STATISTICAL MODELLING AND PREDICTING EVENTS THAT VARY IN SPACE AND/OR TIME

DESCRIPTION OF THE TECHNOLOGY

The complexity of many human and environmental phenomena makes it difficult to correctly understand and predict their development in the future. The research group Mathematical and Statistical Modelling of Spatio-Temporal Data and Data Mining at the Universitat Jaume I of Castelló (UJI) has developed space-time statistical techniques capable of modelling complex phenomena and predicting their behaviour with the aim of drawing some useful conclusions or making important decisions.

These techniques are applied to georeferenced information, that is, on events that take place at a certain place and time. These multivariate statistical and data mining techniques allow us to offer the public administration and companies solutions for prediction in fields such as public safety, environmental pollution, engineering or epidemiology.

The capabilities that the UJI research group provides through technological services are:

- Guidance on solving real problems that evolve in time and/or space.
- Modelling social phenomena.
- Space-time modelling in criminology and prediction of crime and antisocial behaviour.
- Development of statistical software for solving environmental problems.
- Development of air, noise and soil pollution maps.
- Preparation of predictive maps about the mortality rate for insurance companies.
- Development of epidemiological maps related to certain infectious diseases.
- Preparation of economic activity concentration maps.
- Analysis and exploitation of big data.
- Real-time analyses of data about emergencies (data from the 112 service).

In the case of criminology, for example, the integrated analysis of large amounts of data of different types (topographic, meteorological, socioeconomic, from social networks, etc.) may help public administrations to identify areas which are especially vulnerable to crime. As a result, better use can be made of the resources destined to the upkeep of public security.

Likewise, in the field of environmental management, the research group has designed a more complete model for mapping forest fire risk, which includes physical as well as socioeconomic variables with the aim of improving the existing simulation-based fire hazard maps. In this way, variables such as type of vegetation, nearby roads or conflicts over urban development are taken into account along with the temperature, accumulated rainfall or wind speed. All these variables allow fire prevention to be refined.

SECTORS FOR COMMERCIAL APPLICATION

The techniques developed can be applied in any situation in which georeferenced information is used; in other words, events that occur at a known place and time and whose statistical analysis allows relevant data to be inferred for decision-making or planning.

- Public administrations: in various applications, both in the field of big data exploitation (such as those collected in a call centre like 112) and in the generation of space-time statistic tools for epidemiological studies, the improvement of forest fire management, predicting the future evolution of air pollution in cities and crime prevention, among others.
- Insurance companies: multifactorial studies on the incidence of road and other types of accidents; epidemiological analyses in health insurance companies, the development of predictive mortality maps, etc.
- Companies in general that want to exploit georeferenced information.

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TECHNICAL ADVANTAGES AND COMMERCIAL BENEFITS

The technical advantages offered by the methodologies developed in this project are the following:

- They allow the utilisation of large amounts of data that could not be used until now due to the difficulty of processing them with conventional techniques.
- They allow events to be predicted by modelling them and, consequently, decision-making.
- Once implemented, the modelling techniques can be used at a relatively low cost, meaning that the return on R&D&I investment is quick.
- The techniques offered can be adapted to any problem that arises, provided that it involves georeferenced information.

STAGE OF DEVELOPMENT OF THE TECHNOLOGY

The research group has the equipment and the know-how required for an integral approach to projects that use space-time statistical data, both from their conception by means of technical and scientific consulting and advice and during their implementation. The technology is in the implementation phase for the Colombian National Police and other Latin American police forces.

INDUSTRIAL AND INTELLECTUAL PROPERTY RIGHTS

Know-how.

COLLABORATION SOUGHT

We offer:

- Provision of technological services.
- R&D&I on demand for public administrations and companies.

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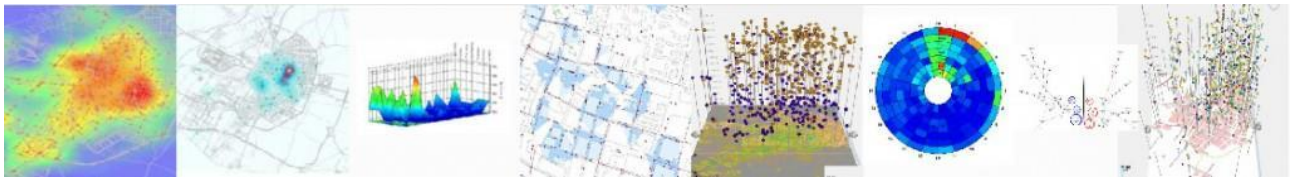

CONTACT DETAILS

César Viúdez Beltrán
Oficina de Cooperación en Investigación y Desarrollo Tecnológico (OCIT)
Universitat Jaume I, Castelló
Tel: +34 964387669
E-mail: patents@uji.es
Web: http://patents.uji.es