

Preface

Both geodetic and geographical science have benefited greatly from the technological revolution that has recently dominated human achievement, more specifically, from satellites for Earth observation and communication, combined with computers with an ever-accelerating rate of improved data processing power and capacity. Satellite positioning and computerized spatial data handling have fundamentally transformed the way in which many areas of research and commercial activity are conducted. The combination of GPS and GIS is used for a broad spectrum of investigative experiments ranging from the study of the Earth's plate tectonics to epidemiological research into the incidence and distribution of children's respiratory diseases. Furthermore, established applications, such as vehicle navigation and emergency services decision support, all now combine GIS and GPS in order to provide a solution.

The complexity and depth of this integration of GIS and GPS vary considerably. Many procedural applications, such as crime pattern analysis, may use GPS to provide accurate positioning of an incident together with GIS to record and analyse the distribution and occurrence of crime. This represents a combination of the two technologies, but they are not really being integrated at the lowest level. At the other extreme, a vehicle-tracking system may process data directly from a GPS receiver together with constraints imposed by digital maps to determine the most statistically likely position.

This book details the research and development activities undertaken by the two authors. These include: the augmentation of GPS-derived positioning using Digital Terrain Models (DTM) and digital mapping, embedded GIS in Intelligent Transport Systems, GIS and GPS in mobile phone positioning, and GIS and GPS in real-time location-based tourist information systems. This book also provides a brief overview of GIS, GPS and datum transformations and projections. One chapter provides an overview of current commercial applications that use the combined technologies: one focuses on applications that use superficial integration, while the other looks at applications with deep integration.

The intended audience for this book includes graduate students in geomatics and civil engineering, geomatics researchers, and R&D professionals in industry. Some chapters may be useful for undergraduate courses in geomatics and civil engineering. To maintain relevance as technology continues to progress, we have chosen to focus on fundamental principles and concepts rather than specific

examples of off-the-shelf technology. Therefore, this is in no way a guidebook to commercially available systems, nor are specific systems even mentioned. Rather, the goal is for you, the reader, to appreciate our approach to the integration of these two technologies at a low level, and be able to apply this kind of approach to your own specific applications. So even if the specific algorithms described here become obsolete (as in time they always do), the general approach will still be relevant.