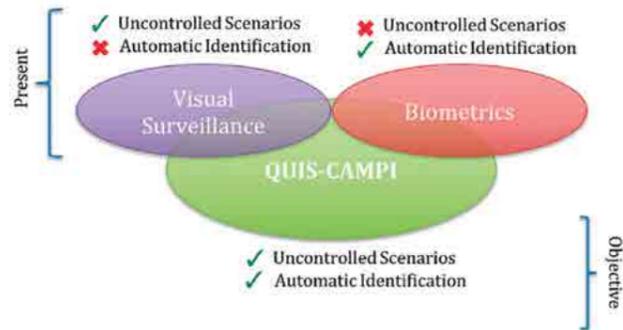


Biometric Recognition in Surveillance Environments

The term QUIS-CAMPI summarizes the project goals: “Quis” stands for “Who is” and “Cam-pi” refers to “delimited spaces” (plural of campus). Hence, this project focuses on the research and development of a biometric recognition system able to work in fully covert conditions, inside a delimited space, under conditions similar to the currently deployed visual surveillance systems.



Main Project Team	
Hugo Proença	PIA-Cv
Paulo Lobato Correia	MSP-Lx
Luís Ducla Soares	MSP-Lx
Jaime S. Cardoso	INESC-UP
Paulo Fiadeiro	RDU/UDR-UBI
Indicators	
Funding	40k €
Journal Papers	11
Journal Special Issues	3
Conference Papers	9
Concluded PhD	1
Concluded MSc:	2

Two Main Publications	
Hugo Proença, João C. Neves, Silvio Barra, Tiago Marques, Juan C. Moreno; Joint Head Pose / Soft Label Estimation for Human Recognition In- The-Wild, IEEE Transactions on Pattern Analysis and Machine Intelligence”, doi: 10.1109/TPAMI.2016.2522441, 2016. (in press)	
Hugo Proença, Ocular Biometrics by Score-Level Fusion of Disparate Experts, “IEEE Transactions on Image Processing”, 23(12), pag. 5082-5093, 2014.	

PROJECT WEBPAGE URL
<http://quiscampi.di.ubi.pt/>

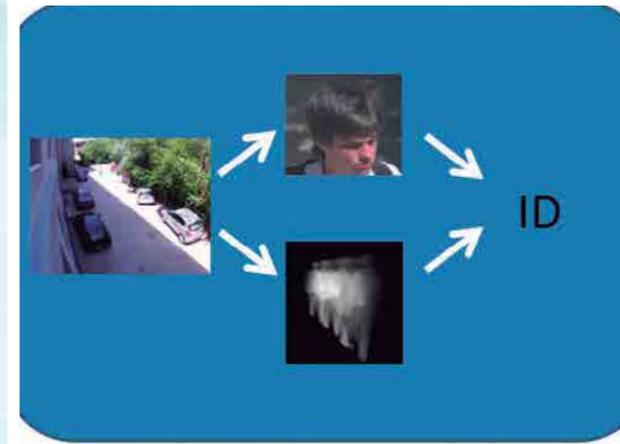


Fig. 1 Two main steps of the QUIS-CAMPI processing chain. The first step analyses the whole scene and extracts high resolution images of the subjects heads (full-hd resolution) and silhouettes of the walking person. The second step performs biometric recognition.

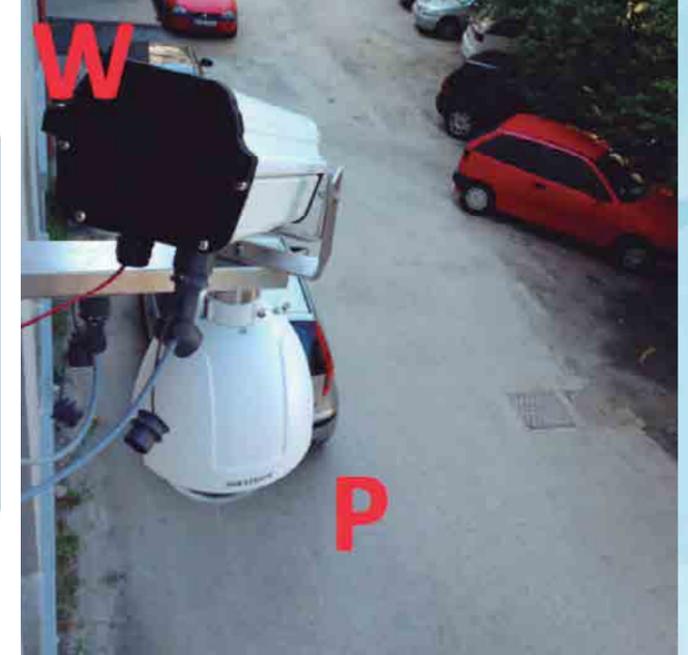


Fig. 2 Example of a synchronized pair of wide-view (W) and PTZ (P) cameras, from the QUIS-CAMPI laboratorial prototype mounted inside the University of Beira Interior campus.

GENERAL MOTIVATION AND OBJECTIVES

Recent attacks in crowded urban environments reduced the perception of safety that citizens have, particularly during major sports, political or social events (due to e.g., 2004 Madrid train bombing, 2013 Boston marathon attacks, 2015 Paris and 2016 Brussels attacks).

It is hard for authorities to confirm whether dangerous individuals are among a crowd, which augments the fear of citizens. To counter-balance this fear, visual surveillance systems are deployed in many cities, but contrary to popular belief, there are no automatic techniques to identify subjects without requiring their participation in the data acquisition process. International police agencies have lists of potentially dangerous individuals, which can only be detected by human verification. As an example, the “TIDE: Terrorist Identities Datamart Environment” from the U.S. National Counterterrorism Center has over 745,000 people listed in the database, whom authorities are willing to arrest.

Hence, the idea in this project was to create systems for automated recognition of humans in urban crowded environments. To realize this vision, we use coupled visual surveillance and pan-tilt-zoom (PTZ) devices, in order to collect high resolution data from outdoor crowded scenarios.

CHALLENGE

Currently, a large number of visual surveillance systems is deployed worldwide. However, their automated analysis is constrained mostly to action recognition (detect fights, suspicious behaviours, unattended luggage...). When it comes to human recognition, the error rates currently obtained in real-world data are far from the desired ones, which is of particular concern for large-scale scenarios. Hence, the current focus is put in the levels of cooperation that are demanded to subjects, in order to obtain input data of minimal quality. The “VeriLook Surveillance” system from Neurotechnology, constitutes a signif-

icant effort toward the fusion of “biometrics” and “visual surveillance”, but its performance is not considered satisfactory for large scale scenarios, and it still runs in relatively controlled environments, uses high resolution cameras and requires a complex enrolment phase in order to obtain a large set of templates per subject, representing the most typical variations (e.g., differences in pose, lighting conditions and distances).

The main challenges of QUIS-CAMPI with respect to the state-of-the-art in automated surveillance and biometric recognition were:

Challenge 1: With respect to the state-of-the-art in biometrics, research for novel algorithms able to work effectively in data of much lower quality than the currently used, in result of the covert data acquisition feature.

Challenge 2: With respect to the state-of-the-art in visual surveillance, improve substantially the ability to perform automated biometric recognition, which is now constrained to human intervention.

WORK DESCRIPTION AND ACHIEVEMENTS

As a primary result of our work, the main achievements can be divided into four groups: [i- PUBLICATIONS] we published several papers in the international journals with the highest impact factors in the Computer Vision / Pattern Recognition domains (e.g., IEEE-TPAMI, IEEE -TIP, IEEE-TIFS); [ii- SYSTEM PROTOTYPE] we have set up live demonstrators of QUIS-CAMPI prototype in international conferences (e.g., BTAS); [iii- DATASETS] we made available a new data set (<http://quiscampi.di.ubi.pt/>), that can be used by any researcher interested in this field; [iv- SCIENTIFIC COMMUNITY] we organized an international contest in the scope of a premium conference in the biometrics domain (ICB). Also, we promoted the importance of unconstrained biometrics recognition in surveillance environments, gathering biometric researchers and forensic scientists/practitioners (papers presented at the International Workshop on Biometrics and Forensics).