



UNIVERSITÀ DEGLI STUDI DI VERONA

Dottorato di Ricerca XXVI ciclo – anno 2011

Borsa di Internazionalizzazione

- Scheda progetto -

Scuola di Dottorato di	.....Scienze Ingegneria e Medicina.....
Corso di Dottorato in	.....Informatica.....
Coordinatore	.....Luca Vigano'.....
Titolo del progetto	.....Discrete Models of Biological Dynamics.....

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.	Ciencias de la Computacion e Inteligencia Artificial, Universidad de Sevilla, Spain	<input type="checkbox"/> attivazione co-tutela di tesi <input type="checkbox"/> rilascio certificazione di "Doctor Europaeus"	<input type="checkbox"/> NO	..10.. mesi
2.		<input type="checkbox"/> attivazione co-tutela di tesi <input type="checkbox"/> rilascio certificazione di "Doctor Europaeus"	<input type="checkbox"/> SI <input type="checkbox"/> NO	.... mesi
3.		<input type="checkbox"/> attivazione co-tutela di tesi <input type="checkbox"/> rilascio certificazione di "Doctor Europaeus"	<input type="checkbox"/> SI <input type="checkbox"/> NO	.... mesi
4.		<input type="checkbox"/> attivazione co-tutela di tesi <input type="checkbox"/> rilascio certificazione di "Doctor Europaeus"	<input type="checkbox"/> SI <input type="checkbox"/> 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.	J. Pérez Jiménez	Mario	Department of Computer Science and Artificial Intelligence, Universidad de Sevilla, Spain	<a href="mailto:marper@us.es">marper@us.es</a> , <a href="mailto:Mario.Perez@cs.us.es">Mario.Perez@cs.us.es</a>	+34 954-55.79.52
2.					
3.					
4.					

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

(si richiede di specificare il ruolo dell'Ateneo partner nel progetto di ricerca, al fine di giustificarne il carattere internazionale e l'eventuale compartecipazione finanziaria del partner).

P systems investigations are nowadays focused on several research lines that make the field "a fast Emerging Research Front" in computer science (as stated by the Institute for Scientific Information in 2003). Although born as a non-conventional model of computation inspired by nature, P systems can fruitfully

be employed as a modelling framework in which to embed in silico simulations of interesting biological systems. Along Metabolic P systems namely, it is possible to model metabolic phenomena, by means of reactive fluxes deduced by temporal series of experimental data and while not having a perfect knowledge of microscopic interactions or kinetics. This kind of modelling was tested on several biological systems, and currently it is under investigation for processes which have no exhaustive differential models in literature.

In this project we intend to analyse dynamical properties of MP systems that are of interest for the biological phenomenon which is modeled, such as liveness, reversibility, periodicity, boundness, and recurrence. In this context, it could be relevant to focus on the oscillatory patterns of biochemical dynamics (for example, in which cases is there oscillation, and how to classify the type of oscillations one can expect? Specific graph structural properties could correspond to oscillatory patterns of interest, namely autocatalytic, autoinhibiting, etc), while developing related software is usually helpful for the investigation of the theoretical properties of the model. Problems of numerical regression, parameter estimation, dynamical systems, graph theory, and computational strategies can come up while modelling phenomena which are known only partially, as signal transduction, biological pathways related to pathologies, cell interaction in immunological processes, energetic metabolisms and dismetabolisms.

Both the laboratories in Verona and Seville carry out research at the intersection between mathematics and natural computation, with application to problems from biology, ecology, and medicine, and they offer an interdisciplinary and stimulating working environment for numerous PhD students. The ideal applicant should be interested in research and management of science, while willing to travel and to interact with an interdisciplinary and international community. She or he will preferably be interested in the theoretical aspects of the problem, and is expected to develop a solid methodology to study issues by means of computational experiments. The emphasis on computational models, mathematics, or biological models can be aduste according to the candidate background and interests.

Data \_\_3/6/2010\_\_

Il Coordinatore del Corso di Dottorato