

PARSECS: A Predictable Data Communication System for Smart Sensors and Hard Real-Time Applications

Micea, M.V. ; Carstoiu, G.N. ; Ungurean, L. ; Chiciudean, D. ; Cretu, V.-I. ; Groza, V. ;
Dept. of Comput. & Software Eng., Politeh. Univ. of Timisoara, Timisoara, Romania

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ABSTRACT

This paper studies the problem of data communication protocols for multiprocessor smart sensors and embedded applications with hard real-time (HRT) or critical requirements. We propose a time-triggered communication interface and set of protocols, called Predictable ARchitecture for Sensor Communication Systems (PARSECS), specifically designed to sustain, at low costs and complexity, the predictable operation of such HRT systems. The general interface architecture, data format, and communication protocols are discussed, along with a case study-the implementation of PARSECS on the full-duplex serial peripheral interface for the COllaborative Robotic Environment-the Timisoara eXperiment (CORE-TX) smart sensors platform. Its predictability, timeliness, and overall performance evaluation and validation are presented in detail based on experimental results and measurements. A comparative study with some of the most prominent systems in the field is also provided.

INDEX TERMS

- **INSPEC**

- **Controlled Indexing**

- data communication , intelligent sensors , protocols

- **Non Controlled Indexing**

- CORE-TX , PARSECS , collaborative robotic environment-the Timisoara experiment , data communication protocols , data format , general interface architecture , hard real-time requirements , predictable architecture for sensor communication systems , smart sensors

- **Author Keywords**

- Communication protocols , hard real-time (HRT) , predictability , serial peripheral interface (SPI) , smart sensors , time triggered