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Research profile:
Currently he is professor in the Department of Automatic Control and Industrial Informatics, Faculty of Automatic Control and Computers, University POLITEHNICA of Bucharest. Between 2012 and 2016, Dan Popescu was vice-dean, responsible for research in the Faculty of Automatic Control and Computers. He is the head of the research laboratory "Processes and Innovative Products to Improve the Quality of Life" from the PRECIS Research Centre.

Research areas of interest are: the complex processing of images, parallel processing of images, multilevel wireless sensor networks, pattern recognition in medical imaging and remote imaging, signal processing by data fusion and consensus, environmental monitoring, management of wastewater, diagnosis based on images, multi-UAV systems for monitoring in precision agriculture and critical infrastructure.
He published many articles in the mentioned topics, together with PhD students and post-doctoral researchers in ISI journals or ISI proceedings of conferences. He organized special sessions at several international ISI conferences (TSP 2016, ICSTCC 2015 and 2016) with the main theme of the image processing for monitoring, diagnostics and control.
Professor Popescu is a doctoral coordinator from 2009 with:

- 9 thesis completed;
- 14 thesis in progress.

Scientific publications: 25 monographs/ book chapters; 72 journal papers and 254 conference papers.

Research projects – project director (last 10 years):

- SYSTEM FOR TRACKING, LOCALIZATION AND DATA ACQUISITION COLLECTION OF FROM MOVING OBJECTIVES THROUGH MOBILE SENSOR NETWORKS (PNCDI 2 – Program 4) no.11-040/14.09.2007, beneficiary: CNMP, competition 2007, 2007-2010
- CELL-BASED PROCESSING OF VIDEO AND MEDICAL DATA FLOWS FROM AMBULANCE NETWORK – EMERGMED, IBM Faculty Awards, 2008 edition
- MONITORING SYSTEM FOR INDOOR AIR QUALITY THROUGH WIRELESS SENSOR NETWORKS, UEFISCDI, CEC innovation, C149/2012, 2012-2013
- MULTISENSORY ROBOTIC SYSTEM FOR AERIAL MONITORING OF CRITICAL INFRASTRUCTURE SYSTEMS, RDI Program – STAR, beneficiary: ROSA, 71/2013, 2013-2016
- MULTI-DRONE SYSTEM FOR THE ASSESSMENT OF THE FLOOD EFFECTS (SIMUL), project director, BRIDGE GRANT – PROGRAM, beneficiary: UEFISCDI, 2016-2018
- INTEGRATED MULTI-AGENT AERIAL ROBOTIC SYSTEM FOR EXPLORING TERRESTRIAL REGIONS OF INTEREST (MAARS), RDI Program – STAR, beneficiary: ROSA, 185/ 2017, 2017-2019
- INTEGRATED UAV-WSN-IOT INTELLIGENT MONITORING SYSTEM FOR PRECISION AGRICULTURE, MUWI, NETIO subsidiary, POC Program, beneficiary: UEFISCDI, 2018-2020

Others:

- IEEE member
- SRAIT member
- Editor invited session at TSP, ICSTCC, MED, ICIAP, CoDit, IDAACS
- Special issue editor at SENSORS
- Scientific committee member at IWSSS (ECAI), IAFA, ICONIP 2019.

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Doctoral research themes proposal

1. Processing of the complex images using correlated chromatic information

By correlated analysis of all colour channels or spectral, the efficiency and accuracy of classification and segmentation may be increased substantially in the case of complex image types like fractal or texture. The main goal is to find new methods and algorithms for calculating the features extracted from the inter spectral co-occurrence matrix or colour fractals. Specific objectives are: a. Calculation of inter spectral co-occurrence matrices. b. Choosing the best features based on performance criteria. c. Extracting fractal features considering the correlation between the colour channels. d. New criteria for classification and segmentation of complex images. e. Implementing parallel algorithms and neural networks for image segmentation in order to assess disasters such as floods and landslides.

2. Multilevel embedded network for complex indoor monitoring

Instead of a single large sensor network, the system integrates various smaller wireless sensor networks, clustered in an indoor area, delimited geographic and possibly interconnected by optical fibre via a control node (management node) with functions for switching or routing, protocol conversion and data processing. The goal is to develop a hybrid, multilevel sensor network, characterized by high speed, intelligence, scalable, with following tasks: data acquisition, identification, localization, communication, visualization and decision.

Objectives: a. Creating an integration technology of sensor networks in multi-level hierarchical structure like SoS. b. Development of methods and techniques on the network to configure itself to different levels of integration. c. Development of methods and algorithms to combine data from integrated networks, with dynamic topology of the nodes. d. Developing methods and adaptive mechanisms to secure data transmission through integrated networks. e. Design and implementation of integrated network functional model.

3. *Complex processing methods for medical image databases*

Creating an image database network, distributed in medical units and interconnected in a national system, it is of great importance both for medical diagnosis support services, research and evaluations related to medical insurance systems. Methods for data mining and diagnosis based on images are investigated in such areas as retinal diseases, cancer, mammograms, stress, depression and so on.

4. *Collaborative neural networks for segmentation and classification of regions of interest in medical images.*

Two aspects are of interest in the analysis of medical images: assessment of the degree of disease progression and segmentation of lesions with a good resolution. Although the two are in correlation, they are usually studied separately. The degree of disease severity is treated as a classification problem, which does not require image-level annotations, while segmentation of lesions requires more pixel-level annotations, being done by experts. We propose a method of classification and segmentation that takes into account the two aspects using collaborative neural networks in the learning process.

5. *Classification of emotions using neural networks and voting schemes.*

6. *Intelligent management systems in the domain of waste waters*

In the field of water treatment we distinguish two types of systems: systems for treating water for feeding water parameters at the right level for human consumption and installations for wastewater treatment, designed to destroy various factors pollutants in order to safety flush the waters used for purposes household or industrial. The goal of the research is to create an intelligent management of waste water treatment, with the following specific objectives: a. Inclusion of the equipment in the concept of SMART CITY. b. Creating an intelligent control system which takes into account historical data for more efficient control of processes. c. Reducing energy consumption. d. Reducing times for maintenance and ongoing analysis, real-time parameters to stipulate any facilities for events. e. Installation of intelligent sensors which communicate with a central control system for automatic metering of households and industrial consumers.

7. *Intelligent system for complex services in high performance agriculture based on the fusion of soil-air sensory data*

In terms of technical and scientific use of data from the drones and from the ground sensors in agriculture, at low level, it is an innovative method that can help to increase crop yields and reduction of chemical fertilizers and herbicides, which leads to profitability, human health and reducing environmental impact.

The purpose of research is to integrate the concepts of "wireless sensor network" and "unmanned aerial vehicles" in a collaborative system based on the fusion of data from the two sources. Specific objectives: a. Design and implementation of terrestrial network of sensors. b. Adapting a fixed wing type platform - UAV - for flights over a surface and collect images or data from ground sensors. c. Creating a database specific for precision agriculture at local farming concerning data collected and processed and history of crop surfaces.

8. *Integrated system UAV- WSN- Internet for environmental monitoring.*

The main objective of the theme is the implementation of a multi-UAV system (fixed wing) for the accurate evaluation of ground-air parameters over large areas. The advantage of the multi-drone system is the increase of the coverage area and the decrease of the operating time. The final result of the research will be a multi-drone collaborative system ordered from a distance, via the Internet, to carry out a mission to detect and evaluate flood disaster areas. Through simple configurations, the system can also be used in other data collection missions (or images) from disaster-affected areas. Objectives: 1. Implementation of communication modules between drones. 2. Elaboration of a software package for image processing and analysis for detecting, locating and evaluating the size of flooded areas. 3. Elaborate a functional model of ground control station (GCS) capable of controlling several drones simultaneously. 4. Implementation of parallel algorithms and neural networks for segmentation of aerial images in order to evaluate disasters such as floods and landslides. 5. Implementation and testing of a functional model containing two drones and two GCSs.

9. *Digital diagnostic system supporting clinical decisions by integrating various medical sources*

A platform will be developed that will use the information provided by the most relevant diagnostic means for a particular area, resulting in an accurate, detailed, structured, systemic and priority assessment of a patient's health. Various data sources will be integrated, such as medical records, in vitro and / or in vivo diagnostics, medical imaging, functional tests (on-chip lab), etc., taking into account, at the same time, the real, particular needs of practitioners.