

Project Description

CSE 522 Real-time Embedded Systems (Spring 2014)

Project Delivery and Schedule:

- Each student should develop a survey report individually on the selected subjects of real-time embedded systems.
- An initial submission will be due on March 26 in Blackboard. You need to submit a one page pdf document to include the subject you plan to study, a short description why you select the subject, and a list of papers you plan to study. The document should be named as *cse522-26805-p1-firstname-lastname.pdf* if you are in online section and *cse522-15970-p1-firstname-lastname.pdf* for on-campus students.
- A final report of 8-10 single spaced pages approximately should be completed and submitted by April 30. Please note that the final exam is scheduled at 9:50am-11:40am, May 5.
- Discussion in study groups and with other students is encouraged. The report must be developed individually.

Suggested Project Ideas and References:

Here is a list of initial subjects and reference papers I would recommend. You may choose an additional subject as long as they are research-oriented, related to emerging issues, or good practices in real-time embedded systems. In this case, please consult with the instructor before you make your initial submission.

1. Toyota's Unintended Acceleration:

NHTSA Report on Toyota Unintended Acceleration Investigation.

- Full report http://www.nhtsa.gov/staticfiles/nvs/pdf/NASA-UA_report.pdf
- Software http://www.nhtsa.gov/staticfiles/nvs/pdf/NASA_FR_Appendix_A_Software.pdf

Michael Barr's slide in Bookout V. Toyota:

http://www.safetyresearch.net/Library/BarrSlides_FINAL_SCRUBBED.pdf

2. RTOS for Automotive Systems

AUTOSAR Release 4.1, Specification of Operating System, 2013,

http://www.autosar.org/download/R4.1/AUTOSAR_SWS_OS.pdf

"On Spin Locks in AUTOSAR: Blocking Analysis of FIFO, Unordered, and Priority-Ordered Spin Locks", RTSS 2013. <http://www.mpi-sws.org/~bbb/papers/pdf/rtss13a.pdf>

OSEK-Group. OSEK/VDX Operation System Specification, 2005,

<http://portal.osek-vdx.org/files/pdf/specs/os223.pdf>

3. Real-time Communication and Schedulability of CAN Bus

"Controller Area Network (CAN) schedulability analysis: Refuted, revisited and revised", Real-Time Systems Journal, Vol 35, No 3, pp 239—272, 2007.

“Response-Time Analysis of Mixed-Type Controller Area Network (CAN) Messages,”
<http://www.diva-portal.org/smash/get/diva2:466219/FULLTEXT01.pdf>

“Response Time Analysis of Messages in Controller Area Network: A Review,”
<http://downloads.hindawi.com/journals/jcnc/2013/148015.pdf>

4. AFDX Avionics Network

“The Evolution of Avionics Networks from ARINC 429 to AFDX”
http://www.net.in.tum.de/fileadmin/TUM/NET/NET-2012-08-1/NET-2012-08-1_09.pdf.

“A Feasible Configuration of AFDX Networks for Real-Time Flows in Avionics Systems,”
2nd International Workshop on Real-Time and Distributed Computing in Emerging Applications
(REACTION), 2013
http://e-rchivo.uc3m.es/bitstream/handle/10016/17922/feasible_REACTION_2013.pdf?sequence=1

“Response time analysis in AFDX networks with sub-virtual links and prioritized switches,”
<http://www.ctr.unican.es/publications/jig-jcp-mgh-2012a.pdf>

“Optimal design of virtual links in AFDX networks,” Real-Time Systems Journal, Volume 49 Issue 3,
May 2013, pp. 308-336.

5. Real-time Hypervisor and Virtualization

“A State-of-the-Art Survey on Real-Time Issues in Embedded Systems Virtualization,”
<http://www.scirp.org/journal/PaperDownload.aspx?paperID=18574>.

“RT-Xen: Towards Real-Time Hypervisor Scheduling in Xen,”
<http://www.cse.wustl.edu/~lu/papers/emsoft11.pdf>.

“Supporting Soft Real-Time Tasks in the Xen Hypervisor,”
http://www-archive.xenproject.org/files/xensummit_amd10/softrealtime.pdf.

“Evaluation of Real-Time Performance in Virtualized Environment,”
<http://www.idt.mdh.se/utbildning/exjobb/files/TR1180.pdf>.

6. RTSJ (Real-time Specification for Java) and SCJ (Safety Critical Java)

“Java for Safety-Critical Applications,” <http://www.jopdesign.com/doc/safecert2009.pdf>.

“Safety-Critical Java Technology Specification,” JST 302
http://download.oracle.com/otn-pub/jcp/safety_critical-0_94-edr2-spec/scj-EDR2.pdf?AuthParam=1393875070_fe7ea568b9c6bfb4afbc609625072036

“Safety-Critical Java Level 2: Motivations, Example, Applications and Issues,”
http://dl.acm.org/ft_gateway.cfm?id=2512991&ftid=1408432&dwn=1&CFID=298231030&CFTOKEN=44905163.

RTSJ, Specification 1.0.2, document, and papers, <http://www.rtsj.org/docs/docs.html>

7. Scheduling in Multi-core Real-time Embedded Systems

- Jinkyu Lee and Kang G. Shin, “Controlling Preemption for Better Schedulability in Multi-Core Systems,” RTSS 2012

- A. Bastoni, B. Brandenburg, and J. Anderson, “An Empirical Comparison of Global, Partitioned, and Clustered Multiprocessor Real-Time Schedulers,” in Proceedings of the 31st IEEE Real-Time Systems Symposium, 2010, pp. 14–24.
- Malcolm Mollison and James Anderson, “Bringing Theory Into Practice: A Userspace Library for Multicore Real-Time Scheduling”, RTAS 2013
- S. Kato, R. Rajkumar, and Y. Ishikawa, “A Loadable Real-Time Scheduler Suite for Multicore Platforms,” Technical Report CMUECE-TR09-12, 2009.
<http://ertl.jp/~shinpei/papers/techrep09.pdf>.