TransNav

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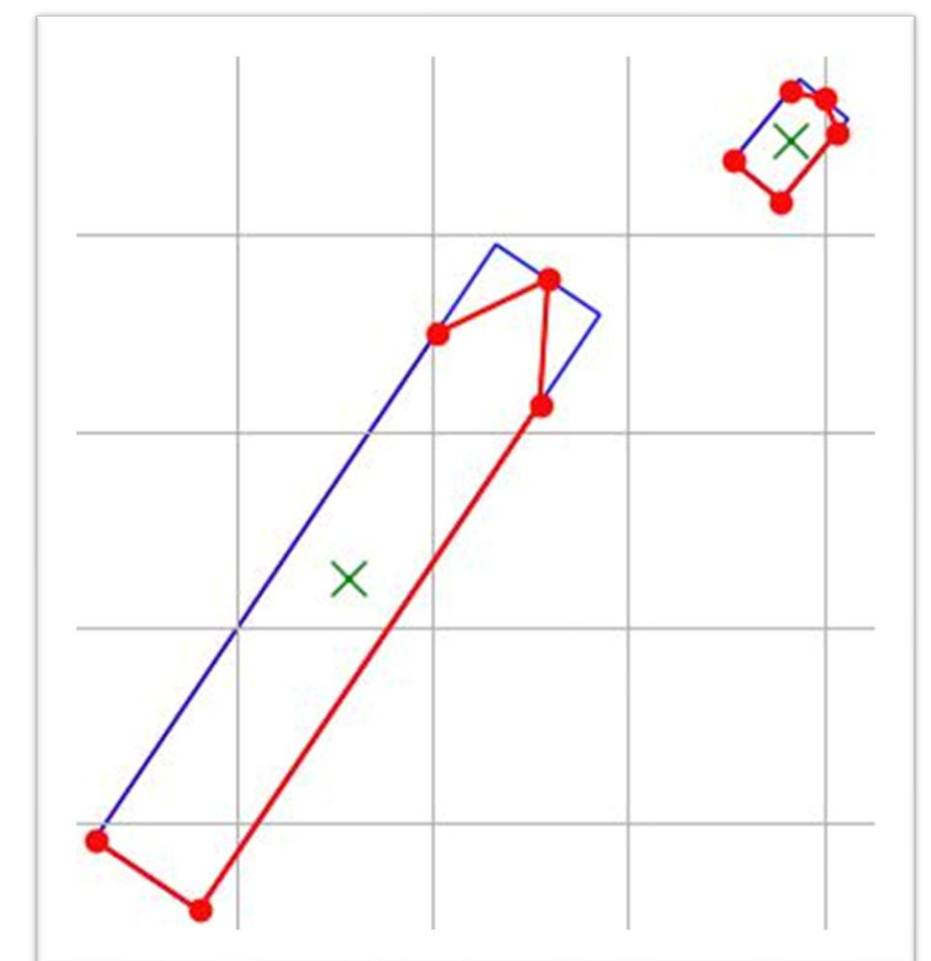
Toward Optimizing In-port Tugboats Trajectories

Objective:

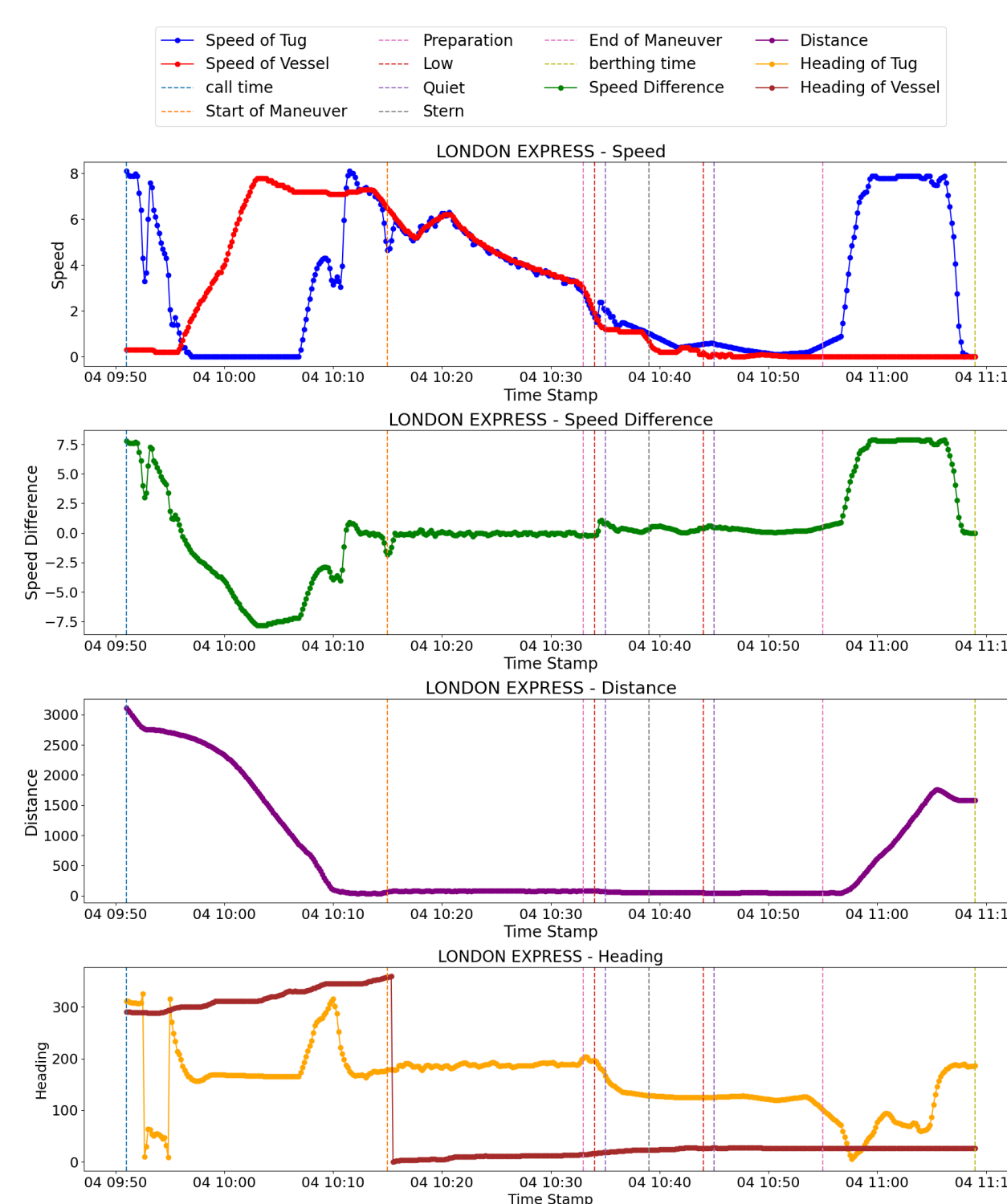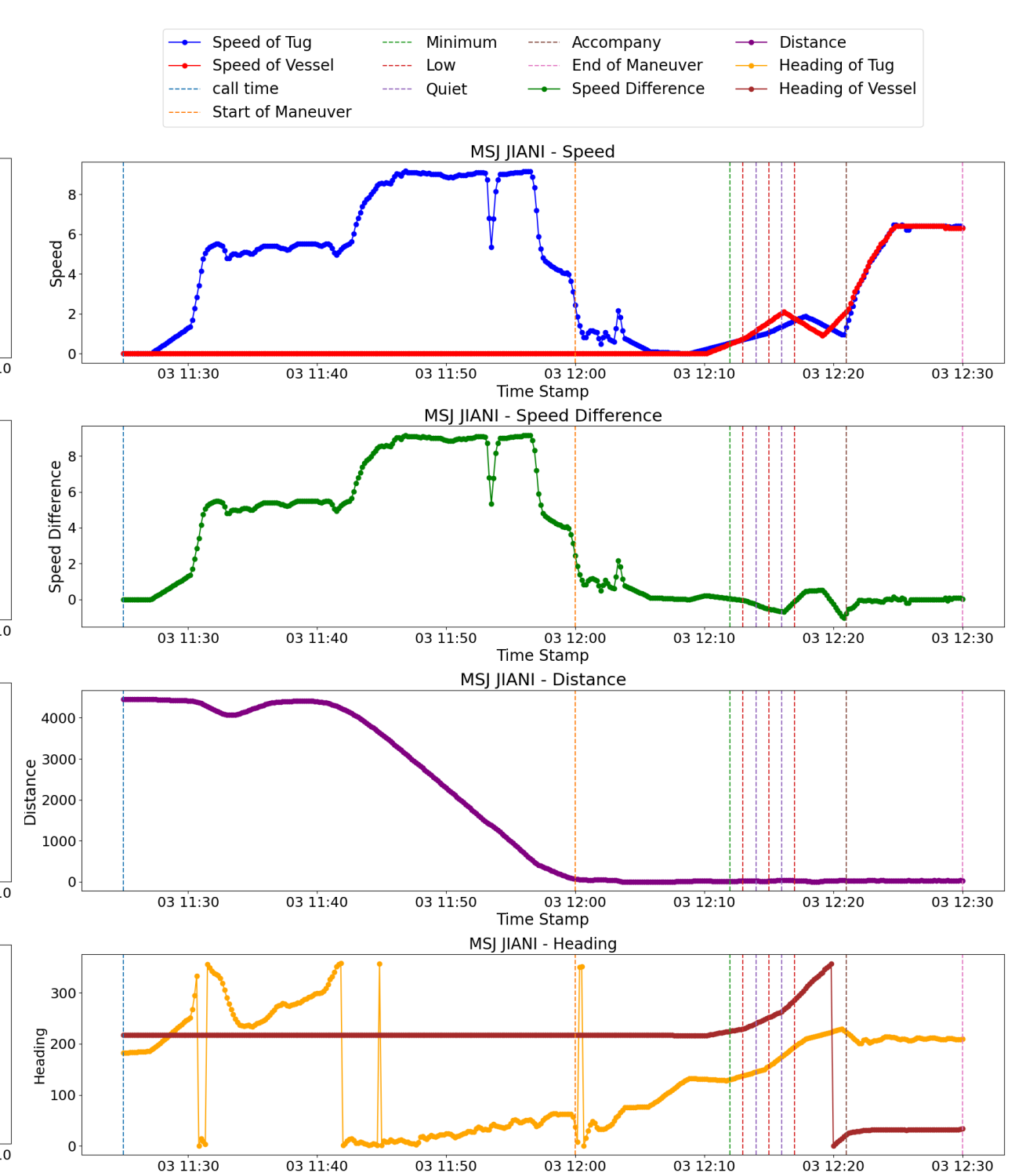Can each stages of port tugboats activity be accurately identified using AIS data?

Azabra Tugboat

Stages of Harbor Tug Maneuver

Methodology:

Resample + Interpolation (ITU)

Free Sailing · **Arrival & Maneuvering**

- Tug
- Start of tug
- End of tug
- Vessel
- Start of vessel
- End of vessel

Results:

☐ Distance while maneuvering <=LOA

☐ Maneuver time independent of LOA

☐ Berthing: ship speed drops to 0–0.1'

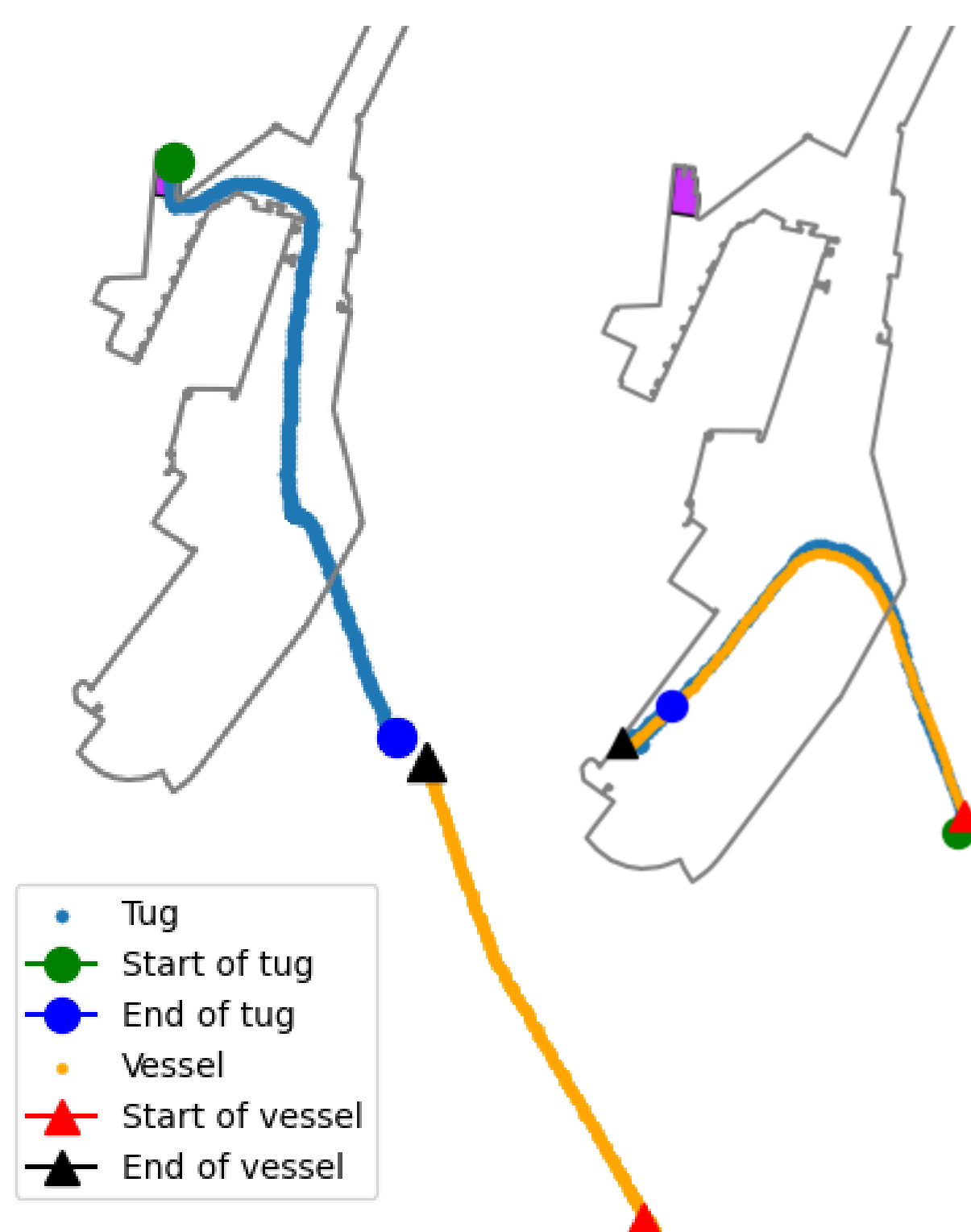☐ Active assistance (while berthing and unberthing): tugboats speeds < 2'

Arrival-Berthing · **Departure-Unberthing**

Conclusions:

- Accompany: Tugboat matches ship speed (>2')

- Free sailing: Tugboats operate independently at higher speeds & distances.

- Key insight: Speed, distance & heading define maneuver stages

Acknowledgments: