

Special issue on advances in scheduling resource partitions and real-time computer vision

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This special issue features state-of-the-art advancements in embedded and real-time systems and applications research. In particular, we present two papers, respectively focusing on the traditional real-time scheduling theories, and on the trendy embedded real-time applications. The two papers are:

- Enhanced Schedulability Tests for Real-Time Regularity-Based Virtualized Systems with Dependent and Self-Suspension Tasks;
- Real-Time Task Scheduling with Image Resizing for Criticality-based Machine Perception.

The first paper by Guangli Dai, Pavan Kumar Paluri, and Albert M. K. Cheng aims to enhance the schedulability tests for regularity-based virtualized systems. Real-time schedulability theories for virtual machines is a long lasting hot topic in real-time systems. Over the years, the *Regularity-based Resource Partitioning* (RRP) model stands out as a promising solution to partition computing resources. However, on top of the RRP virtual machines, the task schedulability theories are still incomplete. This paper addresses several of the open problems. First, a more generic schedulability test is proposed, where the time values no longer have to be integer multiples of the basic time-slices. Second, tasks can now have weak or strong interdependencies. Third, tasks can now be self-suspending. These solutions doubtlessly bring the schedulability theories closer to realities, paving the way for the broader adoption of virtual machines in real-time systems.

The second paper by Yigong Hu, Shengzhong Liu, Tarek Abdelzaher, Maggie Wigness, and Philip David discusses the trendy embedded real-time application of computer vision in autopiloting. Computer vision is a key method to recognize surrounding objects for autopiloting, which naturally requires real-time. However, computer vision algorithms are known to be time costly, and how to enforce real-time

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bounds are open problems. This paper finalizes a framework of solutions to properly segment video frames, a key autopiloting computer vision operation, taking into consideration of real-time demands, distance information, and other driving contexts. The paper's cross-domain approach balances the need for real-time and the need for object recognition accuracy, hence showcases an promising direction for real-time computer vision for autopiloting.

Preliminary versions of these two papers were presented at the "27th IEEE International Conference on Embedded and Real-Time Computing Systems and Applications (RTCSA 2021)," which was held online on August 18–20, 2021. Both papers are recognized as the "Best Paper Candidate" of the RTCSA 2021 conference. The authors were successively invited to submit extended versions to this special issue. We hope this special issue can further inspire our readers to explore the exciting problem space of embedded and real-time computing systems and applications.

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