

Job/Fellowship Reference:

Main research field:

Decision Support Systems in Urban, Territorial and Environmental Engineering

Job/Fellowship summary (max. 400 char.):

The Institute for Systems and Computers Engineering of Coimbra (INESCC) intends to hire one Post Doctoral Researcher for a five years period, depending on the approval of the corresponding position by the Portuguese Foundation for Science and Technology (FCT), in the field of Operational Research in Geographic Information Systems environment. The applicant will work in the development of Decision Support Systems in Urban, Territorial and Environmental Engineering.

Job/Fellowship description (max. 7000 char.):

INESC-Coimbra is a non-profit private institute resulting from a partnership between the University of Coimbra and INESC (Institute for Systems and Computers Engineering) characterized by the interdisciplinary nature of its activities. Its researchers come mostly from the Faculty of Science and Technology and the Faculty of Economics, both at the University of Coimbra. INESC-Coimbra possesses a diversified experience in R&D activities, involving many projects under contract (with the Foundation for Science and Technology, the European Commission, the Portuguese Administration, with several Local Administrations, and companies in energy and telecommunications sectors), as well as advanced educational programs (support to post-graduate, master's and doctorate programs). Information about the past, recent and current research projects in which INESCC has been involved can be found in the website of the institute (<http://www.inescc.pt/>). By this announcement, INESC-Coimbra offers one Post Doctoral research position for a five years period, depending on the approval by the Portuguese Foundation for Science and Technology (FCT) and in accordance to the rules of Ciência 2008 Program.

Operational Research techniques have proven to be powerful tools for generating solutions to problems in facility location, vehicle routing, and combined location-routing as in a wide diversity of other planning and management problems, namely in urban, land-use and environmental applications.

In problems that deal with spatial data, GIS technology may offer interesting spatial analysis functions, capabilities of integrating alphanumeric and graphic data, and means of representing solutions over maps. The move for web-based applications is a trend nowadays - not only the commercial areas are widely using the web but also the scientific community. In this context this doesn't mean just sharing/accessing data and information, but also offering special services provided by an algorithm server where the needed solvers for scientific models (mixed-integer linear programming, network optimization, multi-criteria analysis, simulation, etc.) are centralized benefiting from optimized code, high performance hardware, etc. The web-based algorithm server will help to construct the mathematical models automatically, generating solutions and returning the results to the user in tables and/or graphical interfaces.

The considerations above led us to the concept of WISDSS - "web-based interactive spatial decision support system". Such systems can be developed to assist governmental agencies and the general public in understanding and analyzing complex problems. This is the general research framework where the researcher will develop his/her work, since a multidisciplinary team exists at INESC-Coimbra developing research in this area.

According to the principles described above, the main dimensions of the research to be developed include the application of know-how in the areas described below:

GIS

The research will include the use of alphanumeric and graphic data, and their storage and management using spatial databases (data has a spatial component, i.e., it is associated with a "location" in space) as well as spatial analysis of physical, demographic, economic, and environmental issues, among others. The diverse nature (alphanumeric, graphical, etc.) of the data to be used requires the use of state-of-the-art database management and GIS technologies.

Operational Research

Mathematical programming techniques such as linear and integer programming will be used to build models in a wide range of problems in the fields of urban, land-use, transportation and environmental management. Applications may range from facility location to routing and location/routing problems aiming at optimizing objectives such as financial cost, accessibility, equity, safety, environment protection, etc., either at urban or at regional scale. Heuristics and meta-heuristics will be used, namely in computationally complex routing problems.

Planning problems involve multiple decision makers, multiple "affected" parties, and multiple objectives. As a consequence of the multi-objective nature of the problems, various multiple criteria approaches (a decision methods base) will be included in the decision support systems to be developed in the research. This research will extend the state-of-the-art of formal techniques (as mathematical programming) by allowing the users to develop sophisticated mathematical models to analyze the issues involved. They will be able to do this via user-friendly computer interfaces (to be developed, using state-of-the-art web technologies) that will require (from the user) no special training in operational research.

Some of the reality dimensions may not have a deterministic nature. Therefore, stochastic approaches may also be pursued to tackle some problems in a more realistic way.

The candidate is expected to present the research work in national and international conferences, and to submit papers to national and international scientific journals. The candidate should also be willing to participate in ongoing projects, in the

supervision of master or PhD students and other young researchers, in the preparation of proposals to R&D projects both at national and international levels.

The applicant should have the following profile: at least 3 years of post-doctoral research; significant research in some of the following areas: Operational Research (mathematical programming, multi-objective analysis, simulation, queueing systems), Spatial Decision Support Systems based on Geographic Information Systems (GIS) and web mapping services and technologies, excellent programming skills (preferably web-oriented).

In exceptional cases, duly justified, FCT may consider accepting applicants with less than 3 years of post-doctoral experience.

The contractual conditions are in accordance with the program Ciência 2008.

Candidates should send the following documents in pdf format to secretaria@inescc.pt no later than the 30th September 2008:

a) An application letter addressed to the Director of Inescc; b) Curriculum Vitae; c) Statement of motivation/commitment for application; d) At least one letter of recommendation. More information regarding this vacancy can be requested by email to coutinho@dec.uc.pt.

Vacant posts: 1

Type of contract: Contrato a termo certo

Job/Fellowship country: Portugal

Job/Fellowship city: Coimbra

Job/Fellowship company/institute: INESC - Coimbra

Application deadline: 30/9/2008