6.852 Distributed Algorithms Project Outline

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Decentralized Approaches for Autonomous Intersection Control

- Introduction
  - Motivation
  - Problem Definition
    Mutual exclusion problem- only one car allowed in the critical region (intersection)
    What assumptions are we making about the cars? (message passing capabilities)
    How are we defining a successful algorithm? throughput, wait-free

- Decentralized Approaches
  Translate these algorithms into distributed algorithms lingo
  - Ring based semaphore control [2]
  - Decentralized Navigation Functions [3]
    This paper has been built upon. [4] modifies it in such a way that heavier vehicles that need more energy and time for acceleration or breaking are given an indirect priority at intersections etc.
  - Virtual Node Layer Approach [1]
- Future Work Discussion
  - Try to use VNLayer to use a centralized algorithm (such as [5])
  - Discussion on different areas to optimize for these algorithms. This could include different levels of priority for cars and different measures for throughput.
- Conclusion

References

[1] Brown, Matthew, et al. "The virtual node layer: a programming abstraction for wireless sensor networks." SIGBED Review 4.3 (2007): 7-12.

[2] Naumann, Rolf, and Rainer Rasche. "Intersection collision avoidance by means of decentralized security and communication management of autonomous vehicles", Univ.-GH, SFB 376, 1997.

[3] Roozbehani, Hajir, Sylvain Rudaz, and Denis Gillet. "On decentralized navigation schemes for coordination of multi-agent dynamical systems." Systems, Man and Cybernetics, 2009. SMC 2009. IEEE International Conference on. IEEE, 2009.

[4] Makarem, Laleh, and Denis Gillet. "Decentralized Coordination of Autonomous Vehicles at intersections." World Congress. Vol. 18. No. 1. 2011.

[5] Kurt Dresner and Peter Stone. "Multiagent Traffic Management: An Improved Intersection Control Mechanism", AAMAS'05 Proceedings of the fourth international joint conference on Autonomous agents and multiagent systems, New York, NY, USA, 2005.