Potential GIS-based applications for use by the SAPS

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Geographical Information Systems (GIS) are envisaged as tools to facilitate policing through crime mapping and analysis.

Internationally, GIS has been widely utilised to supplement crime-fighting strategies [1, 2, 3]; locally, however, the question remains whether South Africa, and the South African Police Services (SAPS), have the necessary geographical information (GI) infrastructure, capacity and knowledge required to supplement the policing process.

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The following discussion proposes potential crime mapping possibilities for South Africa. It is noted that the possibilities mentioned may already be realities in a number of more developed countries; nevertheless, the challenges to their potential use and introduction within the SAPS are discussed.

Interactive Internet-based crime mapping

A controversial type of information to which people have increasing access to is crime-related data and maps on the Internet [4]. These are often in the form of interactive Internet-based crime mapping websites offering spatial and statistical queries and analysis tools. Police departments in the United States (US) were the first to put crime maps on the web and there are currently many policing agencies that use web mapping technology to inform the public regarding crime patterns [5].

In a South African context, the dissemination of crime data on an Internet Map Server (IMS) can provide residents of a particular area with easy access to the vast database of crime information in the possession of the SAPS, and put crime into its spatial perspective. The result for the SAPS could potentially be a reduced work load, in that fewer calls will be made to the SAPS Crime Information and Analysis Centre (CIAC) for data requests, if the maps are readily available; the facilitation of partnerships with researchers and other agencies, and increased accountability for various police departments [4]. The result for the government is a constituency better informed and aware of criminal incidents in their towns and cities.

In March 2007 the Centre for Justice and Crime Prevention launched its Crime and Victimisation Mapping Tool that maps crime trends in different provinces, police districts and towns of the country. While this venture is an important step towards interactive internet-based crime mapping in the country a lot more needs to be done to achieve the spatial analytic capabilities of international crime mapping sites. For examples of websites displaying crime maps consult the Amethyst Information Hub2, Crime and Disorder Information Exchange (CADDIE)3 and Suisun City’s crime mapping website4.

Geographic profiling

Geographic profiling is a progressive criminal investigative methodology with huge potential for policing in South Africa. The methodology was developed by Dr. Kim Rossmo, and is an aspect of offender profiling, which focuses on

determining the most probable area of an offender’s residence based on locations of a connected series of crimes [6, 7]. In brief, crime locations are entered by address, (i.e. latitude/longitude, or digitised) and are “analysed with a patented criminal hunting algorithm that produces a probability surface showing likelihood of offender residence” [7, 8].

A range of geographic profiling strategies may be employed [9] and are inserted into a computerised geographic profiling system (i.e. Rigel [7]; Dragnet [6]) to produce a three-dimension probability map, or “jeopardy” surface. This surface represents a topographical map indicating peaks and valleys colour-ramped to highlight the areas most likely to be the residence of the offender.

In 1999, a geographic profiling consultant conducted a workshop at the CSIR in Pretoria and presented the principles behind geographic profiling to a selected number of members of the SAPS and CSIR. Following the workshop, geographic profiling techniques were used to assist the CSIR and the Brixton Murder and Robbery Unit in Johannesburg in two serial killer cases [10]. Although the suspect had already been arrested, geographic profiling software was used to analyse the case, and the resultant maps, showing the activity space and probability surfaces, were forwarded to the SAPS investigating team as well as to the CSIR project team [11]. The maps proved to be remarkably accurate in determining the place of highest probability of the serial offender’s residence [10]. (See Fig. 2.)

Geographic profiling systems are currently not in use within the SAPS, and currently there are a limited number of South Africans who have completed an authorised geographic profiling analysis course. With almost 50 serial murderers having been identified in South Africa in the preceding two decades [12] and with South Africa rated as second in the world with respect to serial sex related crimes [13], it is easy to see the potential of such a tool for the SAPS.

Geodemographic segmentation systems

Geodemographics is the “analysis of people by where they live” [14] and is posited on the complementary assumptions that the areal unit of measurement such as a census area, encloses a broadly homogenous social and economic environment and that individuals in the same neighbourhood share habits, preferences and to some extent behaviour [15, 16]. The origins of geodemographic segmentations lay specifically in marketing research with geodemographic “cluster systems” being used to reach new customers, choose new business locations and to target direct mail [17].

This focus is changing, however, with Singleton [18] noting a growing trend to utilise geodemographic neighbourhood segmentation systems in a variety of fields including crime where Ashby and Longley [3] demonstrated how geodemographics could be used to better deploy police resources at a variety of spatial scales throughout England and Wales; while Williamson et al [19] used geodemographics to examine the extent to which the level and the pattern of youth offending varied between different types of neighbourhood and the schools they attend.

Schwabe [20] reports on the possibility of the SAPS using geodemographic segmentation systems to compile a national or provincial profile of victims and offenders for each crime type. In doing so, geodemographic systems can provide insight into the social context of crime in South Africa and highlight the socio-economic causes of criminal development. Benefits include the provision of detailed descriptions per environment (i.e. human, social, physical and economic) that contribute to crime and the prioritisation of areas not only by the SAPS in their crime prevention strategies, but also by public works programmes to, for instance, improve local infrastructure or service delivery.

Critical success factors

While potential GIS crime mapping applications undoubtedly exist to assist South African policing in the future, a variety of factors constrain the present ability of the SAPS to harness the technology. GIS is often claimed as a unique field of interest and expertise; the challenge lies in exploiting the technology to provide valuable analytic benefits to the SAPS. Several critical success factors are considered for the continued integration and future success of GIS within the SAPS.

Crime statistics

In crime analysis the quality of output depends on the quality of input. Good quality data provides the backbone for sound tactical, operational, and strategic plans [21], while poor quality data undermines the intelligence that can be garnered from crime analysis studies [5]. In South Africa it has become an accepted practice to argue that official crime statistics — those collected and released by the SAPS — provide a poor indication of levels of crime in the country [22]. In the past crime figures were compounded by mistrust and suspicion associated with the apartheid government but the new democracy has still not brought an acceptance of police statistics [23].

On 20 July 2000, the former Minister of Safety and Security adopted a moratorium inhibiting the access to crime statistics for analysis and dissemination purposes. The reason being the questionable accuracy of the statistics as a result of among others, insufficient note-taking at the crime scene and inefficient capturing of the data on the SAPS’ Case Administration System (CAS) [24]. The task team appointed to develop a strategy to improve the reliability of the data unearthed during the previous calculation of national crime statistics the following [25]:

- The incorrect recording and registration of reported incidents of crime;
- Inadequate supervision and control in respect of this recording and registration of incidents;
- Incorrect extraction and analysis of crime information; and
- A number of systems and procedural issues that required improvement and modernisation.

The moratorium on the release of crime statistics was lifted in July 2001 amid some uncertainty regarding what methodological changes had actually been made to the statistics generation process [26].

In a spatial sense the accurate reporting of the location where a crime takes place is vitally important to geocode crimes and subsequently gain a visual inspection of its distribution. Louw [23] reports that many police members don’t anticipate any benefits of crime statistics, and therefore data input receives little attention, and the quality of the statistics suffers accordingly.

The Deputy Divisional Commissioner of the Training Division of the SAPS [27] reported the need for timely, reliable, accurate and valid crime information but refers to the fact that “...while police departments are aware of the need for information, not all collect the same kinds of information, nor do they collect it in the same ways. Some are collected systematically, producing reliable results; some are careless and more haphazard.” An appreciation
of data quality procedures needs to be inculcated in the SAPS including generating an awareness in those who take notes at the crime scene, and those who enter data into the SAPS’ systems as to the extent to which these data are important and depended on by those conducting crime analyses.

**Geocoding**

Geocoding is vitally important in spatial crime analysis [28] and “is the name commonly given to the process of converting street addresses to latitude and longitude, or some similarly universal coordinate system” [29]. Two predominant challenges face the spatial mapping of crime incidents in South Africa:

First, comprehensive and accurate attribute and spatial information on all crimes committed within an area must be recorded. The SAPS currently gathers a minimal amount of information on crimes and crime scenes with the result being that with the exception of a few independent research studies [10, 30, 31] crimes have generally not been spatially located in South Africa [20]. Additional logistical challenges lie in distinguishing between the ambiguous addresses of the physical crime address noted by the SAPS and the GIS databases that contain corresponding address data [5].

The problem can be as a result of sloppy police work through an inaccurate recording of address level data at the crime location, human errors such as misspelling, or incomplete data or data omissions within the police docket. Leggett [32] notes that in addition, many residents in South Africa live on properties in informal settlements, as well as around mine dumps and in undeveloped areas, in which there is an absence of any physical address, as well as no formal or well-defined road network. These properties or ‘street segments’ are extremely difficult, if not impossible, to geocode.

A second major difficulty arises when attempts are made to geocode an address for a street that does not exist or is not yet added to the GIS database at the SAPS. This difficulty is particularly pertinent in South Africa which has experienced phenomenal growth in urban and rural property development in the past decade.

**Continued support of the South African government and policy-makers**

A reciprocal relationship exists between governments and GIS. Geographic information (GI) plays a significant role for governments in the context of the global information economy, while governments can create a supportive platform from which implementation policies can be developed and maintained. Masser [33] summarises the significance of GI for government as lying in four different conceptual standpoints:

- As a resource, wherein GI can be seen as an available source of wealth that may be drawn upon when needed
- As a commodity, wherein GI can be bought, sold and have multiple life cycles
- As an asset, wherein GI is a valuable item owned by the government, and lastly,
- As an infrastructure

The continued growth and integration of GIS within the SAPS can provide all these benefits to the South African government and to its public but requires national directives strong enough to guide local action, and that have the support of local and provincial government. Since it is the responsibility of the South African cabinet for determining national policing policy, the future of advanced GIS crime information analysis effectively lies in the hands of the South African government.

While GIS practitioners would argue that the benefits of linking GIS to all crime prevention strategies is unlimited, policy makers require that provincial executives, in particular, firstly, state their need for GIS as a priority for their specific province’s police, and secondly, outline specific protocol and steps for the successful integration of GIS in their policing strategy. Continued governmental support in the form of sustained policies and guaranteed funding are however required to further guide the successful integration of GIS within all aspects of the SAPS.

**Conclusion**

The future of GIS and subsequent crime mapping in policing in South Africa revolves primarily around the ability of the GIS private sector, local and provincial government, and the broader GIS community in South Africa to overcome the basic problems regarding lack of infrastructure, be they human, capital or technical before widespread GIS integration within the SAPS can be achieved.

**Acknowledgment**


**References**


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**Fig. 2: The geographic profile of the Wemmerpan Serial Killer [10].**


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