

System-level Approaches to Manage Physical Overhead in Automotive Cyber-Physical Systems

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Abstract

Modern automotive systems integrate tightly coupled physical and computational components, which are referred to as **Cyber-Physical Systems (CPSs)**. These systems require **high levels of reliability** because they are used in safety-critical applications. To achieve high reliability, we intrinsically rely on redundancy; however, redundant physical components can lead to high costs, increased energy consumption, larger system volume, etc. Therefore, **physical overhead** is a prominent issue in reliable CPSs. This has motivated us to adopt an alternative approach. Our proposed approach is based on the idea that the **abundance and computational power of processing systems**, along with **adequate network coverage** in modern CPSs, can provide a means **to shift the type of redundancy**. Indeed, the goal of our research is to replace physical redundancy with nonphysical and computational redundancy (software, time, and information) so that acceptable levels of reliability can be achieved with low physical overhead.

Biography

Amin Foshati received the first M.Sc. degree in software engineering from Shiraz University, Shiraz, Iran, in 2012, and the second M.Sc. degree in computer architecture from Shahid Beheshti University, Tehran, Iran, in 2021. He recently earned his Ph.D. degree in computer engineering from the Sharif University of Technology, Tehran, Iran. From 2015 to 2020, he founded and led a startup specializing in custom hardware and software design. He is presently affiliated with the Embedded Systems Research Laboratory and focuses his research on **cyber-physical systems, digital twins, and dependable hardware/software design**.

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