D3CoS

Designing Dynamic Distributed Cooperative Human-Machine Systems

COMPLETED

EXECUTIVE *summary*

D3CoS aims to develop new and affordable methods, techniques and tools (MTTs) that will support different steps in the industrial development process of Dynamic Distributed Cooperative Human-Machine Systems. The results of this project will improve development process and so reduce costs and time to market.

CONTRIBUTION *to SRA*

Design Methods and Tools: D3CoS will provide techniques to support the design, development and evaluation of cooperative human-machine systems. These techniques will be used in industrial Embedded System development processes and will be integrated into existing tools being used for Embedded System design.

Model-based tools and design process: D3CoS will define a generic framework for cooperative human-machine systems to abstract the commonalities and peculiarities of any given cooperative transportation system. D3CoS will further provide appropriate tools for requirements capture, specification, development or evaluation, that can be integrated in the industrial Embedded System design processes. Generic cross-domain tools will be developed and, where the application of these tools is not possible, domain specific tools.

MARKET INNOVATION *& impact*

D3CoS results will reduce effort and time to market of innovative and ambitious distributed cooperative human-machine systems. D3CoS aims to improve the quality of system design, development and evaluation through methods, techniques and tools as well as enhance support through model-based development and testing that will, in turn, reduce the cost of system design, development and evaluation leading to increased productivity and competitiveness for European manufacturers. Safety improvement for cooperative human-machine systems will be achieved by including a human-centered system design perspective and applying agent modelling techniques in early phases of the embedded system development process. Furthermore, the developed toolset will support early product design evaluations.

RELEVANCE & CONTRIBUTIONS *to Call 2010*

D3CoS targets ASP8 human-centric design of embedded systems by:

> Applying industrial embedded HMI system development processes in four different domains - Automotive, Maritime, Manned Aviation, Unmanned Aviation - to identify common as well as specific process steps and characteristics in order to define a common methodology for DCoS development combining industrial development processes with DCoS system development methodologies.

> Developing and studying models of multi-modal human-machine interaction (including computational models of human cognitive, perceptual and psychomotor capabilities) to predict potential weaknesses of cooperative systems as well as human models to infer human internal states, intentions and plausible future human actions.

> Developing and studying ES cross-domain reusable techniques, reference designs and design patterns for multi-modal input and output devices within cooperative systems.

> Developing a methodology for the DCoS development process that includes agile prototyping based on a Wizard of Oz approach to allow efficient exploration of the usually huge design space of cooperative systems in early design phases.

R&D INNOVATION *and technical excellence*

Steady, fast increasing demand for transportation, a key factor of modern human societies, obviously leads to increased traffic density and congestion in the air, on land and at sea. Combined with a system philosophy based mainly on a master (human)-slave (machine) relationship inherent in most current assistance systems, this has an adverse effect on efficiency, safety and the environment.

D3CoS goes beyond traditional assistance systems and consequently addresses the whole cooperative systems development process from a multi-agent perspective, where humans and machines inherently cooperate to achieve common, subordinate goals or tasks in order to tackle the challenges posed by future cooperative traffic environments.

The D3CoS project seeks technical excellence through:

> Open experimental simulation platform-interfacing models of cooperative human and machine agents

> Support for reusability of successful designs and design patterns for intelligent multi-modal human-machine interfaces

> Support for the reusability of designs and design patterns for (human) state inference and state adaptation

> Architectures for cooperative systems with Embedded Systems

> A common methodology to integrate the D3CoS methods, techniques and tools into an easy-to-use, reliable, valid tool chain for DCoS Development for industrial application.

PROJECT *partners*

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