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Using GIS to reconcile crime scenes with those indicated by serial criminals

Primary author:
Antony K Cooper, Divisional Fellow, Information and Communications Technology, CSIR, PO Box 395, Pretoria, 0001, South Africa
Email: acooper@csir.co.za
Telephone: +27 12 841 4121, Facsimile: +27 12 841 4720

Additional authors:
Piet Byleveld, Superintendent, Serious Violent Crime Unit, South African Police Service, Private Bag X2, Brixton, 2001, South Africa
Telephone: +27 11 248 5500, Facsimile: +27 11 248 5565

Peter MU Schmitz, GIS Specialist, Information and Communications Technology, CSIR, PO Box 395, Pretoria, 0001, South Africa
Email: pschmitz@csir.co.za
Telephone: +27 12 841 3841, Facsimile: +27 12 841 4720

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Abstract

Sometimes, when serial criminals are caught, they admit to their crimes and are willing to point out crime scenes to the police. The South African Police Service (SAPS) then sends independent police officers with the suspect to document those locations he indicates. The CSIR has been assisting detectives and prosecutors prepare selected cases for court, by compiling maps of the relevant details, which enhance the ability of the court to follow the proceedings of a complex case. For serial criminals, they show the crime scenes attributed to the suspect, those indicated by the suspect, and the routes taken by the suspect with the independent officers. When compiling such maps, great care needs to be taken over the accuracy of the data, which includes revisiting the scenes with a GPS receiver to record their coordinates. This quality assurance highlights discrepancies between the crime scenes described in case dockets and those the suspect pointed out, allowing the investigators to link additional dockets to the suspect. It also highlights any errors there might be in the compilation of the original dockets, allowing the prosecutor to present a better case to the court.

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1. Introduction

The South African population is highly mobile – even the poor, many of whom travel several times a year between remote rural areas (where their traditional homes are) and the metropolitan areas where they work, and where many of them have to endure long daily commutes. The result is that many South Africans have wide-ranging activity spaces – and hence, so do many criminals in South Africa, complicating investigations, especially of serial crimes. In addition, two unfortunate characteristics of some serial criminals in South Africa is that they tend to be marauders rather than stalkers, resulting in short cooling off periods between successive crimes (resulting in a greater frequency than might be the international norm), and they tend to have multiple *modi operandi*, making it much more difficult to link a series of crimes together.

The Council for Scientific and Industrial Research (CSIR) is one of eight statutory Science Councils in South Africa. Based in Pretoria, the CSIR is the largest scientific and technological research, development and implementation organization in Africa. For several years, the CSIR has been helping the South African Police Service (SAPS) develop its crime mapping and analysis capabilities, and has been providing specialized crime mapping and analysis for detectives working on selected priority cases. Some of this work has been reported on at previous International Crime Mapping Research Conferences [Cooper *et al* 1999, Schmitz & Cooper 2000; Schmitz *et al* 2000]. SAPS is responsible for combating crime across the whole of the country (some municipalities are establishing their own crime prevention police forces), and for administrative purposes, is divided up into Provinces, Police Areas and Police Stations. Currently, all case dockets consist of a physical file of hard-copy documents, though SAPS does have several large data bases and analytical tools, and selected data fields are captured from all dockets in all but a few parts of South Africa. Invariably, because of a constraint on resources, many detectives have to carry several dockets simultaneously by themselves, and even large cases tend to have only small teams of detectives working on them.

This paper describes how crime mapping and analysis can be used to link unsolved case dockets to a suspected serial criminal, and how it can be used to enhance the quality of a case for presentation in court.

2. Background to the case

During the 1990s, detectives linked a number of rapes and murders in southwestern Johannesburg to a crime series. After about three years, the series suddenly stopped, leading investigators to assume that the serial criminal was either dead or in prison. Subsequently, they identified a suspect in prison who had been arrested for a rape committed in the area. Interviews with the suspect and further investigation by the detectives led to many more cases from other police station precincts being linked to the suspect.

The case is currently before the courts, so we are withholding the details of the case. Nevertheless, it illustrates the general issues behind investigating serial crimes in South Africa, and how crime mapping can be used to help identify other cases that can be linked to the suspect, and how it can help to improve the robustness of the case to be presented in court by the prosecutor.

Initially, the suspect admitted to being a serial criminal and was willing to assist the police by taking them to the scenes of his crimes. When this is done, the suspect is accompanied by independent police officers that have not been involved in the case, so that they cannot lead the suspect or otherwise damage the credibility of the case. This suspect made several trips, each time with different officers, and he took them to many more locations than there was case dockets linked to the suspect. At each of these locations, the police took photographs and made written descriptions of the scene. Some of these scenes were over 30 kilometres away from those of the initially identified series.

SAPS then approached the CSIR to map the data they had collected on the crime series and suspect. The initial objective was to reconcile the crime scenes already identified as being part of the crime series (body dump sites), with those locations indicated by the suspect. This reconciliation was then used to track down unsolved dockets that could then be linked to the suspect, and to improve the quality of the case being prepared. The maps will also be used in court to lead the court through the multiple case dockets and evidence.

3. The crime mapping

We used a desktop geographical information system (GIS) for the mapping. As a backdrop, we used both the Witwatersrand digital street map data provided by Map Studio, and the Cities Revealed digital orthophotography, though the latter does not cover the entire area of interest for this case. The photography is contemporary with the crime series, and it is very useful in areas that do not have a formal or well-defined road network, such as in informal settlements, around mine dumps and in undeveloped areas. The boundaries of police station precincts were also used in the GIS, to facilitate identifying in which precinct each crime scene fell, and hence, which police station was responsible for the related case docket.

The GIS specialist used the information in the case dockets to find and visit all the body dumpsites, and the notes and photographs supplied by the independent police officers to find and visit all those crime scenes indicated by the suspect. At each, he recorded the coordinates using a hand-held global positioning system (GPS) receiver, and captured them into the GIS. He also used the GPS receiver to digitise the several routes taken by the suspect with the independent officers. Viewing the locations on the GIS revealed three patterns:

- Those where a body dumpsite was in close proximity to an indicated crime scene – these provided a clear link between the initial set of case dockets and the suspect. Interestingly, in some of these pairs the locations were on opposite sides of a road or an open space; the discrepancy was possibly caused by the suspect's failing memory (given the very high number of crime scenes).

- Those where an indicated crime scene was relatively far away from a body dumpsite – these were previously unsolved cases now linked to the suspect, and the discrepancy was sometimes, unfortunately, due to a lack of care in compiling the docket when the case was initially reported. This has actually made a significant contribution to enhancing the quality of the case being prepared for presentation in court, by eliminating blatant errors.

- Those where there was no body dumpsite that could be linked to an indicated crime scene – these were an indication of possible unsolved crime dockets that could now be linked to the suspect. The GIS enabled the detectives to identify the relevant police stations holding the dockets, and hence narrow down their search. It also enabled them to track down witnesses and rape victims that survived, but did not report their case.

With previous cases, we have found that maps make a positive impact on the judge in the case – not only do they show a professionalism in the case preparation, but they also allow all the court to follow easily the proceedings through a complex case. It is crucial that the investigators and prosecutors be involved in the preparation of the maps, to ensure that they understand what is being presented and that the maps meet their needs. The maps must focus on the essentials, and not be cluttered with unnecessary background data: while this might result in maps that look fairly Spartan, it does mean that they are less confusing and more useful.

4. Conclusions

This paper has described the use of GIS to prepare maps of a crime series. These maps have highlighted discrepancies between body dumpsites as identified in case dockets, and those crime scenes pointed out by the suspect to independent police officers. Addressing these

discrepancies has enabled the police to link additional unsolved case dockets to the suspect, and to improve the quality of the case being prepared for presentation in court. In addition, with all the data having now been captured, we have great flexibility in the nature of the maps we prepare for use in court – for example, preparing small-scale overview maps and large-scale maps of clusters of crime scenes. It would have been much more difficult and time-consuming to do this mapping manually.

This process has highlighted the need for quality assurance when preparing a large and complex case for presentation in court, and has highlighted how tools such as GIS can introduce rigour to the case preparation, facilitating such quality assurance.

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5. References

Cooper Antony K, T Christopher Gilfillan, Melinda A Potgieter, Peter M U Schmitz, and Pierre M du Plessis, "Crime Clocks and Target Performance Maps", paper presented at the Third Annual International Crime Mapping Research Conference, Orlando, FL, December 1999.

Peter M U Schmitz, and Antony K Cooper, "Mapping crime scenes and cellular telephone usage", paper presented at the Fourth Annual International Crime Mapping Research Conference, San Diego, CA, December 2000.

Peter M U Schmitz, Antony K Cooper, Piet Byleveld, and D Kim Rossmo, "Using GIS and digital aerial photography to assist in the conviction of a serial killer", paper presented at the Fourth Annual International Crime Mapping Research Conference, San Diego, CA, December 2000.