#### **1. Paper 1: Anticipatory Lane Change Warning using Vehicle-to-Vehicle Communications**

<https://sci-hub.ru/https://ieeexplore.ieee.org/document/8569910>

**Introduction:**

* **Objective:** This paper introduces an algorithm that uses vehicle-to-vehicle (V2V) communications to predict unsafe lane changes and prevent them.
* **Background:** Conventional systems use on-board sensors with limitations such as line-of-sight issues. V2V communication can sense farther and "see" occluded vehicles, improving anticipatory driving and safety.

**Methods:**

* **Algorithm Development:** The Anticipatory Lane Change (ALC) algorithm predicts the safety of a lane change by using data from surrounding vehicles. It utilizes a car-following model and kinematics for motion prediction.
* **Simulation Setup:** The algorithm was tested in the VISSIM traffic simulator and evaluated using the Surrogate Safety Assessment Model (SSAM).

**Results:**

* **Safety Improvements:** The algorithm reduced potential traffic conflicts by up to 30%, especially in high traffic volumes and with high penetration rates of ALC-equipped vehicles.
* **Impact on Traffic Flow:** The effect on average speed was minimal, showing that safety improvements did not significantly affect mobility.

**Conclusion:**

* **Effectiveness:** The ALC algorithm shows promise in enhancing traffic safety by preventing unsafe lane changes, particularly in congested conditions.
* **Future Work:** Testing the motion prediction module on real-world data and exploring the benefits for application-equipped vehicles were suggested as future research directions​​.

#### **2. Paper 2: Lane-Changing Trajectory Optimization to Minimize Traffic Flow Disturbance in a Connected Automated Driving Environment**

<https://www.mdpi.com/2076-3417/12/17/8528>

**Introduction:**

* **Objective:** This paper proposes an approach to jointly optimize the lane-changing trajectory of a connected automated vehicle (CAV) and the longitudinal control of an impacted vehicle in the target lane to minimize traffic flow disturbances.
* **Background:** Lane-changing maneuvers often cause traffic disruptions and shockwaves. Coordinating CAV movements can potentially mitigate these issues.

**Methods:**

* **Model Predictive Controller (MPC):** Designed for the vehicle in the target lane to respond appropriately to lane-changing maneuvers.
* **Trajectory Optimization:** Various lateral trajectories were considered, and the optimal one was chosen based on minimizing the deceleration required by the impacted vehicle.
* **Simulation and Analysis:** The approach was evaluated through analytical and simulation-based investigations.

**Results:**

* **Disturbance Reduction:** The proposed approach effectively minimized acceleration disturbances and shockwave magnitude.
* **Trajectory Selection:** The selected trajectory minimized velocity changes in the target lane, reduced traffic disturbances, and maintained passenger comfort.

**Conclusion:**

* **Optimization Benefits:** The joint optimization of lane-changing and car-following maneuvers can significantly improve traffic flow stability.
* **Future Research:** Further investigations are needed to explore the implications of different traffic conditions and to validate the approach with real-world data​​.

#### **3. Paper 3: Modeling and Analysis of the Impact of Cooperative Adaptive Cruise Control on Traffic Flow**

<https://sci-hub.ru/https://ieeexplore.ieee.org/document/8916942>

**Introduction:**

* **Objective:** The study aims to model and analyze the impact of Cooperative Adaptive Cruise Control (CACC) on traffic flow and stability.
* **Background:** CACC systems allow vehicles to communicate and coordinate with each other, potentially improving traffic efficiency and reducing congestion.

**Methods:**

* **Simulation Model:** A traffic flow model incorporating CACC was developed and simulated.
* **Scenario Analysis:** Various scenarios with different penetration rates of CACC-equipped vehicles were analyzed to assess their impact on traffic flow.

**Results:**

* **Traffic Efficiency:** The introduction of CACC improved traffic flow efficiency, reduced travel time, and increased roadway capacity.
* **Stability Improvement:** CACC-equipped vehicles demonstrated enhanced stability, reducing the occurrence of traffic jams and shockwaves.

**Conclusion:**

* **Positive Impact:** CACC systems can significantly enhance traffic flow and stability, especially at higher penetration rates.
* **Further Studies:** The study suggests exploring real-world implementations of CACC and their long-term impacts on traffic systems​​.