SS21 (Embedded Real-Time Systems)

The purpose of this seminar is to independently and scientifically work on a topic of embedded real-time systems and related. The goal is to summarize the topic in an oral presentation and a written elaboration in form of a paper. Another purpose of this seminar is to practice working in structured and time-driven workflows (e.g. for conferences or workshops). Moreover, both of these aspects are a good preparation for working on your thesis. We have many theses regarding these topics available; contact us if you are interested in that.

This seminar is a bachelor and master module at the same time. Compared to the bachelor seminar, we expect that master students include more related work and therefore write a longer paper and hold a longer presentation (see below).

Prerequisites

For the participation of this seminar the attendance of the "Embedded Real-Time Systems" lecture is not specifically required. However, specific lecture topics required for the paper should be reworked.

Moreover, we recommend the attendance of the lecture "**Scientific Working for Seminars and Thesis**" (Wissenschaftliches Arbeiten für Seminar und Abschlussarbeiten) held by Mr. Mazarakis.

Lecturers

Reinhard von Hanxleden (rvh@informatik.uni-kiel.de)
Lena Grimm (lgr@informatik.uni-kiel.de)
Alexander Schulz-Rosengarten (als@informatik.uni-kiel.de)

Topics

You may choose from one of the following papers. The scope, complexity and required knowledge for these papers roughly divides them into topics for bachelor students and for master students. However, bachelor students that take great interest in a master students topic may also choose from those.

The papers are assigned via *first-come-first-serve*. Already taken papers are marked. Please send an email to Lena (lgr@informatik.uni-kiel.de) in order to reserve a paper.

Many of the links do only work in the university network. Through the usage of a VPN or a remote session to the terminal server, those are also accessible from home. If any problems occur feel free to contact us.

Bachelor Recommendations

Juha-Pekka Tolvanen and Steven Kelly. 2018. Effort Used to Create Domain-Specific Modeling Languages. In *Proceedings of the 21th ACM/IEEE International Conference on Model Driven Engineering Languages and Systems* (MODELS '18). ACM, New York, NY, USA, 235-244.

[assigned] Döbel, Hermann Härtig, Can We Put Concurrency Back Into Redundant Multithreading?, EMSOFT 2014

[assigned] Yooseong Kim, David Broman, Jian Cai, and Aviral Shrivastaval, WCET-Aware Dynamic Code Management on Scratchpads for Software-Managed Multicores, In *Proceedings of the 20th IEEE Real-Time and Embedded Technology and Application Symposium* (RTAS 2014), Berlin, Germany, 2014

[assigned] Marten Lohstroh and Edward A. Lee, Deterministic Actors, *2019 Forum for Specification and Design Languages (FDL)*, Southampton, United Kingdom, 2019

[assigned] Charles Hartsell, Nagabhushan Mahadevan, Shreyas Ramakrishna, Abhishek Dubey, Theodore Bapty, Taylor Johnson, Xenofon Koutsoukos, Janos Sztipanovits and Gabor Karsai, CPS Design with Learning-Enabled Components: A Case Study, *In Proceedings of the 30th International Workshop on Rapid System Prototyping (RSP'19),* New York, NY, USA, 2019

Björn Forsberg, Maxim Mattheeuws, Andreas Kurth, Andrea Marongiu, and Luca Benini. A Synergistic Approach to Predictable Compilation and Scheduling on Commodity Multi-Cores In *The 21st ACM SIGPLAN/SIGBED Conference on Languages, Compilers, and Tools for Embedded Systems* (LCTES '20). Association for Computing Machinery, New York, NY, USA, 2020

Jun Xiao and Andy D. Pimentel. CITTA: Cache Interference-aware Task Partitioning for Real-time Multi-core Systems. In *The 21st ACM SIGPLAN /SIGBED Conference on Languages, Compilers, and Tools for Embedded Systems* (LCTES '20). Association for Computing Machinery, New York, NY, USA, 2020

Mladen Skelin and Marc Geilen. Compositionality in scenario-aware dataflow: a rendezvous perspective. In *Proceedings of the 19th ACM SIGPLAN /SIGBED International Conference on Languages, Compilers, and Tools for Embedded Systems* (LCTES 2018). Association for Computing Machinery, New York, NY, USA, 2018

[assigned] Zhe Jiang, Neil C. Audsley and Pan Dong. BlueVisor: A Scalable Real-Time Hardware Hypervisor for Many-Core Embedded Systems. *2 018 IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS)*, Porto, 2018

Yecheng Zhao and Haibo Zeng. Optimization techniques for time-critical cyber-physical systems. In *Proceedings of the Workshop on Design Automation for CPS and IoT* (DESTION '19). Association for Computing Machinery, New York, NY, USA, 2019

[assigned] Himanshu Neema, Janos Sztipanovits, Cornelius Steinbrink, Thomas Raub, Bastian Cornelsen, and Sebastian Lehnhoff. Simulation integration platforms for cyber-physical systems. In *Proceedings of the Workshop on Design Automation for CPS and IoT* (DESTION '19). Association for Computing Machinery, New York, NY, USA, 2019

[assigned] Jeffrey M. Fischer and Rupak Majumdar. Programming event processors with thingflow. In *Proceedings of the 10th ACM/IEEE International Conference on Cyber-Physical Systems* (*ICCPS '19*). Association for Computing Machinery, New York, NY, USA, 2019

[assigned] Francois Pcheux, Liliana Andrade, Marie-Minerve Louërat, Ilias Bournias, Roselyne Chotin and Daniela Genius. Virtual Prototyping of Open Source Heterogeneous Systems with an Open Source Framework Featuring SystemC MDVP Extensions. *2020 Forum for Specification and Design Languages (FDL)*, Kiel, Germany, 2020

Master Recommendations

Jordan A. Ross, Alexandr Murashkin, Jia Hui Liang, Micha Antkiewicz, Krzysztof Czarnecki, Synthesis and exploration of multi-level, multi-perspective architectures of automotive embedded systems, Software & Systems Modeling 2019

Carlos A. González, Mojtaba Varmazyar, Shiva Nejati, Lionel C. Briand, and Yago Isasi. 2018. Enabling Model Testing of Cyber-Physical Systems. In *Proceedings of the 21st ACM/IEEE International Conference on Model Driven Engineering Languages and Systems* (MODELS '18). ACM, New York, NY, USA, 176-186.

Reza Ahmadi, Ernesto Posse, and Juergen Dingel. 2018. Slicing UML-based Models of Real-time Embedded Systems. In *Proceedings of the 21st ACM/IEEE International Conference on Model Driven Engineering Languages and Systems* (MODELS '18). ACM, New York, NY, USA, 346-356.

Bader Alahmad and Sathish Gopalakrishnan. 2018. On Budgeting and Quality, with an Application to Safety-Critical Real-time Systems. In *Proceedings of the 26th International Conference on Real-Time Networks and Systems* (RTNS '18). ACM, New York, NY, USA, 19-29.

Andreas Sailer, Michael Deubzer, Gerald Lüttgen, and Jürgen Mottok. 2017. Comparing trace recordings of automotive real-time software. In *Proceedings of the 25th International Conference on Real-Time Networks and Systems* (RTNS '17). ACM, New York, NY, USA, 118-127.

Tobias Sehnke, Dieter Schwarzmann, Matthias Schultalbers, and Rolf Ernst. 2017. Temporal properties in automotive control software. In *Proceedings of the 25th International Conference on Real-Time Networks and Systems* (RTNS '17). ACM, New York, NY, USA, 98-107.

Tobias Klaus, Florian Franzmann, Matthias Becker, and Peter Ulbrich. 2018. Data Propagation Delay Constraints in Multi-Rate Systems: Deadlines vs. Job-Level Dependencies. In *Proceedings of the 26th International Conference on Real-Time Networks and Systems* (RTNS '18). ACM, New York, NY, USA, 93-103.

Evgeny Kusmenko, Bernhard Rumpe, Sascha Schneiders, and Michael von Wenckstern. 2018. Highly-Optimizing and Multi-Target Compiler for Embedded System Models: C++ Compiler Toolchain for the Component and Connector Language EmbeddedMontiArc. In *Proceedings of the 21st ACM/IEEE International Conference on Model Driven Engineering Languages and Systems* (MODELS '18). ACM, New York, NY, USA, 447-457.

[assigned] Arne Hamann, Dakshina Dasari, Jorge Martinez, and Dirk Ziegenbein. 2018. Response Time Analysis for Fixed Priority Servers. In *Proceedings of the 26th International Conference on Real-Time Networks and Systems* (RTNS '18). ACM, New York, NY, USA, 254-264.

Guillaume Brau, Nicolas Navet, and Jérôme Hugues. 2017. Heterogeneous models and analyses in the design of real-time embedded systems - an avionic case-study. In *Proceedings of the 25th International Conference on Real-Time Networks and Systems* (RTNS '17). ACM, New York, NY, USA, 168-177.

[assigned] Alessandro Biondi and Marco Di Natale. Achieving Predictable Multicore Execution of Automotive Applications Using the LET Paradigm. *2018 IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS)*, Porto, 2018

Schedule

> ⚠ **Access to Online Meetings**
>
> All registered participants have received a link via the seminar's mailing list. If you did not get the link, please contact Lena.

Date	Milestone
Tue. 20.04. 13:00, Online	First Meeting/**Kick-Off** with a Latex and EasyChair introduction. The meeting will take place online via *BigBlueButton*.
Tue. 20.04. 23:59	Deadline for topic selection (via email to Lena)
Tue. 04.05. 8:00	Deadline of the first draft in EasyChair. This includes abstract, introduction, outline, notes for chapter contents and an overview list of bibliography for related work.
Wed. 05.05., Online	Individual feedback dates. The meetings will take place online via *BigBlueButton.*
Tue. 25.05. 8:00	Deadline of the first full version (submission update in EasyChair)
Wed. 26.05., Online	Individual feedback dates. The meetings will take place online via *BigBlueButton.*
Tue. 08.06. 8:00	Deadline of the review version (submission update in EasyChair) and admission to program committee (invitation via email)
subsequently	Review assignment (via email)

Tue. 15.06. 8:00	Deadline reviews (in EasyChair)
Wed. 30.06., Online	Individual feedback dates on presentation slides. The meetings will take place online via *BigBlueButton*. The slides need to be available online or sent to the advisor beforehand (as PDF).
Sun. 11.07. 23:59	Deadline final version (submission update in EasyChair)
Tue. 13.07., all-day	Final presentations

The Final Presentations

Currently, it is unclear how the talks will take place. This will be influenced by the development of the pandemic. However, it is most likely that there will be a online meeting with each participant presenting their topic online.

Usually, the presentation of the prepared topic is held during a block seminar. The attendance at the seminar day is mandatory. Every attending person receives the proceedings of the current semester.

Tue. 13.07.

agenda.pdf

Papers, Talks, Review

This seminar includes creating a paper, a talk, and two reviews.

Paper

The paper should provide an overview of the chosen topic. It should be written in a style that late bachelor student can understand it. The paper should be 6 (master) or 4 (bachelor) pages long (including bibliography), not more not less, and it should use the ACM LaTeX-style (more details below). We advise you to read the writing advice for writing a thesis. You can write your paper either in English or German.

Talk

The talk should be 40 minutes (master) or 25 minutes (bachelor) long. This is followed by 5 minutes of questions. The slides should contain page numbers to allow the participants to ask specific questions after the talk. It would be great to include a short tool demo if your topic includes some concrete implementation.

You can freely choose your presentation tool. Therefore, for the individual dates on the presentation slides it would be best to to use your own computer. If the slides are provided as PDF beforehand, a different computer could be used.

Especially when using online tools, note that the block seminar might take place in Falckenstein and that there is no WLAN access. Therefore, the presentations must allow to be held offline.

The talk can be held in English or German.

Review

A review consist of two parts:

1. General comments (what do you like/ not like regarding content, structure, and readability) as well as general suggestions to improve the paper
2. In detail remarks and corrections

The first part of the review should be at least half an A4 page long. It should be written in full text and not only consist of notes. The review content should be similar to the review you get during the individual dates, however, it should be more in detail and with a clear focus on content, structure, and readability of the paper.

It is not possible to add files in the EasyChair review form. Therefore, it is not possible to add an annotated pdf as detailed correction.

The reviews are assigned after the review-version deadline and are based on the submitted version of the papers.

Grades

This seminar is graded. The grade is based on each milestone (the different versions of the paper, the reviews, the slides, the talk). For each milestone quality, timing (see dates) are graded. Missed deadline may cause you to fail the seminar.

Technical Details

LaTeX

Your papers should be created with LaTeX using the provided style. You can find all necessary files in this archive, including an example document that includes helpful LaTeX-hints to start with. Copy all files in some folder and begin to write your paper. The style is an adjusted version of the official ACM style. Please use the style provided here and not the official one.

LaTeX can create a bibliography (it includes scientific publications, which are referenced to prove statements) too. The example includes a file named `myrefs.bib`, which holds the references. ACM provides a short overview with examples of bibliography entries.

While writing your paper keep the following in mind:

- Think about whether you want to write your paper in German or English and make use to use the corresponding style.
- If you use graphics from your original paper, you should not just add a screenshot of the pdf your paper. Try to use the image from the original paper by exporting them, including the pdf directly (`\inlcudegraphics[page=... trim=...]{*.pdf}`), or by recreating the image by yourself (ideally as a vector graphic). This way you should get a result that is not pixelated or at least not worse than the original.
- A paper always consists of an introduction, at least one main chapter, and a conclusion.

EasyChair Tutorial

You can find our seminar in EasyChair: **Link**

We use the EasyChair system to manage our seminar. EasyChair is a popular system to manage conferences. Should you end up as a PhD student, it is likely that you won't get around using it at some point in your career.

This section describes how to use EasyChair over the course of the seminar.

Registration

If you do not have an EasyChair account (which is most likely), you need to sign up for an account first.

Go to the registration page. First solve the very challenging Captcha and then fill in your personal data.

> ⚠ Use your university mail address!

First name† (*):	\<First Name\>
Last name (*):	\<Last Name\>
Email address (*):	\<stu12345\>@mail.uni-kiel.de
Retype email address (*):	\<stu12345\>@mail.uni-kiel.de

Continue

You will receive an **activation mail** with a link. When you navigate to the given site, you nee to provide further information. Choose a username and password and create the account.

To use EasyChair, you must agree to its Terms of Service *(view terms)*, *(download terms)*,

☑ I agree to EasyChair Terms of Service

Enter your personal data.

First name[†]: `<First Name>`

Last name (*): `<Last Name>`

Organization (*): Kiel University, Department of Computer Science

Country (*): Germany ⌄

The Web page is used to provide a link to it on some EasyChair pages, for example when you are mentioned as an author of paper. It is optional. Please do not use the Web page of your organization here: if you fill this out, it should only be your personal Web page.

Your personal Web page:

Enter your account information. Note that user names are case-insensitive

User name (*): `<username>`

Password (*): `<password>`

Retype the password (*): `<password>`

Create my account

Creating a new Submission

To create your submission, visit the EasyChair site of the seminar (link provided above). First you need to log in, then you will be asked for the role you want to enter as. Choose the only option: Author. During the seminar you will get an additional role, see PC section. Next, click on the _New Submission_ button in the header bar.

Complete the form with the information about you and your paper. Note that, all fields are not final and can be changed later on.

Author Information

Please fill out the form below. Some items on the form are explained here:

- **Email address** will only be used for communication with the author. It will not appear in public Web pages of this conference.
- **Web page** can be used on the conference Web pages, for example, for making the program. It should be a Web page of the author, not the Web page of her or his organization.

Author	
First name†:	`<First Name>`
Last name (*):	`<Last Name>`
Email (*):	`<stu12345>@mail.uni-kiel.de`
Country (*):	Germany
Organization (*):	Kiel University, Department of Computer Science
Web page:	

† Note: leave first name blank if there is no first name. If you are not sure how to divide a name into the first and last name, read the Help article about names.

Title

The title should be entered as plain text, it should not contain HTML elements.

Title (*):	`<Your Paper Title>`

Keywords

Type a list of keywords (also known as key phrases or key terms), **one per line** to characterize your submission. You should specify at least three keywords.

Keywords (*):	`<Keyword1>`
	`<Keyword2>`
	`<Keyword3>`

Topics

Please select topics relevant to your submission from the following list.

☐ Master   ☑ Bachelor

Uploads

Paper (*). Upload your paper. The paper must be in PDF format (file extension .pdf)

Browse... test.pdf

Ready?

If you filled out the form, press the 'Submit' button below. **Do not press the button twice: uploading may take time!**

Submit

⚠ Use the *New Submission* option **only once** for your first submission!

All following uploads of your paper and milestone submissions must be updates of your existing submission (see next section).

Updating your Submission

After you created a new submission, you can access your submission via the new button *Submission <your number>* in the header bar. The page then displays the current state and information about your submission.

You can update these information using the options in the top right box of this site.

Program Committee (PC)

During the seminar (usually after the second deadline) you will receive an invitation into the Program Committee (PC) of the seminar. This the a prerequisite for the reviewing process. Hence, it is **important that you accept the invitation** as soon as you receive it.

The invitation mail features a response link. Click on that link, make sure that "I accept the initiation" is selected and click on *Answer Invitation*. You do not need to provide a response message (*Email body*) or specify the *Email subject*.

Different roles in EasyChair

As soon as you are part of the PC, you have different roles in which you can access/enter the seminar page on EasyChair. The roles have different purposes and permissions.

| Role	Purpose
Author	Create and update your submission
PC member	Create and update reviews

This means you cannot edit your submission when you are in the *PC* role and you cannot create reviews in the *Author* role.

Changing your role

When you access the EasyChair page of the seminar you are usually ask in which role you want to enter.

Your current role is always displayed in parentheses after the seminar title at the top of the page.

You can change your role by accessing the conference menu (e.g. Kiel-rtsys-sem-18ws) in the top bar an selecting *Change role*.
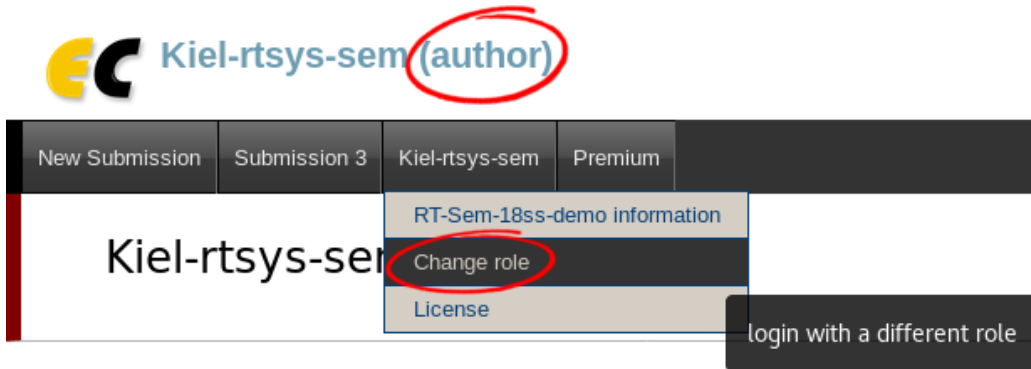

Writing Reviews

After the deadline for the review versions, you will be assigned as reviewer for two other submissions. You will be notified by mail when the assignment is done. The mail will not contain a direct link. Hence, visit the EasyChair page of the seminar, but this time enter in your **PC member role**.

Click on *Assigned to me* in the *Review* menu and download the paper you are assigned to review (submission column with file/pdf symbol). When you have read the paper and you are ready to write the review click on the + button to create your review.
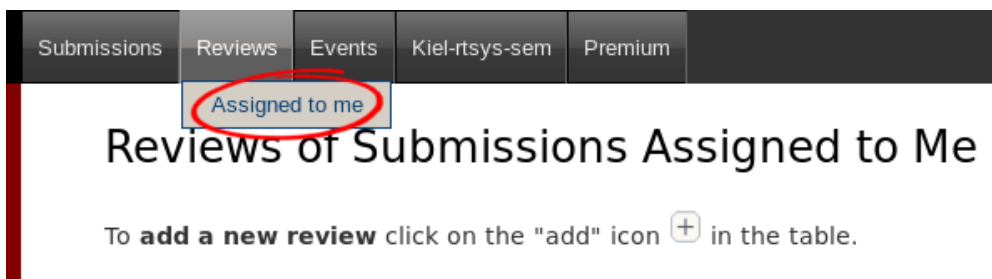
Complete the review form and submit it. Note that the form may have additional fields you need to fill out.

Paper and reviewer information

Title:	\<Paper Title\>
Authors:	\<First Name\> \<Last Name\>
PC member:	\<First Name\> \<Last Name\>

Evaluation

General evaluation (*). Please provide a detailed review.

```
This paper is great, one of the greatest.
You will make this seminar great again!
```

Detailed comments. You may provide detailed comments on, for example, spelling mistakes or grammar issues.

```
In line 1, "Despite the constant negative press covfefe.", I assume you
misspelled coverage or is covfefe a word?
```

Submit review

⚠ If you want to update your review, navigate to the *Assigned to me* page but **do not create a new review**. Click on the link with your name in the new *(Update review) PC member* column to edit your review.

Viewing Reviews of your own Submission

When all reviews are finished, you will receive an Email with the reviews for your paper.

Alternatively, you can log in with your **Author role** and access the reviews on your submission page *(Submission \<your number\>)*.

Resources

In general, it is advised to look for related work in the university network since you will get access to many online libraries. We the following search engines and web pages:

- Google Scholar: http://scholar.google.de/
- dblp: http://dblp.uni-trier.de/
- CiteSeer: http://citeseer.ist.psu.edu/
- IEEE-Xplore: http://ieeexplore.ieee.org/Xplore/dynhome.jsp
- ACM Digital Library: http://portal.acm.org/dl.cfm
- Universitätsbibliothek Digitale Medien: http://www.uni-kiel.de/ub/emedien/index.html