Special Session on **Smart and Exotic Cameras**

Organisers

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Abstract

Under the term “Exotic/smart camera”, we aim in focusing on non-conventional cameras where researchers need of elaborating on new optical system (particular geometry, optico-mechanical system,…) or new systems combining video/data sensing, processing, and communication on a single embedded platform.
Smart and/or Exotic cameras are not simple vision devices which forward images but rather they are embedded systems that understand life scenes.

The processing capability of a smart camera can take the form of a dedicated field-programmable gate array (FPGA), a digital signal processor (DSP), a fully-fledged CPU or CPU/GPU combination or a CPU supported by an FPGA. These approaches have emerged thanks to a confluence of simultaneous advances in three key disciplines: computer vision, image sensors and embedded computing.
The interest in this subject lies in the many robotic applications in industrial as well as in domestic settings that involve visual control of robots.

Content.

Smart and exotic imaging systems combine image sensing, processing, and sometimes other sensors like GPS, Radar, depth sensors (Kinect..), linear sensor, … most of time on a single embedded platform. This approach has emerged thanks to a confluence of simultaneous advances in four key disciplines: computer vision, smart sensing, data fusion and embedded computing.

This kind of embedded systems which are able to deal with a wide range of problems, presenting several advantages which can be categorized as:

- Communication bottlenecks: embedded processing allows reducing the data communication between sensors and the host system, avoiding the bottlenecks that frequently occur in real-time image processing.
- Autonomous or Mobile devices: avoiding the use of a mainframe computer system, compact sizes (for unmanned aerial vehicles for example) and low power consumption can be obtained.
- Active perception in which a high-speed feedback link between sensing and processing is fundamental. These systems are essentially based on an intensive real-time exchange between sensing and processing units, where higher level processes drive the perception tasks. This feedback is performed at different levels, ranging from analog threshold setting and dynamic configuration of the image sensor at the low level, up to region of interest (ROI) selection at the high level.
- Camera networks: distributed processing using smart cameras have major advantages over centralized processing systems, since it avoids the transmission of large amounts of information. This has a two-fold result, in that both transmissions of sensed data as well as transmission of camera control information are reduced or even avoided.

The aim is to bring some answers to many questions which remains open such as: Why could exotic or smart cameras be more efficient? What is the best choice for a given application? Why do we need to design dedicated sensing systems?

In summary, the purpose of this special session is to create a place to share experiences and concerns while presenting the latest advances and work in progress. The secondary audience is researchers not familiar with the later developments in this field; they will find the special session interesting and informative.