Chapter 6
Flexible Querying of Imperfect Temporal Metadata in Spatial Data Infrastructures

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ABSTRACT

Spatial Data Infrastructures (SDI) allow users connected to the Internet to share and access remote and distributed heterogeneous geodata that are managed by their providers at their own Web sites. In SDIs, available geodata can be found via standard discovery geo-services that makes available query facilities of a metadata catalog. By expressing precise selection conditions on the values of the metadata collected in the catalog, the user can discover interesting and relevant geodata and then access them by means of the services of the SDI. An important dimension of geodata that often concerns such users’ requests is the temporal information that can have multiple semantics. Current practice to perform geodata discovery in SDIs is inadequate for several reasons. First of all, with respect to the temporal characterization, available recommendations for metadata specification, for example, the INSPIRE Directive of the European community do not consider the multiple semantics of the temporal metadata. To this aim,

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INTRODUCTION

Infrastructures are complex systems in which a network of interconnected but autonomous components is used for the exchange and mobility of goods, persons, information. Their successful exploitation requires technologies, policies, investments in money and personnel, common standards and harmonized rules. Typical examples of infrastructures which are critical for society are transportation and water supply. In Information Technology, the term infrastructure could be related to communication channels through which information can be located, exchanged, accessed, and possibly elaborated.

The importance of Spatial Data Infrastructures (SDIs) has been recognized since the United Nations Conference on Environment and Development in Rio de Janeiro in 1992. Geographic information is vital to making sound decisions at the local, regional, and global levels. Crime management, business development, flood mitigation, environmental restoration, community land use assessments and disaster recovery are just a few examples of areas in which decision-makers can benefit from geographic information, together with the associated Spatial Data Infrastructure (SDI) that support information discovery, access, and use of this information in the decision-making process.

In time, the role of discovery services of data with a geographic reference (geodata) has become a main issue of governments and institutions, and central to many activities in our society. In order to take political and socio-economics decisions, administrators must analyze data with geographic reference; for example, the governments define funding strategies on the basis of CO₂ pollution distribution. Even in everyday life, people need considering data regarding the area in which they live, move, work and act; for example, consider a family wishing to reach mountains for a skiing holiday, and looking for meteorological data. In order to be useful, the data they are looking for should fit the area and period of time of their interest; they should trust in the quality of the data; if possible, they should obtain what they need with simple searching operations, and in a way that allows evaluating the fitness of the data with respect to their needs and purposes.

In 2007, the INSPIRE Directive of the European Parliament and of the Council entered into force (INSPIRE Directive, 2007) to trigger the creation of a European Spatial Data Infrastructure (ESDI) that delivers to the users integrated spatial information services. These services should allow users to discover and possibly access spatial or geographical information from a wide range of sources, from the