ALINA LILIANA TRIFAN

TIME-CONSTRAINED COLORED OBJECT DETECTION FOR INTELLIGENT ROBOTS

Field: Computer Science

Advisor name: António José Ribeiro Neves, Assistant Professor

Co-advisor name: Manuel Bernardo Cunha, Assistant Professor

Department: Departamento de Engenharia Electrónica e Telecomunicações

Date: 16-02-2016

My present job: Unemployed

Abstract:

Object detection in digital images with small computational costs and processing time is a necessity of some of the most diverse domains, such as robotics, video surveillance or traffic analysis, among others. With current advances in technology and the decrease of prices in image sensors and video cameras, nowadays digital cameras can acquire images at high resolutions and frame rates. This means that a great amount of visual information has to be processed in a small amount of time. This Ph.D. addresses the problem of time-constrained detection of colored objects and uses as a test bed intelligent robots that play soccer in an autonomous manner. This work is integrated in the Intelligent Robotics and Systems Laboratory from the Institute of Electronics and Informatics Engineering of Aveiro of University of Aveiro. The autonomous robotic soccer team CAMBADA was the test bed of all the work developed during this Ph.D. The objective was to present a modular solution of a vision system that could be used for time-constrained color detection in the aforementioned robotic project. Algorithms for colormetric camera calibration, optimal image scanning and colored blob formation have been designed and based on them functional robotic vision systems have been developed. These vision systems have been used in real adversarial soccer scenarios and the results obtained prove their efficiency. Moreover, all the developed algorithms and software have been aggregated within a computer vision library, which is both free and open source and designed for time-constrained colored object detection. In addition, several support tools have been implemented as well, as tools for remote monitoring or color calibration of a robotic vision system.

How my research is having impact:

The research that I have conducted during my PhD is relevant for the area of Computer Vision since it introduces new approaches for time-constrained color detection. The work that I have developed resulted in an open source software library, available to the research community for use, tests and further improvements. For the worldwide community of researchers in RoboCup, my research focused on multiple aspects involved in the autonomous robotic soccer.