UNIVERSITÀ DEGLI STUDI DI VERONA

Dottorato di Ricerca XXVI ciclo – anno 2011
Borsa di Internazionalizzazione
- Scheda progetto –

Scuola di Dottorato di	**Scienze Ingegneria Medicina**
Corso di Dottorato in	**Informatica**
Coordinatore	**Luca Viganò**
Titolo del progetto	**Retinal image analysis**

Partner straniero:

La lettera di intenti o eventuale strumento convenzionale già esistente dovrà essere prodotta entro e non oltre la fine del mese di marzo 2011.

N.	Denominazione	Eventuale iniziative previste	Sede attività didattica	Periodo di permanenza previsto per il Dottorando*
1.	**School of Computing of the University of Dundee**	x attivazione co-tutela di tesi x rilascio certificazione di "Doctor Europaeus"	x SI ☐ NO	6 mesi
2.		☐ attivazione co-tutela di tesi ☐ rilascio certificazione di "Doctor Europaeus"	☐ SI ☐ NO	.... mesi
3.		☐ attivazione co-tutela di tesi ☐ rilascio certificazione di "Doctor Europaeus"	☐ SI ☐ NO	.... mesi
4.		☐ attivazione co-tutela di tesi ☐ rilascio certificazione di "Doctor Europaeus"	☐ SI ☐ NO	.... mesi

* Periodo di permanenza complessivo previsto: minimo 6 mesi, massimo 18 mesi.

Docenti referenti presso gli Atenei partner

N.	Cognome	Nome	Ateneo	Indirizzo e-mail	Telefono
1.	Trucco	Emanuele	Univ of Dundee	e.trucco@dundee.ac.uk	+441382386504
2.					
3.					
4.					

DESCRIZIONE del progetto (min. 2500 – max 5000 caratteri)

This proposal is grounded in a collaboration started recently between Verona Computer Science (Prof Giachetti) and the School of Computing of the University of Dundee (Prof Emanuele Trucco, NRP Chair of Computational Vision). The scientific backdrop is an existing international collaboration on retinal image analysis driven by the Universities of Edinburgh and Dundee (UK), and involving the Univ of Verona in Italy and, in Singapore, the biomedical image processing centre of A-STAR and the Singapore Eye Research Institute. The project is developing an ambitious software system, VAMPIRE (Vascular Assessment and Measurement Protocols for Images of the REtina), enabling efficient, semi-automatic measurements of the retinal vasculature in high volumes of data, for use in clinical, genetic and cognitive studies, some of which are currently under way with a beta version of VAMPIRE.

Prof Trucco is the Dundee co-ordinator for this collaboration and will host the student during his 6 months in Dundee. The student will be integrated in a group including currently 2 full professors, one lecturer, 2 research assistants, and 4 PhD students, all working on computer vision and applications, mostly biomedical.

The scientific contents of the project will build on the current collaboration between Verona and Dundee. Within this, algorithms have been developed and tested for detecting the exact contour of the optic disk in fundus retinal images. This package will soon be integrated within the current version of VAMPIRE. The project will contribute to the extension of VAMPIRE to the detection of lesions (visible signs of pathologies in the retina), especially diabetes-induced. Technically, we aim to address the following.

(a) Multi-modal analysis of fluorescein angiograms (FA) and fundus images.
Fundus images are easily acquired by a simple snapshot with a camera commonly found in most opticians' practices. Instead, FA are expensive and invasive, involving the injection of a contrast medium into the arterious system, taking up to 15-20 minutes, and forcing the patient to sit still for the same amount of time as asequence of 40 to 60 images is acquired manually. FA, however, show very clearly the vasculature and contain information on the haemodynamics. Some features visible in FA frames are not obvious in fundus images. We posit that some textural features of fundus images associated to features normally revealed via FA might be detected in fundus images via appropriate operators. This would make it possible to simplify and make cheaper a currently complex and invasive procedure.

(b) Contextual analsis for computer-assisted diagnosis. It is widely accepted that the detection and assessment of retinal lesions for diagnostic purposes, as performed by clinicians, involves contextual reasoning. In other words, not only the presence of a condition is supported by the detection of a set of lesions, but lesion detection itself can be made more robust by the presence of lesions participating in the same diagnosis (e.g., diabetic retinopathy). We plan to deploy and build on recent context-based techniques developed in computer vision to improve the reliability of the detection of a small set of conditions associated with diabetes, leveraging lesions like blood leakages, tortuosity, abnormal vascular calibre, and ischemia.

Il Coordinatore del Corso di Dottorato

Data _____ _____