Abstract:

We present a mathematical programming based decentralized framework to generate time optimal velocity profiles for a group of path constrained mobile vehicle robots subject to communication connectivity constraints. Each vehicle robot starts from a fixed start point and moves towards a goal point along a fixed path so as to avoid collisions with other robots, and remain in communication connectivity with other robots. The main contribution of this paper is the discrete time decentralized Receding Horizon Mixed Integer Nonlinear Programming (RH-MINLP) formulation of the multi-vehicle path coordination problem with constraints on kinematics, dynamics, collision avoidance, and communication connectivity, and the application of state-of-the-art MINLP solution techniques. We test scenarios involving up to ten (10) robots to demonstrate (i) the effect of communication connectivity requirements on robot velocity profiles; and (ii) the dependence of the solution computation time on communication connectivity requirements.

BibTex Reference:

```
@inproceedings{ABK11,
   author="P. Abichandani and H.Y. Benson and M. Kam",
   title="Decentralized Multi-Vehicle Path Coordination under Communication
Constraints",
   booktitle="{Proc. International Conference on Robotics Systems ({IROS) 2011})}",
   address = "San Francisco, CA",
   month="September",
   year= "2011"
}
```

Text Reference:
P. Abichandani, H. Y. Benson, and M. Kam, Decentralized Multi-Vehicle Path Coordination under Communication Constraints, in Proceedings of International Conference on Robotics Systems (IROS) 2011, San Francisco, CA, September 2011.