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PROJECTE DE DOCTORAT INDUSTRIAL EXPEDIENT 2015 DI 022

DADES DE L'EMPRESA I DE L'ENTORN ACADÈMIC

Títol del projecte

High Performace Embedded Systems for Digital Laser Printing.

Empresa

MACSA ID S.A.

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BREU DESCRIPCIÓ DEL PROJECTE DE RECERCA

The goal of this PhD is to develop a high-speed and high-throughput digital printing solution on a high number of laser markers running in parallel (up to hundreds of lasers). That solution is currently envisaged as a scalable modular design to be implemented on an embedded platform containing a general purpose processor for image processing and management and an FPGA module to implement the parallel processing architecture that will directly drive the individual lasers. This will enable in-line digital printing of variable information across virtually any print platform, substrate or width.

The main scientific goal is to propose, design and implement the parallel processing system using state-of-the-arte technologies on FPGA such as ad-hoc hardware modules (i.e. VHDL-coded), soft-core processors (i.e. NIOS-II for Altera FPGA), interconnection resources (interconnection fabrics) and high-level languages to build parameterizable systems (i.e. OpenCL). That work must be consistent with the annotation, estimation and analysis of performance parameters at system level : speed for real-time applications and power to avoid thermal and energy issues. At the same time, this solution should be flexible in terms of its capability to be implemented in different FPGA devices according to the cost, I/O and performance requirements.

This system will be implemented using standard industrial processes in order to build the real machinery implementing the complete marking system. Some of the performance parameters expected are: (1) Laser imaging system comprises discrete fibre coupled laser diodes coupled



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to a linear array of fibres; (2) Operation of the lasers is synchronized to the product motion; (3) Monochrome 24mm wide images, expandable to 50mm, to be produced at product speeds of 2m/s with a resolution of 200dpi (127um pitch).

MACSA is considering this project inside its strategic R&D and for its development agreements have been set with several European partners such as II-VI Laser Enterprise (Switzerland), DataLase (United Kingdom), Sidel (Italy) and Tetra Pak (Unilever, Sweden). On the other side, the CEPHIS group at UAB has strategic relations with many key partners in Europe and abroad through the Hipeac network (<https://www.hipeac.org/>).

Research instays s abroad (of typically 3 months) are optional during the duration of the project according to the final PhD plan agreed with the PhD candidate. These can lead to obtain the European Mention of the industrial PhD.

Both scientific publications in conferences and journals of industrial electronics and embedded / parallel computing are expected and potentially some patents.

