The impact of autonomous vehicles on traffic management: the case of dynamic lane reversal

**Introduction**

Self-driving, totally connected vehicles are currently a hot topic in both research and industry. However, a majority of research focuses on making AVS work, not how they will impact the road network after their presence is widespread.

**Methodology**

*Cell transmission model*
- Realistically propagate traffic to capture phenomena such as shockwave propagation

*Linear programming formulation*

**Background**

Stems from concept of contraflow lanes used when traffic is dominantly one direction, such as evacuation.

**Dynamic lane reversal**

Implies changing the direction of the flow for very small time intervals based on knowledge of the demand

**Motivation**

Autonomous vehicles open up new management ideas for our road network, such as dynamic lane reversal or reservation based intersections

**Results**

We need new and improved planning models to account for their presence and evaluate policy options!

**Example network details**

- **Simple two link network and grid network**
- **More complexity in flow interaction**

**Example network details**

- **Simple two link network**

**Assumptions**

- Facilitate solving the model
- Heuristic solution methods in the future

**Contributions**

This work adapts a linearized cell transmission model for system optimal dynamic lane reversal with autonomous vehicles.

We analyze impact of various demand and departure time scenarios.

1. All vehicles are autonomous (no mixed conditions)
2. Vehicles follow system optimal behaviour
3. Vehicles are required to change lanes between timesteps
4. The demand is deterministic and perfectly known
5. Traffic conforms to the basic assumptions of hydrodynamic flow and CTM

When the demand and route assignment is known (system optimal behaviour), dynamic lane reversal is an optimization problem!

**Conclusion**

With the increased communication possible with autonomous vehicles, the direction of flow on lanes could change in short time increments.

*The effectiveness of dynamic lane reversal will depend on the demand!*