María del Mar Gómez Zamora

R&D Project Manager

Universidad Rey Juan Carlos. International Excellence Campus "Smart Energy"

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Bilateral Meetings

- Wednesday (10:00am - 12:00pm)
- Wednesday (12:00pm - 2:00pm)
- Wednesday (2:00pm - 4:00pm)
- Wednesday (4:00pm - 6:00pm)

Description

- Rey Juan Carlos University is a public University located in Móstoles, Madrid, (Spain). Is the most modern of the six public universities in the Autonomous Community of Madrid, provides teaching for some 35.000 students on four different campuses. The University´s commitment to teaching and research excellence and its collaboration with industry and business, combined with technological facilities and a marked international profile, make the URJC a point of reference among Spanish Universities as they face the challenges of the 21th century. The URJC is fully committed to undertaking academic research as is evidenced by its own initiative to offer incentives to increase scientific output.
- The Campus of International Excellence (CEI) "Smart Energy" project is based on two areas of significant scientific, social, and economic importance: bioenergy and smart infrastructures. The project is originated from the integration of the following institutions: Two public universities: Universidad de Alcalá (UAH), Universidad Rey Juan Carlos (URJC), two Spanish multinational companies: FERROVIAL and REPSOL: two public research organisations: Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas (CIEMAT) and Instituto Madrileño de Estudios Avanzados en Energía (IMDEA-Energía); a public corporate entity, attached the Ministry of Industry, Tourism and Trade: Instituto para la Diversificación y el Ahorro de la Energía (IDAE). CEI "Smart Energy" is a joint project involving seven institutions and is committed to looking at two important challenges in today's society: replacing fossil fuels, and rational use of energy through the design of more efficient infrastructures. The objective of CEI "Smart Energy" is to build an internationally renowned campus with strong business links in the field of Bioenergy and Smart Infrastructures, based on an open, innovative, networked university model, which creates leaders and entrepreneurs that promote local social-economic development, leading to increased social impact of university activities. The project's strategic objectives are: to create an environment of multidisciplinary excellence for teaching and research; to foster cooperation and competence both internationally and in the local sector; to encourage mobility and attract talented researchers, teachers, professionals, students and citizens and to commit to undertake corporate social responsibility actions with a socioeconomic impact, in terms of tecnology transfer to society and job creation.

Organization Type
University
Organization Size
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Areas of Activities

SMART SOCIETY

1. empowerment
2. entrepreneurship
3. apps for society

TECHNOLOGY

1. sensors
2. Internet of things cloud
3. big data
4. apps
5. security
6. public safety
7. emergencies

ENERGY

1. renewables
2. grid architecture
3. storage
4. zero carbon
5. efficiency
6. management
7. electricity
8. metering

MOBILITY

1. Intelligent transport systems
2. mobility on demand
3. sharing services & infrastructures
4. electric vehicle

5. parking
6. car fleets
7. transport investments (Markets & Projects)

SUSTAINABLE CITY

1. green building
2. water & waste management
3. urban redevelopment

Offer

IoT Security support for industrial remote facilities

These are the two R&D fields of interest of the HwSw Design Group where we want to be in the near future and where we have been working recently on: hw acceleration of algorithms for high-volume data transfers of seismic traces and hw-sw security framework for IoT networks.
The HwSw Design Group has a vast experience in delivering ad-hoc hardware-software solutions able to increase the performance of algorithms implemented for a great variety of systems. For example, FPGA-based prototype boards (implementing an Intel comercial microcontroller with clock cycle precision for INDRA EUROFIGHTER typhoon), HPRC cluster (image content-based retrieval and Montecarlo financial simulations) or GPU/MultiGPU and Altamira UNICAN, MareNostrum BSC supercomputers (Compression/Decompression algorithms for increasing the seismic data transfers).
We won the 2015 Campus de Excelencia Internacional “Smart Energy” first prize with the “IoT: iluminación eficiente inteligente y segura en redes abiertas (URJC-UAH)” proposal with the ZWIT Project support.
We closely work with URJC and UAH research groups in big data analysis and lighting efficiency.
IP: José Ignacio Martínez Torre, Javier Castillo Villar

Keywords: HPC GPU Embedded Systems Security Big data
Cooperation Offered

1. Investment/Financing
2. Technical co-operation

Offer

Smart Fussion Wireless sensing For Energy Efficiency in Smart (Universidad Rey Juan Carlos)

The environment of the Smart Cities concept, generates a large amount of unstructured information of varying reliability and multiple sources. That is why draw conclusions from a simple aggregation of data is far from the optimal strategy. Our research group point the process of data acquisition sensors, wireless communication and efficient extraction patterns as an integral process . Reliable information retrieval and reconstruction of significant data from multiple types of sensors (temperature, presence , movement, light , etc.) behaviors. In particular we work to measure

consumption / energy efficiency of buildings and instruments for high quality traffic to optimize applications journey times . We are specialized in data fusion for optimization of energy consumption. IP: Julio Ramiro y Antonio Caamaño

Keywords: Wireless consumption data fusion
Cooperation Offered

1. Technical co-operation
2. Investment/Financing

Offer

Algorithms, methods, technologies and systems for big data analysis and engineering.

Today, organizations in any activity sector must confront the analysis of large and complex datasets that cannot be attained with conventional computing resources. These datasets frequently include structured data (such as relational databases, data warehouse systems, or well-defined hierarchical files) and unstructured data (such as textual fields containing free text, sometimes in multiple languages, or multimedia data files and streams). Furthermore, some of these datasets can be saved in distributed, disk-based file systems for batch processing, whereas in other cases it is required to process data streams as they become available (e.g. to interactive results to inform the analyst or feed other systems). In this context, it is required to design and build advanced systems for data engineering and analytics tailored to these situations. We have a well-established expertise in the design, implementation and deployment of key components for big data systems.
- Scalable and efficient methods and tools for data harvesting, cleansing and preparation
Our group designs and implements methods and tools to retrieve large data sets from multiple sources that may be static (such as data dumps or files from open data repositories) or dynamic (data imported in real-time from social networks, sensor networks, online transactions, etc.). We use multiprocessing and distributed computing strategies implemented in Python or Java to acquire and consolidate these datasets, supporting diverse standards (HDFS, Parquet, S3, XML, JSON, CSV, HDF5), advanced solutions for data ingestion and searching (Apache Flume, Apache Kafka, Solr), along with relational and unconventional databases (MySQL, PostgreSQL, MongoDB, Tokutek, Aerospike).

- Hybrid methods and tools for stream processing and in-memory data processing
Our group is pioneer in working with the new breed of big data technologies for stream and in-memory data processing, in particular Apache Spark. This project has rapidly established as the new industry standard for either streaming processing or hybrid platforms combining batch and streaming processing. Additionally, we work with technologies and components from leading providers in big data and scientific programming in the market, such as Databricks, RStudio or Continuum Analytics, among others.

- Machine learning algorithms and tools for complex datasets
Our group is actively working on design and implementation of advanced machine learning algorithms and tools tailored to the analysis of complex datasets: large and distributed data volumes, dynamic analysis of streaming data or highly dimensional datasets. We are specialized in the integration and analysis of heterogeneous datasets mixing structured and structured sources. Our solutions incorporate advanced statistical models and techniques such as

Bayesian methods, cluster analysis (k-NN, dynamic k-means in stream processing) and scalable classification systems (SVMs, random forests, bagging, ensemble methods, etc.).

- Content classification and opinion mining with complex datasets
Vast amounts of textual information from social systems in corporate environments and Internet (knowledge management platforms, microblogging, social networks, customer feedback and opinion) can be retrieved and analysed to gain knowledge about opinion streams targeting different topics (brands, products, projects, leaders, breaking news, democratic processes, etc.). Our group actively works in the design and implementation of high-performance algorithms, methods and information systems for large-scale classification of multimedia content and opinion mining, involving heterogeneous and very noisy datasets (a typical issue with internet data sources). In this regard, we have developed specific algorithms to enable efficient computations in these problems, which frequently entail working with highly sparse matrices.
PI: Javier Moguerza, Felipe Ortega.

Keywords: big data key components
Cooperation Offered

1. Technical co-operation
2. Investment/Financing

Offer

Advanced Decision Support Systems

Decision Support Systems (DSS) provide assessment and insights to backup decision-making processes. The availability of massive data sets from inside and outside of corporations and organizations paves the way for designing and implementing advanced DSS enabling interactive, data-driven decision-making with information that is presented and updated almost in real-time. Our group has a solid background in the design, implementation and deployment of vertical solutions for DSS: integrating data acquisition from multiple sources; high-performance distributed computing; statistical methods and models for predictive analytics (Bayesian models, stochastic programming, linear and non-linear optimization); and intuitive dashboards. We have covered different application areas including monitoring the development of online collaborative communities, collaborative software projects, or energy efficiency in large buildings, based on real-time information provided by sensor networks and covering decision-making for the short and long-term, alike.
PI: Javier M. Moguerza, Emilio López Cano.

Keywords: DSS decision-making massive data
Cooperation Offered

1. Technical co-operation
2. Investment/Financing

Offer

Data governance and quality: assessing integrity and quality over the complete data lifecycle

Data preparation and cleaning tasks are consistently reported to take up to 80% of the total effort in the implementation and deployment of big data systems. In spite of this, many companies still face serious problems to provide an accurate assessment about the completeness and quality of their data sources. This problem is aggravated by the existence of the so-call information silos, especially in large corporations: different divisions, departments and groups maintaining their own databases, data warehouse systems and data repositories. Oftentimes, the content stored in these silos is not integrated at all among them. This creates unnecessary redundancies (e.g. storing duplicated information in different systems) and hinders opportunities to leverage the real value of corporate data sources through the exploitation of connections, correlations and dependencies found among different factors. Our group can provide extensive assessment in the design and implementation of data governance and data quality processes, taking care of the whole data lifecycle from harvesting, through processing and modelling, to presentation. For instance, we design and implement methodologies and tools for automated data monitoring, preparation and cleaning or provide assessment in selecting the best-suited data sets to align data analytics and business intelligence with corporate goals and business process.
PI: Felipe Ortega, Emilio López Cano.

Keywords: big data assessment so-call information silos
Cooperation Offered

1. Other
2. Technical co-operation

Offer

Video surveillance system and intelligence monitoritation.

The technological solution offered is characterized by the use of non invasive sensors. They can be located in any environments of interest: microphones arrays, video and depth cameras (time of flight cameras) including the fusion of information provided by each of them.
The extraction of attributes is made from the information obtained by the sensor system. With that information we can make the identification, localization and tracking of objectives (multimodal information extraction), the extraction of physical attributes (presence and characterization of users, and other acoustic or visual elements and events of interest), and the extraction of semantics related to the appearance or basic human behaviors (e.g. fall detection).
The selection of the sensors to be used and the information fusion strategy, will depend on the system objectives (objects and people detection, behavior information extraction, privacy considerations, etc.), on the environmental conditions (illumination changes, absence of visible light, indoor and outdoor scenarios, etc.), and on the environment characteristics (space size, objects size, the population to be monitored, etc). As an example: the use of time of flight cameras allows to obtain information of the environment without invading the users privacy, what is very interesting in many applications.
This technological solution can have many different applications in several sectors: Homes' monitoring and surveillance (with security aims, monitoring of elderly users of users with disabilities, etc), people counting for capacity control,

railway systems control (object detection on level crossings, tunnels' entrance and exit, people counting at the entrance and exit of passengers, etc.). PI: GEINTRA Group.

Keywords: Video-surveillance security interaction with the environment behavior and activity monitoring.
Cooperation Offered

1. Technical co-operation
2. Investment/Financing

Offer

Ultrasonic localization and positioning system for extensive indoor spaces.

The local positioning system is based on ultrasonic emitters located on the ceiling or high places. The receptor sites are located on the nodes to be located over the ground or placed on it. The ultrasonic beacons are encoded with different binary sequences (using DS-CDMA as multi-access technique) and modulated to the ultrasonic frequency of interest (around 40 kHz). The transducers used ensure the avoidance of noise caused by audible sounds. The system is characterized by the absence of synchronization between emitting beacons and receiving nodes. Each receiver node calculates its position independently and privately. There is not limit on the number of nodes simultaneously located. The deployment is made from modules of 4 or 5 emitters assembled in a joint structure. It has a coverage area on the ground of about 50 m2. Either 2D or 3D positioning can be undertaken with this number of emitters in each module. Many modules of this type can be used as required, with coverage areas that can overlap, depending on the needs of total space to be covered. In the initial deployment the system needs to be calibrated which means that the coordinates of the emitter beacons have to be determined; This is done automatically with a mobile robot carrying a receiving node or in a semiautomatic mode, takingmeasurements manually from several known positions. Once the first module is calibrated, the remainder are referenced to it, also in an automatic or semiautomatic mode.
The positioning method is based on hyperbolic trilateration from differences of the time of flight. The low-level and high-level algorithms are prepared to tolerate high levels of sound noise (e.g. tests were conducted with drills connected near the localization of the tests), to minimize the effects of multipath propagation (which are the most common errors introduced in such systems) and near-far effects (so that the farthest beacons are not blinded by the nearest. The positioning accuracy achieved is centimeter, even in relatively hostile environments. The system permits up to about five position updates per second.
To sum up, it is a low cost system that has been tested for the navigation of mobile robots with algorithms that merge external location information provided by the ultrasonic system with the one of the robot dead reckoning. Its adaptation and use in other applications (people or objects location) is immediate and you have just to analyze the location of the receiver microphone to avoid, at least in a sufficient number of cases, the ultrasonic signal direct path obstruction. PI:Jesús Ureña Ureña.

Keywords: Ultrasonic positioning systems indoor navigation signal encoding automatic calibration.
Cooperation Offered

1. Technical co-operation
2. Investment/Financing

Offer

Definition and design of efficient complex embedded systems.

Throughout its story the research group has achieved a remarkable experience in the design and development of electronic embedded systems. They are based on different types of devices such as general purpose processors, digital signal processors, or programmable logic devices (FPGA). This work has been carried out with the successful completion of numerous previous research and technological projects, in which they have addressed the design of such electronics systems.
Previous developments have focused on various application areas. Among them it stands out for its current relevance the design of last generation communication systems, the design of electronic power converters for renewable energy and the design of rail transport electronic systems, among others.In each of those fields an analysis of different algorithms and proposals has been carried out. The study of the most efficient architecture for the required needs, the algorithm adaptation and optimization to the architecture, and finally its implementation and starting up. This involves the development of a systematic methodology but with enough flexibility to carry out the efficient implementation of signal processing algorithms in various kinds of embedded systems. Their competitive advantages can be found in the high frequencies achieved, response times, the systematization of tests and verification, safety approvals, etc. PI: Álvaro Hernández Alonso

Keywords: Embedded systems FPGA systems System-on-Chip digital signal processing.
Cooperation Offered

1. Technical co-operation
2. Investment/Financing

Offer

Smart sensors for energy efficient cities.

The highest energy costs of cities are focused on transportation systems and heating/refrigerating systems. The development of different technologies specially designed to optimise the energy consumption needs to deal with both type of systems to have a proper impact. Following this statement, a research group of the University of Alcalá has developed two main new technologies. On the one hand, a set of smart sensors have been created to optimise the use of transportation systems in urban environments. Among them we remark:
- Signalised roundabouts and intersections, adaptive to the current traffic status.
- Adaptive traffic monitoring and management.- SmartCross: optimal traffic lights timing by pedestrian detection in pedestrian crossings.
- Prioritising public transport vehicles in roundabouts and intersections.
- Outdoor parking slots monitoring by a fleet of public transport vehicles applied to reduce the time needed to find a free parking slot.
On the other hand, thermal imaging technology is also available to identify homes and buildings that may need improvements in their isolation installations. A specially vehicle is equipped with

infrared cameras, GPS and range-based sensors. It takes thermal images of homes in winter and summer months to automatically identify buildings showing poor isolation capabilities (heat and cool losses trough poorly isolated walls, windows and roofs). These images contain information about the global positioning of each one of the buildings analysed. Thus, digital and interactive maps can be provided to the user, including specific information about thermal isolation of each of the elements analysed by the system. PI: Miguel Ángel Sotelo Vázquez
David Fernández Llorca

Keywords: Traffic Engineering/Control Systems 4.6.4. Thermal insulation energy efficiency in buildings 1.2.3. Artificial Intelligence (AI) 1.2.12. Imaging Image Processing Pattern Recognition
Cooperation Offered

1. Technical co-operation
2. Investment/Financing

Offer

ILCS (Intelligent Lighting Control System)

La presente tiene como objeto la implementación de un sistema electrónico de control de encendido/apagado y/o atenuación de la luminaria de farolas viales de túneles, carreteras, autopistas o autovías en función de la presencia/no-presencia de vehículos en dicho vial. Esto viene justificado ante el alto grado de ineficiencia del gasto de energía en numerosos tramos de túneles/carreteras/autopistas/autovías ya que durante ciertos intervalos horarios (sobre todo de madrugada) apenas existe, o simplemente no existe, circulación dentro de una vía.
Gracias a la introducción de nuevas luminarias basadas en LEDs, (Light Emitting Diode) se abren nuevas posibilidades de control y manejo de la cantidad de iluminación deseada en cada momento, que antes no era posible debido al tiempo de re-inicialización de las lámparas de mercurio y vapor de sodio (lámparas de gas). En los sistemas comerciales actuales, la reducciónde la luminosidad se suele realizar mediante el uso de un interruptor de hora astronómico que
permite apagar un porcentaje de las farolas llegada una cierta hora de la noche y encender en la madrugada. Sin embargo, este sistema deja bastante que desear en cuanto a generación de una iluminancia uniforme, no cumpliendo las normativas actuales. El sistema propuesto realiza un control adecuado en el nivel de luminosidad de las farolas en función de la distancia a la detección de un coche. La mayor parte de los sistemas comerciales están basados en controles centralizados del sistema de alumbrado viario, incluyendo en cada farola un sistema pasivo todo/nada.
El proceso de determinación del momento en el que se debe realizar el encendido de las diferentes luminarias, es otra de las contribuciones notables de la presente.
Para alcanzar lo anteriormente expuesto es necesario implementar un sistema de detección de movimiento de vehículos/usuarios así como de un sistema de comunicación inteligente y autónoma entre luminarias. La presente propuesta apuesta por un sistema descentralizado donde

cada luminaria se comporta como un nodo, no necesitando la existencia de un servidor central. En este sentido se tiene una red de comunicaciones en malla siendo todos los nodos de similares características, sin control global y sin nodos centralizados. Cada nodo tiene una identificación única. Para ello, la presente patente, hace uso de un sistema de identificación basado en las coordenadas GPS (Global Positioning System) en cada una de las farolas.
Otra de las principales novedades de la presente patente, es el uso de comunicaciones inalámbricas basadas en tecnología Wi-Fi (IEEE 802.11]) y/o ZigBee (IEEE 802.15) que permiten comunicaciones entre los diferentes nodos sin necesidad de cableado especial y que consiguen la generación de una red mallada sin necesidad de nodo central.
El sistema electrónico empleado para la detección de movimiento está basado en un sistema multi-sensorial formado por uno o varios de los siguientes sistemas sensores:
•Sensor de Microondas: Encargado de detectar el vehículo que llega por la izquierda (según el sentido de circulación español) mediante la reflexión de una onda electromagnética de rango comprendido dentro del campo de las microondas (entre 1 GHz y 300 GHz).
• Sensor de Infrarrojo: Su operatividad es análoga al sensor de microondas. Su uso está pensado como sistema sensorial de detección redundante con objeto de detectar un vehículo en las mejores condiciones posibles, pudiendo fusionar múltiples datos sensoriales.
• Sensor de visión CMOS: Las imágenes captadas por este sensor serán procesadas por el microprocesador con idea de fusionar la información derivada de ellas junto a la del resto de elementos sensoriales con idea de tener mayor fiabilidad a la hora de establecer un vehiculo candidato
•Acelerómetros. Gracias a ellos se detectarán vibraciones que puedan conducir a la conclusión de la presencia de un vehículo
•Microprocesador: Es la parte inteligente del sistema encargada de la toma de decisiones
Debido a la introducción en el sistema de un control inteligente electrónico, es posible xplotar el uso de éste en otras tareas ya que la carga computacional asociada al control de luminarias es baja. De esta forma se apuesta en la presente propuesta por la articulación de mecanismos de comunicación entre vehículos (V2V) o entre los vehículos y la infraestructura (V2I). Gracias a la red mallada presentada es posible la transmisión de información entre dichos elementos con objeto de lograr aplicaciones ITS como pueden ser detección y transmisión de accidentes a coches próximos, conteo inteligente de vehículos, recepción de información en tiempo real en cada vehículo, etc. PI: Ignacio Bravo Muñoz

Keywords: Eficiencia energética Luminarias LED encendido/control inteligente sistema basado en microprocesadores ITS
Cooperation Offered

1. Investment/Financing
2. Technical co-operation