RESPECT: Paral·lelisme i heterogeneitat fiable per sistemes crítics incrustats

Description

The high-performance demands of the functionalities required in complex critical systems is rapidly increasing. In the space domain, on-board processing algorithms for navigation and control systems are needed to increase spacecraft autonomy; in the automotive and railway domains, advanced driving assistance systems (ADAS) and obstacle detection and avoidancesystems (ODAS) rely on deep neural networks that have high computational demands for image recognition purposes.

The capabilities required by these scenarios exceed the capabilities of current compute nodes that are mainly based on micro-controller systems-on-chip (SoC) that require centralized architectures with more powerful multi-core micro-processors and accelerators, including GPU and FPGA devices. Critical embedded software (CES) is typically designed following the strict procedures defined in safety standards (e.g., ISO14620 for space and ISO26262 for automotive) for the verification and validation (V&V) of the system.A crucial challenge for the exploitation of highly-parallel and heterogeneous architectures in the critical domain is maintaining the dependability of the system, including time and functional safety among others, while providing high-performance capabilities and considering further non-functional constraints like fault-tolerance and real-timerequirements.

RESPECT will tackle this challenge by providing a unified framework that facilitates the developmentof advanced critical software targeting parallel and heterogeneous systems from two complementarypoints of view: (1) high-performance demands, considering productivity, portability and heterogeneity;and (2) critical demands, considering time and functional safety, maintainability and resilience. To that end, RESPECT will develop an enhanced parallel programming model (PPM) and the required tools for the deployment of CES in parallel heterogeneous platforms like the Xillinx Ultrascale+ andthe NVIDIA Jetson AGX Xavier and will test its capabilities in real scenarios from the automotive,space and railway domains.RESPECT will reduce the time and expenses needed for the development and the V&V processes of parallel critical systems as required in the automotive, railway and space sectors, among others.

Barcelona Supercomputing Center - Centro Nacional de Supercomputación