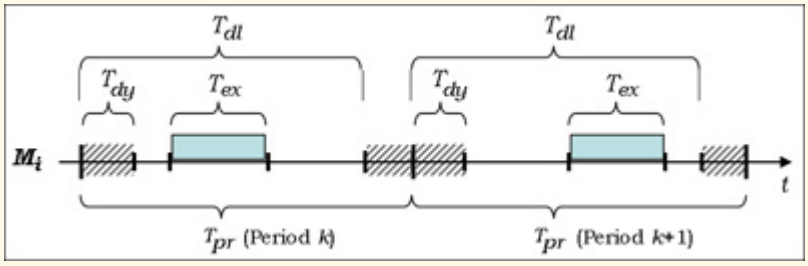
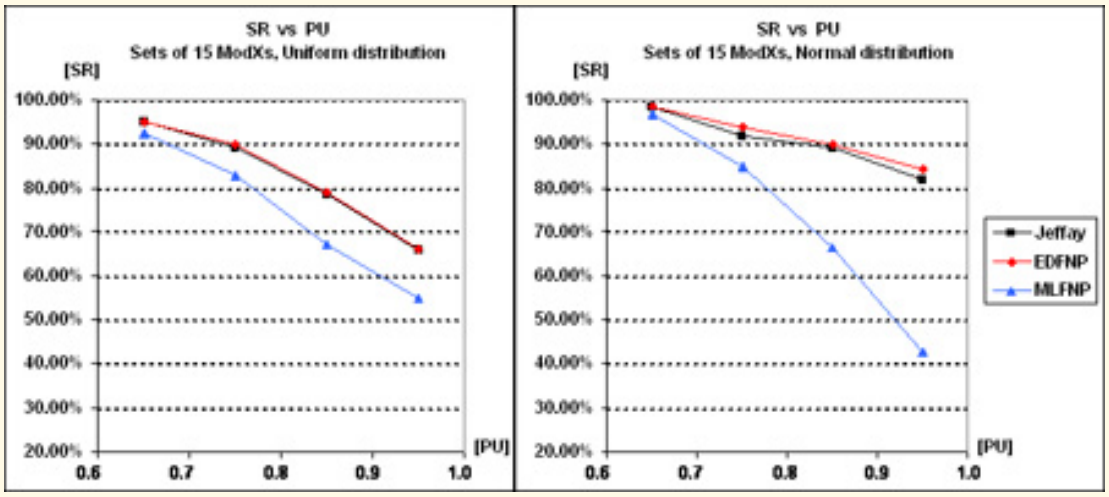
OPEN-HARTS Overview

Our research provides a set of original, theoretical and applicative solutions and results in the field of hard real-time systems for critical applications of digital signal acquisition and processing, and embedded control:

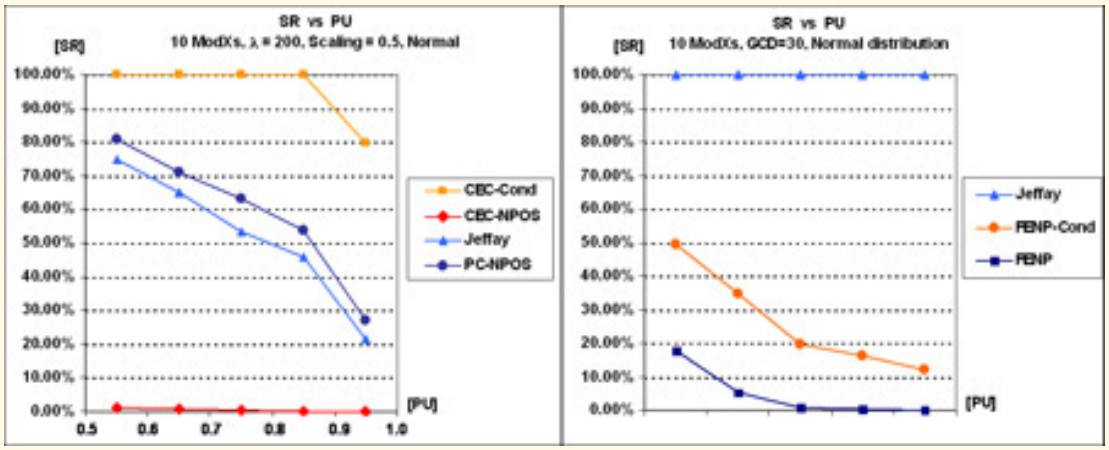
- Design, development and validation/demonstration of an homogenous set of models for signals and real-time tasks, based on a proper time representation system;



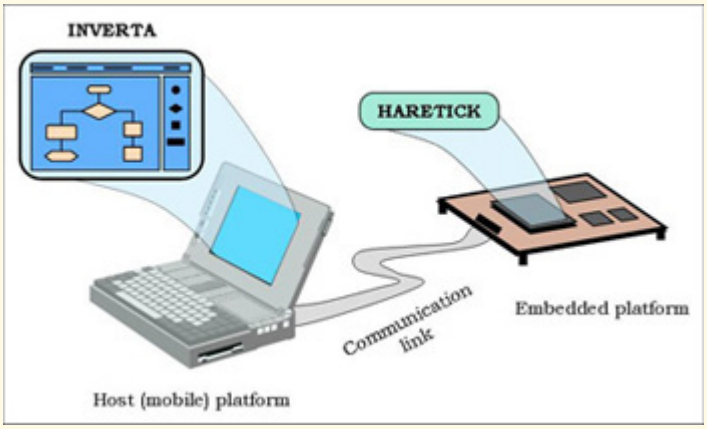
- Study and development of the methods and techniques necessary to enable proper operation of hard real-time systems to provide firm guarantees that all the deadlines will be met as specified by the critical applications, while also maximizing their operating predictability. The research focuses on the non-preemptive scheduling algorithms of hard real-time task sets and on the corresponding mechanisms needed to be developed to solve the asynchronous operating elements within hard real-time systems;
- Adaptation, analysis and evaluation of the algorithms for non-preemptive scheduling of simple, independent *ModX* sets: *EDFNP* and *MLFNP*;



- Introduction, demonstration, simulation and evaluation of the algorithms for non-preemptive *online* scheduling of *ModX* sets: *CEC-NPOS* and *PC-NPOS*, as well as of the algorithm for non-preemptive scheduling of the sets of *ModXs* with fixed execution within their respective periods: *FENP*;



- Unification into a sound methodology of the models and techniques introduced for hard real-time system development, analysis and implementation: the *OPEN-HARTS* system. Its two main components are discussed in detail: the integrated visual environment for real-time application development and analysis, *INVERTA*, and the hard real-time operating kernel for DSP-based and embedded platforms, *HARETICK*;



- Implementation of a fully operational prototype of a hard real-time operating kernel (*HARETICK*), on a DSP-based platform (Motorola DSP56307 EVM), as a case study for the models, algorithms and methods proposed and studied in the thesis;
- Design and implementation of a set of applications to test and demonstrate the correct operation of the *HARETICK* kernel, according to the proposed methodology, and consequently, to evaluate its performances. The system's ability to generate *perfectly* periodic output signals proves it can reach maximum level of predictability - a key objective of our research.