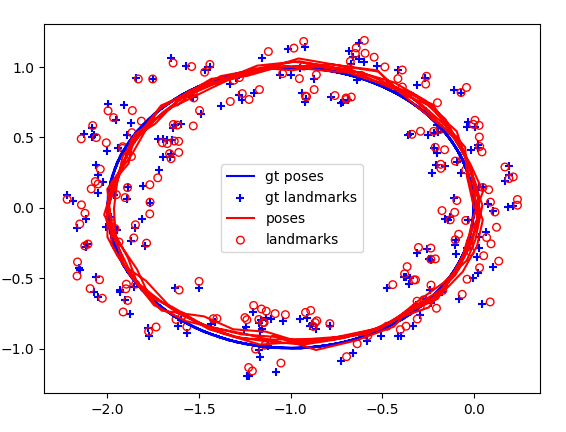


Fig 17: R Matrix from QR

Fig 18. 2d\_linear\_loop with QR

f) QR with COLAMD: time to solve: 0.019s

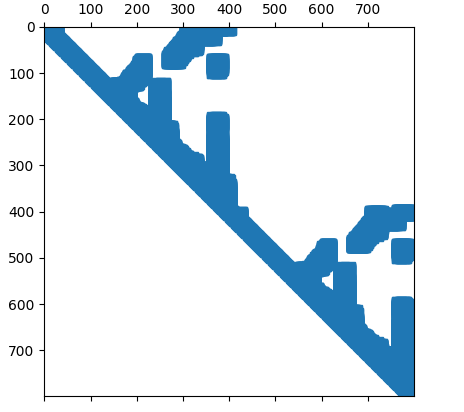


Fig 19: R Matrix from QR + COLAMD

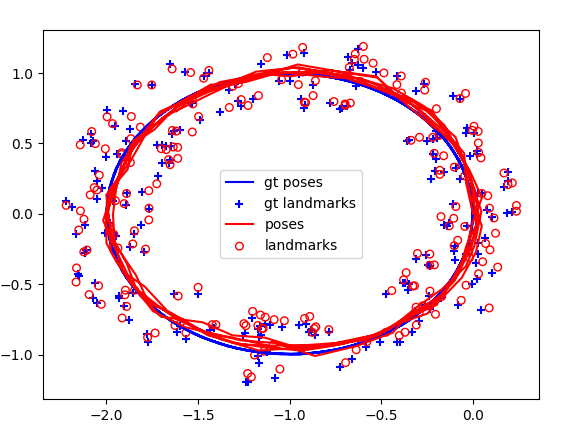


Fig 20. 2d\_linear\_loop with QR + COLAMD

1. **NonLinear model**

A graph of a graph with red and blue lines

AI-generated content may be incorrect.

Fig 21: Before optimization

1. Default:

A graph with red and blue lines

AI-generated content may be incorrect.

Fig 22: Default solver, After optimization

1. Pseudo Inverse

A graph with red and blue lines

AI-generated content may be incorrect.

Fig 23: Pseudo Inverse solver, after optimization

1. LU

A graph with red and blue lines

AI-generated content may be incorrect.

Fig 24: LU Solver, after optimization

1. LU- COLAMD

A graph with red and blue lines and white text

AI-generated content may be incorrect.

Fig 25:LU-COLAMD After optimization

e) QR

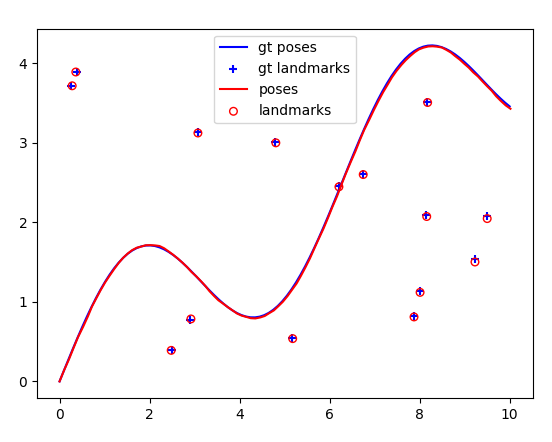
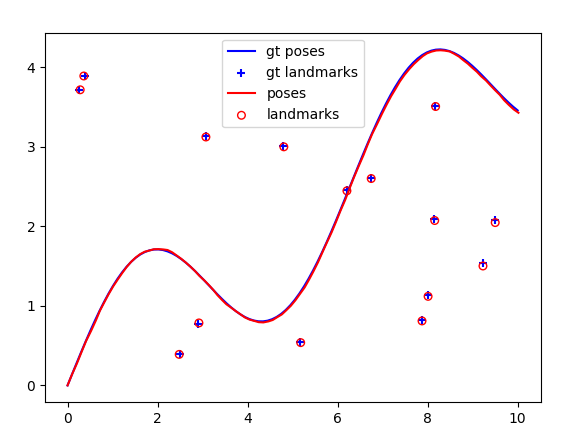


Fig 26: QR after optimization

f) QR COLAMD

Fig 27: QR after optimization