Software Engineering Seminar

- Joint seminar for Bachelor and Master students
- Seminar will be held in English
- Bachelor students may choose to do their paper and presentation in German (confirm with supervisor)
- Topics have already been assigned

Organizing Chairs

- Winter terms: Software Engineering: Dependability (Prof. Dr.-Ing. habil. Peter Liggesmeyer)
- Summer terms: AG Programmiersprachen (Prof. Dr. Ralf Hinze)
Software Engineering: Dependability

Prof. Dr.-Ing. Peter Liggesmeyer
http://seda.cs.uni-kl.de/staff/liggesmeyer/
Office hours: on appointment
Room: 32-425

Dipl.-Inform. Felix Möhrle
http://seda.cs.uni-kl.de/staff/moehrle/
Office hours: on appointment
Room: 32-433

http://seda.cs.uni-kl.de/teaching/sem/ws2018/

Summer term:
• Software Engineering 2 - Modeling (Bachelor)

Winter term:
• Safety and Reliability of Embedded Systems (Master)
• Quality Management of Software and Systems (Master)
• Software Quality Assurance (Master)
Goals of the Seminar

- Critical reading of scientific papers
- Understanding
- Summarizing
- Explaining
- Citing
- Presenting

Students are provided with some initial literature

Task: Read literature, become familiar with contents and relevant terminology, find additional literature
Google Scholar: https://scholar.google.com
IEEE Explore: https://ieeexplore.ieee.org
DBLP: https://dblp.uni-trier.de
A Vehicle-to-Vehicle Communication Protocol for Cooperative Collision Warning

Xue Yang, Jie Liu, Feng Zhao and Nitin H. Vaidya

Abstract—This paper proposes a vehicle-to-vehicle communication protocol for cooperative collision warning. Emerging wireless technologies for vehicle-to-vehicle (V2V) and vehicle-to-roadside (V2R) communications such as DSRC [1] are promising to dramatically reduce the number of fatal roadway accidents by providing early warnings. One major technical challenge addressed in this paper is to achieve low-latency in delivering emergency warnings in various road situations. Based on a careful analysis of application requirements, we design an effective protocol, comprising congestion control policies, service differentiation mechanisms and methods for emergency warning dissemination. Simulation results demonstrate that the proposed protocol achieves low latency in delivering emergency warnings and efficient bandwidth usage in stressful road scenarios.

I. INTRODUCTION

Traffic accidents have been taking thousands of lives each year, outnumbering any deadly diseases or natural disasters. Studies [2] show that about 60% roadway accidents could be avoided if the operator of the vehicle was provided warning at least one-half second prior to a collision.

Human drivers suffer from perception limitations on roadway emergency events, as the following simplified example illustrates. In Figure 1, three vehicles, namely A, B, and C, and C is less than 35 meters, or the distance between A and C is less than 70 meters.

![Diagram of vehicles A, B, and C](image)

Fig. 1. V2V helps to improve road safety

To summarize, being further away from A does not make vehicle C any safer than B due to the following two reasons:

- Line-of-sight limitation of brake light: Typically, a driver can only see the brake light from the vehicle directly in front.
- Large processing/forwarding delay for emergency events: Driver reaction time typically ranges from 0.7 seconds to 1.5 seconds [3], which results in large delay in propagating the emergency warning.

Above limitations result in large delay in propagating emergency warnings when depending on brake lights and human responses. Environmental conditions such as bad weather or curved roads may further impair human perception in cases of emergency.
there are totally $M$ co-existing AVs. The total arrival rate of EWMs, $\lambda$, is the sum of EWM transmission rate from each individual AV. As a simplifying approximation, we also model the channel service process as Poisson since each EWM has the same packet size and there is no feedback between the channel service rate and the EWM transmission rate in our system. With $M$ independent arrival streams from all $M$ AVs, a M/M/1 queueing system can be constructed by merging all arrival streams into one with total arrival rate of $\lambda$. Let the channel service rate be $\mu$. From queueing theory, we know that the system is stable if and only if $\lambda < \mu$ and the average waiting time in the system for a message is

$$\text{Delay}_{wait} = \frac{1}{\mu - \lambda} + \frac{1}{\mu}$$  \hspace{1cm} (4)

if the FCFS (First Come First Serve) service order is applied [25]. Even though contention based MAC protocol is used and the channel in fact serves the backlogged messages from different AVs in a random order, by assuming that each backlogged message is served with equal probability, one can show that the average waiting time remains same when the system is stable as follows.

REFERENCES

## Timeline

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
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<tbody>
<tr>
<td>Kick-off meeting</td>
<td>19.10.2018</td>
</tr>
<tr>
<td>Annotated table of contents</td>
<td>23.11.2018</td>
</tr>
<tr>
<td>Draft version of paper</td>
<td>18.01.2019</td>
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<tr>
<td>Final version of paper</td>
<td>08.02.2019</td>
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<tr>
<td>Presentations</td>
<td>t.b.d.</td>
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- 5 weeks
- 8 weeks
- 3 weeks

▶ Please send all documents (annotated TOC, draft paper, final paper) to your supervisor and moehrle@cs.uni-kl.de
Guidelines

Papers

▶ Master students: approx. 15 pages, not including figures
▶ Bachelor students: approx. 10 pages, not including figures

Presentations

▶ Master students: max. 20 minutes presentation time
▶ Bachelor students: max. 15 minutes presentation time
▶ Each presentation is concluded with questions and feedback
▶ Participation in presentations by other students is mandatory

Please use the templates provided on the seminar website.
Successful participation in the seminar

- Participate in meetings:
  - Attend the kick-off meeting and presentations
  - Make appointments with your supervisor
- Meet deadlines (meetings, appointments, submissions)
- When writing your seminar paper:
  - Follow the guidelines
  - No plagiarism: reference used literature
  - Consult your supervisor regularly
- Give a presentation on your topic
Tips

How to fail the seminar

➤ Topic not addressed
➤ Not consulting your supervisor
➤ Plagiarism
➤ Missed deadlines
➤ Absence during presentation sessions
➤ Poor quality of the seminar paper or presentation
➤ Non-compliance with guidelines (templates etc.)
## Supervisors

<table>
<thead>
<tr>
<th>T1</th>
<th>Anto Melvin</th>
<th><strong>Supervisor:</strong> Felix Möhrle</th>
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<tbody>
<tr>
<td>T2</td>
<td>Wenyu Qiao</td>
<td><a href="mailto:moehrle@cs.uni-kl.de">moehrle@cs.uni-kl.de</a></td>
</tr>
<tr>
<td>T3</td>
<td>Marvin Caspar</td>
<td>Room 32-433</td>
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<tr>
<th>T4</th>
<th>Mario Biedenbach</th>
<th><strong>Supervisor:</strong> Nishanth Laxman</th>
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<tr>
<td>T5</td>
<td>Tagline Treichel</td>
<td><a href="mailto:nishanth.laxman@cs.uni-kl.de">nishanth.laxman@cs.uni-kl.de</a></td>
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<tr>
<td>T6</td>
<td>Fabien Wilhelm</td>
<td>Room 32-424</td>
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<th>T7</th>
<th>Ningning Feng</th>
<th><strong>Supervisor:</strong> Nikita Bhardwaj</th>
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<tr>
<td>T9</td>
<td>Pascal Grosch</td>
<td><a href="mailto:bhardwaj@cs.uni-kl.de">bhardwaj@cs.uni-kl.de</a></td>
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<td></td>
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<td>Room 32-435</td>
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<th>T10</th>
<th>Tereshchuk Pavlo</th>
<th><strong>Supervisor:</strong> Jasmin Jahic</th>
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<tr>
<td>T11</td>
<td>Shekhar Bhattacharya</td>
<td><a href="mailto:jasmin.jahic@iese.fraunhofer.de">jasmin.jahic@iese.fraunhofer.de</a></td>
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<tr>
<td>T12</td>
<td>Milad Chatrangoon</td>
<td>Fraunhofer IESE</td>
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<tr>
<th>T13</th>
<th>Sumit Kumar Tomer</th>
<th><strong>Supervisor:</strong> Lena Sembach</th>
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<td><a href="mailto:lena.sembach@iese.fraunhofer.de">lena.sembach@iese.fraunhofer.de</a></td>
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<th>Thilo Pütz</th>
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<tr>
<td>T15</td>
<td>Mareike Mett</td>
<td><a href="mailto:anna-maria.vollmer@iese.fraunhofer.de">anna-maria.vollmer@iese.fraunhofer.de</a></td>
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