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Book Review: *Crime Modeling and Mapping using Geospatial Technologies*, Leitner, M. (Ed.). Springer Verlag, 2013, 446 pages, £ 117.00 (Hard Cover) ISBN 9789400749952, Springer Dordrecht, Heidelberg, New York, London

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There are a number of texts and edited collections given over to the use of spatial techniques in analysing, modelling and mapping crime data. Such efforts are reinforced by several well-established national (and international) conference series that focus on the use of GIS in analysing crime data as well as themed sessions in major geography conference events and dedicated workshops concerned with applying GIS-based methodologies. Commercially and freely available software packages are increasingly being customised for use in law enforcement agencies and the operational and strategic benefits of using such tools are also receiving increased media attention as a result of their use in high profile cases where geo-spatial technologies have been to the fore in helping to convict offenders. The focus of this volume, the eighth in the *Geotechnologies and the Environment* series edited by Gatrell and Jensen, is on describing examples of the use of spatial and temporal techniques that typically are not available in proprietary packages but which have nevertheless been applied using the types of event data now routinely being collected by law enforcement agencies. Many of these studies are exploratory in nature and some report on early results from what are clearly longer term initiatives but the majority involve some degree of collaboration with law enforcement agencies (even if this is only in the form of initial data provision), are based on sound theoretical reasoning and provide useful lessons for others concerned with analysing mainly disaggregate (point level) crime data.

The chapters in this book are largely drawn from papers presented at the AAG Annual Conference held in Washington DC in 2010 with 10 of the 25 presentations being used as a basis for contributions. This in turn was followed up with a call for

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papers to various list servers of GIS users who were involved in crime related research using GIS. The 18 chapters included in the book are written by 48 authors with the majority (75%) being located in United States-based academic organisations. The chapters are organised into five sections which respectively cover spatial problems (2 chapters), crime analysis (5), crime modelling (6), crime mapping (3) and applications/implementations (2). As with any edited collection of this format, a case could be made for some of the chapters appearing in alternative sections of the book – the majority of case studies involved mapping of crime data of some description for example. Space precludes a detailed account of each of the chapters but the first two contributions provide an important context for much of the research reported in subsequent chapters. Thus for example, the chapter by Andresen and Malleson provides practical examples which draw attention to the importance of well recognised problems such as the ecological fallacy and the MAUP in analysing (point-level) call for police service data and all recorded crime for urban areas (for Vancouver and Leeds respectively). This introduces a recurring theme highlighted in a number of contributions regarding the most appropriate scale of measurement and also demonstrates the need for sensitivity analysis using units at a range of different spatial scales. This in turn calls for an awareness of the unique characteristics of spatial data which has implications for examining the validity of existing theories of crime in spatial contexts. Johnson and Ratcliffe in the second chapter of this volume draw on the use of clustering techniques in operationalising drug markets in a study which has wider implications for researchers using boundaries to illustrate spatial and temporal trends in crime incidence. Their conclusion that care is needed when using such approaches to interpret crime patterns when potentially targeting areas and implementing policies aimed at crime prevention again is a recurring theme.

The second section of the volume given over to examples of crime analysis includes some useful case studies. These include innovative approaches based on a combination of exploratory GIS and spatiotemporal analysis to visualise offender residency movements to examine enforcement of restriction policies (Murray et al.) and the use of so-called 'hot streets' maps at detailed spatio-temporal scales to aid the police in developing crime prevention strategies and understanding underlying causation factors (Herrman). Such research whilst drawing attention to the choice of appropriate scale of analysis (in this case street segments) also highlights the importance of temporal units, especially when we focus in on small areas, and the implications this has for policing response. This is a theme examined later in the volume in chapters specifically focused on combined spatio-temporal modelling and visualisation. The study by Kaspryzk and colleagues, examining different approaches in estimating probable journey-to-crime (JTC) travel in order to delineate the location of origin points, stands out partly because it is one of the few non-US based studies but more importantly because it adopts a raster approach involving the derivation of cost surfaces based on the crime event location. There are six chapters in the section given over to crime modelling which again provide a range of approaches to analysing different types of crime. Kim and colleagues, for example, propose a conceptual model which categorizes homicides in relation to a combination of social relationship dynamics and spatial factors before reviewing the potential of such modelling in gaining an understanding of homicide incidence (using case study data for Florida). This in turn leads the authors to propose sequence categorisation methods whereby such processes can be incorporated into a GIS framework to better understand homicide patterns and thus builds on the potential of geographical profiling to further

enhance existing GIS-based methodologies such as hot spot analysis. Another innovative modelling study by Lee and Wilson draws on a combination of theoretical frameworks such as Environmental Criminology and Deviant Places Theory to simulate the impacts of changes in urban area characteristics on neighbourhood patterns of estimated property crime (particularly following modelled patterns in foreclosure rates). These are then compared to the use of tools such as cellular automata and agent-based modelling. Their findings suggest that such models have real potential in predicting changes in spatial patterns of crime over time which should in turn benefit policy makers trying to prevent the detrimental impacts of these types of urban changes.

Three chapters are included in the section given over to crime mapping where the focus is on visualisation tools typically not incorporated into proprietary mapping packages. Fuhrman and colleagues for example use bivariate mapping techniques to compare cognitive aspects of students' fear of different types of crime on a US university campus with rates of reported crime categorised by these types. They also draw attention to policy implications of their research in terms of highlighting increased levels of police patrols in some parts of the campus and the use of educational campaigns. Again this is a feature of the majority of the contributions in that each of the studies does reinforce the policy implications of the research described therein. The overall impression gained therefore is that a conscious effort has been made to couch contributions in terms of real world applications that should benefit law enforcement agencies in wider (international) contexts. As an example, the chapter by Morgan and Steinberg which explores visualisation techniques specifically geared to analysing temporal elements of crime data describes a usability analysis of the use of these spatio-temporal visualisation tools in a criminal search strategy exercise. Responses from crime mapping professionals were generally positive and the suggestion is that these types of cartographic representation tools have real applicability where the exact locations of events are unknown in space and/or time. As if to reinforce the message of the potential benefits of the types of techniques described in the previous 16 chapters, the two chapters included in the Applications and Implementation section of the book, examine just how joint working between academics and professionals in agencies tackling crime can help in different stages of criminal investigations. Elmes and Roedl for example demonstrate how clusters of crime can be identified across jurisdictional boundaries and call for increased efforts to ensure consistency of approaches both in terms of data collection and analytical procedures. Whilst theirs is a localised study based across a university campus this case study has wider implications for the nature of such partnerships in wider contexts, a position returned in the final contribution by Martinez–Viveros and colleagues which describes an academic-government collaboration that focuses on spatial data infrastructures using open source tools.

Overall this volume contains contributions that include interesting and innovative approaches to analysing crime data that are presented in a logical and structured format. One slight criticism that could be levelled at the book is the trend towards applications that involve investigating the use of such tools to examine crimes in the relatively data-rich context of urban areas in developed countries (and in particular for studies conducted in cities in the United States). Whilst many of the techniques described will be transferable to other situations, some may be less relevant and some discussion of the unique dimensions of crime in rural or developing world contexts may have added to the breadth of examples included here. Whilst the use of techniques such as crime mapping has a relatively long history in policing, a number of the spatio-temporal modelling,

simulation and advanced visualisation techniques described in detail here have yet to be routinely applied in practice. Further research is needed on the potential of such applications becoming mainstreamed into the work of such agencies in wider contexts. The chapter by Morgan and Steinberg which introduced spatio-temporal visualisation techniques in criminal search strategies, for example, includes a realistic appraisal of the types of issues that will need to be addressed if the widespread use of such tools is to become a reality in law enforcement agencies. This in turn points the way towards even closer collaboration between academia and such professionals if the wider adoption of such tools is to be achieved. In the meantime the editor of this volume has brought together an impressive collection of papers that has truly demonstrated the advantages of working in close collaboration with professionals in multi-disciplinary partnerships.