

Evidentiary data collection from Global Positioning Systems: A qualitative study from a Queensland Police Search Coordinator's perspective

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Abstract

This research focuses on the evidentiary issues of Global Positioning System (GPS) digital data collection in order to achieve consistency both within the Queensland Police Service (QPS) Legislative directives and also in methodical performance with other digital forms in operational and administrative environments. Since digital evidence can be modified, duplicated and/or illegally obtained, the relevance, dependability and admissibility of such evidence needs to be established to achieve court acceptability.

This study investigated QPS policy and the evidentiary requirements of digital procedure within Police Search Coordination. Extensive literature was consulted through academic journal data bases, the QPS Intranet, and relevant websites. This study found a significant absence of GPS data capture techniques, resulting in procedural inconsistencies within the QPS Search Coordination. The study highlighted the topic's relevance, and it is envisaged that consequent recommendations for consistent procedures will minimise occurrences of evidential failure in court situations. Calls for higher standards will require that Search Coordinators understand the transformation of GPS data into admissible evidence.

Key words: *Metadata, data, document, global positioning system, evidence, court, computer, standard of proof, statement, admissibility, operational procedures.*

Introduction

The QPS is the Search and Rescue (SAR) authority in Queensland and is responsible for the overall coordination of SAR operations. Within Queensland, qualified Police Search Coordinators are authorised to organise SAR in land-and marine-based operations. In a SAR case, it is the Search Coordinator who is to bear the "onus" or "burden of proof" of the data evidence and to ensure that the information from the GPS device used is credible and can be evidentially traced (Lynch and Foote

2000). The QPS Search Coordinator is responsible for maintaining and preserving adequate records of the SAR operations (QPS, 2013b).

To date, the Queensland Police Service has collection procedures in place for the taking of digital images, extracting data from computers, and the extraction of video and GPS data from taxi cameras (Morley, 2007). However, the QPS does not have standardised GPS data capture procedures in place for the collection of GPS data with regard to all cases, including Search Coordination. Such procedures are essential to ensure that police integrity is not questioned and that they do not compromise issues (Morley, 2013). The absence of standardized GPS data capture procedures has created procedural inconsistencies within the SAR sphere of the QPS.

There are a number of manuals to which the police refer during SAR operations, including the National Search and Rescue Manual, Australian Land Search Manual, and the QPS Operational Procedures Manual. These documents primarily relate to the SAR procedures that are to be used and they complement each other. Although reasonably detailed, none of these publications consider the need for standardised procedures for the collection of GPS data used in a search.

Little research has been carried out in the specific area of Global Positioning System data collection procedures within Search Coordination. Some researchers have provided explanations for extracting digital data and evidence from computers (Morley, 2013), but this does not take into account the intricacies of tangible GPS data collection procedure. Little consideration has been given to the lack of and inconsistency of evidential procedures (Strawn, 2009; Lynch and Foote, 2000). Within the scope of QPS policy, this specific topic has not been the subject of any previous research and has not, therefore, presented an opportunity for discussion. The absence of instructions for Geographical Information Systems (GIS) for police search coordinators has created data management problems which include the loss, lack of and misplacement of data essential for evidence.

The credibility and reliability of this information and by extension, the decisions based on GIS in a procedural context, necessitate a continuous trail of data to dispel these concerns (Lynch and Foote, 2000). Therefore, instructions are necessary for the efficient functioning of GIS evidence support and evidence clarification, collection and retention. Established procedures standardise GIS data collection methods to improve service to decision makers (Tomaszewski and MacEachren, 2006). It is becoming evident that the use of technology, especially forensic techniques, by law enforcement officers has already resulted in judicial demands for more rigorous science as a criterion for admissibility (Pollack, 2002). Since the QPS has an incomplete and/or inconsistent policy regarding the collection and validity of digital evidence relating to GPS, it risks failing to comply with the minimum requirements for the management of metadata (QGCIO, 2010).

'Evidence' is a term which is defined as 'facts presented for the purpose of deciding a disputed question'. Evidence must be factual and only as such, is allowed to be presented in court matters

(Evidence Act 1977 (QLD) (Austl.). Examples of evidence are a knife used in a stabbing, a written statement taken from a witness by a police officer or GPS tracks and waypoints downloaded from a GPS during a search for a missing person. Courts will admit or exclude evidence sought to be presented based on relevance to a court matter.

The 'standard of proof' required in criminal cases in respect of the prosecution is 'beyond a reasonable doubt'. This means that the prosecution must prove its case to the point that there can be no reasonable doubt in the mind of the justice or jury that an offence has occurred. In order for police to successfully pursue a matter in court, it is necessary for them to present incontrovertible evidence to support their case. This standard of proof differs from that required in civil matters where the proof required is the lesser standard of 'on the balance of probabilities' (QPS, 2013a). The person who brings an action in court is said to bear the "onus of proof". In a SAR case, it is the Search Coordinator who is to bear the "onus" or "burden of proof" of the data evidence and to ensure that information from the GPS is trustworthy and can be evidentially traced (Lynch and Foote, 2000).

Evidence must have legitimacy to help commit a court and jury to a verdict and, as such, information must have relevancy, credibility, trustworthiness, and measurability (Palmer, 2013). A qualitative data analysis of research information collected from Coroners Court findings and legislative literature is evaluated with and against current QPS Operational Procedures. The context of the study is limited to the Queensland Police Search Coordination role and Queensland legislation. The research centres on the question; how can evidence be collected from a GPS and how can it be admissible in a court? This study has two objectives:

- (1) To develop understanding of the evidentiary relationship of GPS data;
- (2) To explore the legally acceptable and ethical parameters of GPS evidence admissibility in Queensland courts, collection and admissibility of that evidence in Queensland Courts.

Global Positioning System

To comprehend the evidentiary requirements relating to a GPS, it is necessary to have a basic understanding of the system and how it works. The system was developed by the United States Department of Defence as a tool for the military, primarily for navigation. A GPS uses a series of satellites in orbit around the globe that send out signals to a ground receiver that is then able to use the signals to triangulate a position on or above the earth's surface. The satellite system is supported by a number of ground stations that monitor the data sent by the satellites and transmit corrective data back to them. An identification code for the particular satellite transmitting a data signal is used by the GPS receiver to decipher the position of the receiver in relation to the satellites (Strawn, 2009). As satellites orbit the Earth, they transmit signals to the GPS receiver and the GPS satellite transmits data that indicates its location and the current time. That data can be then transferred to other electronic devices such as a desktop or laptop computer.

Data

For the purpose of this discussion, data is the information processed or stored by a computer. This information may be in the form of text documents, images, audio clips, software programs, or other types of information. Computer data may be processed by the computer's central processing unit (CPU) and is often stored in files and folders on the computer's hard drive. At its most rudimentary level, computer data is a bunch of ones and zeros, known as binary data. Because all computer data is in binary format, it can be created, processed, saved, and stored digitally. This allows data to be transferred from one computer to another using various network connections and other media. Any collection of information processed by a GPS is data, as a GPS transmits as well as receives signals and stores that information on a hard drive within the GPS (NISO, 2001). For example, a car's satellite navigation system stores the home address and a route to a destination in a GPS device. This can be classified as data.

Metadata

Metadata is the information that defines and describes data. A computer contains the metadata relating to the data stored within it. An example is a photograph taken on a digital camera and uploaded to a computer. When the image is examined, it may provide information including the date and time when it was taken, the settings used on the camera to take the photograph and even in some cases, where the photograph was taken. This is because some modern cameras have a GPS embedded in them. This information is metadata. Metadata provides information to enable the user to make an informed decision about whether the data is fit for the required purpose. This is the primary difference between an electronic document in its native, electronic form and the same document printed on paper, again with the paper being the metadata (Byrnes, 2009). Metadata may appear alongside the data in the form of geospatial databases and earth imagery, but can also be used to document geospatial resources including data catalogues, mapping applications and data models.

Document and Statement

A document is defined as, 'in addition to a document in writing, any disc, tape, soundtrack or other device in which sounds or other data (not being visual images) are embodied so as to be capable (with or without the aid of some other equipment) of being reproduced'. A statement is defined in the Act as a document, including any instrument or part of an instrument that purports to have been produced or authenticated at a certain time, in a certain manner, by a certain person (Evidence Act 1977 Schedule 3 (QLD) (Austl.).

Computer

A computer is defined as a general purpose machine, 'commonly consisting of digital circuitry, that accepts (inputs), stores, manipulates, and generates (outputs) data as numbers, text, graphics, voice, video files, or electrical signals, in accordance with instructions called a program'. Recognised and common devices, such as laptop computers and desktop computers, iPads, smart phones are computers. GPS receivers, such as the Satellite Navigation systems in modern cars, are also

classified as computers. Geographical Information Systems (GIS) are an integrated collection of computer software which is used to view and manage data about geographic places. These information systems store data as information that has already been processed and is stored within a computer as metadata (NISO, 2001). The Queensland Evidence Act (Evidence Act (QLD) 1977 s95 (QLD) (Austl.) states that a 'computer' means any device for storing and processing information and any reference to information being derived from other information is a reference to its being derived by calculation, comparison or any other process.

Document Admissibility

In order for documentary evidence to be admissible in civil proceedings, such as Coroners Court matters, the Evidence Act requires that, "in any proceeding (not being a criminal proceeding) where direct oral evidence of a fact would be admissible, any statement contained in a document to establish that fact shall be admissible as evidence if the maker of the statement had personal knowledge of the matters dealt with by the statement, and the document is or forms part of a record relating to any undertaking from information supplied" (Evidence Act s92 1977 (QLD) (Austl.). In criminal proceedings however, in order for documentary evidence as to facts in issue to be admissible, the Act states that, "In any criminal proceeding where direct oral evidence of a fact would be admissible, any statement contained in a document and tending to establish that fact shall, subject to this part, be admissible as evidence of that fact if (a) the document is or forms part of a record (Evidence Act 1977 s93 (QLD) (Austl.).

Queensland Evidence Act

The Queensland Evidence Act 1977 (Evidence Act 1977 s95 (QLD) (Austl.) establishes that GIS data in a statement shall be evidence if a certificate signed by 'a person occupying a responsible position' in relation to the operation of the relevant device (a GPS) or the management of the relevant activities (a search co-ordinator) and also require that a person signing a statement, stating that they believe that the data is true and correct to these activities. As an example, an SES Officer, who operates a GPS during a SAR operation, provides a witness statement to police stating that he or she operated that device and downloaded that data onto a specific computer.

Operational Procedures Manual

Queensland Police Service Operational Procedures Manual (OPM) provides instructions and directions for the day-to-day operation of policing. These procedures are essential to ensure legal consistency and quality in policing services. The OPM also requires a written response for contingencies or solutions for common policing problems and ensures that common problems have the same response each time. In particular, the OPM relates to all SAR matters within the QPS and governs the directions and steps a police officer or a SAR Coordinator must take in order to successfully and efficiently coordinate SAR (QPS, 2013b).

The OPM is issued pursuant to the provisions of the Police Service Administration Act 1990 'Commissioners Directions'. The aim of this manual is to provide guidance and instructions in salient aspects of operational policing. To this end QPS staff are to comply with the contents of this Manual so that their duties are 'discharged lawfully, ethically and efficiently' (PSA Act 1990 (QLD) Austl.). The OPM outlines general policies and procedures which may be adapted to circumstances as they arise.

Implications Relating to Data Collection and SAR

The QLD Government Information Website contains the purpose, policy and scope for the management of Metadata (QGCI, 2010). There are three mandatory principles which directly relate to metadata. The principles are; agencies must use standard metadata schemes; agencies must manage their metadata records; and the participation in the consolidation of metadata across all Queensland Government agencies. These requirements draw on Queensland, Australian and international standards and practices for detailed implementation requirements (QGCI, 2010).

Activities involving data capture and download must comply with the minimum requirements for the management of metadata (QGCI, 2010). Responsibility, control and coordination of volunteer rescue organisations in all SAR operations lies with the QPS. It is QPS SAR policy that the SAR Coordinator is responsible, procedurally, to undertake a number of duties. In particular, this person is responsible for the coordination, maintaining and preservation of adequate records of the SAR operations (QPS, 2013b).

Findings

The purpose of information security within the QPS is to protect the confidentiality, integrity and availability of Queensland Police Service information. Currently there are no procedures set out in the QPS OPM involving GPS data collection, metadata management and GIS, despite policy in place describing the reasons and need for management of data.

The absence of Instructions for GIS support for police search co-ordinators has created issues with data management. Data within a SAR operation should form a logical compilation that serves the purpose of locating a subject. This data can be backed up and moved from one computer to another, and shared with colleagues. Without a management strategy, data will become impossible to reorganize and subsequently misplaced. This will lead to inefficiency and loss of credibility when data is required to assist in court proceedings, resulting in doubts about the reliability of information from GIS as evidence. By extension, the reliability of decisions based on GIS and the procedural need to evidentially trace that data could also be questioned (Lynch and Foote, 2000). The use of GIS evidence can be supported by signed witness statements, Justices Act 1886 endorsed, thus avoiding the rejection of GPS data as evidence. SAR Coordinators should ensure that statements are obtained

from witnesses in appropriate cases and should be obtained at the earliest practicable opportunity (Justices Act 1886 (Qld) (Austl.).

A search coordinator must understand that a GPS is a computer (Evidence Act 1977 Schedule 3 (QLD) (Austl.). GPS information can be manipulated on a GPS device (Strawn, 2009). Data is processed, stored, received and transmitted within the device and can be altered easily and with less trace than information held on a paper documents such as a statement (Lynch and Foote, 2000). A GPS has a central processing unit which stores files and folders and data can be uploaded to a computer and printed out on paper or transferred to another computer in the form of metadata (QGCI0, 2010). Metadata can be presented as a statement and as a representation of fact and as such, is capable of being reproduced (Evidence Act 1977 (QLD) (Austl.).

Recommendations

The research project has revealed that the Queensland Police SAR Coordinators require standardised guidelines for data collection procedures, in particular for GPS data. Evidentiary issues related to SAR Coordination improvements are linked more to the credibility, perspective and practicality of the recommendations. Gaps identified can be addressed by incorporating data collection procedures within the Queensland Police Operational Procedures Manual. It is recommended that all activities involving data capture should comply with the minimum requirements for the management of metadata (QGCI0, 2010). A legally acceptable and detailed policy and procedures to capture GPS data as evidence is required to achieve compliance to those principles which directly relate to metadata.

Conclusion

This study highlighted the relevance and purpose of the research relating to SAR operations and has furthered an understanding of the evidentiary relationship with GPS data. The legally acceptable and ethical parameters of GPS evidential data collection and admissibility of that evidence have been explored. These evidential issues are highly relevant to this research topic as there is a need to minimise risk through improved quality of police methods of collection and evidence presentation. There are currently no procedures in the OPM relating to data collection from GPS devices. Proactive information management practices can be seen as a measure of good corporate governance and risk mitigation, particularly for the 'litigation prone' (Byrnes, 2009).

About the author

Jeffrey (Jeff) Magnus is a police officer based in Northern Queensland. He holds a Bachelor Degree in Policing at Charles Sturt University (CSU), and a Masters in Emergency Management (CSU). Jeff specialises in Field Search Coordination and works as a Disaster Management Support officer within the Queensland Police, assisting State and Local Government in the response and coordination to disaster events.

Abbreviations

CPU	Central Processing Unit
GIS	Geographical Information System
GPS	Global Positioning System
OPM	Operational Procedures Manual
PSA	Police Service Administration (Act)
QGCI	Queensland Government Chief Information Office
QLD	Queensland
QPS	Queensland Police Service
SAR	Search and Rescue
SES	State Emergency Service

References

- Byrnes, S. (2009). Discovery of Electronic Evidence. Retrieved from <http://www.seamusbyrnes.com>
- Evidence Act (1977). Queensland, Australia. Retrieved, from <https://www.legislation.qld.gov.au/LEGISLTN/CURRENT/E/EvidceA77.pdf>
- Justices Act. (1886), Queensland, Australia. Retrieved from <https://www.legislation.qld.gov.au/LEGISLTN/CURRENT/J/JusticeA1886.pdf>
- Lynch , M., & Foote, K. E. (2000). Legal issues relating to GIS. Retrieved from <http://www.colorado.edu/geography/gcraft/notes/legal/legal.html>
- Morley, S. (2007). Capture of Taxi Camera Data. Retrieved from <http://gpsnet.qldpol/Operations/ser/Documents/QPRIMEUseandStorageofDigitalImages.pdf>

- Morley, S. (2013). Use and Storage of Digital Images. Retrieved from http://qpsnet.qldpol/specialist/osc/fsg/formProc/techproc/Documents/PVR/pvr_103_taxi_came ras.pdf
- NISO. (2001). Understanding Metadata. Retrieved from <http://www.niso.org/publications/press/UnderstandingMetadata.pdf>
- Palmer, G. (2002). Forensic Analysis in the Digital World. *International Journal of Digital Evidence*. 1(1).
- Pollack J., US District Court, PA: U.S. v Plaza, Acosta (Cr. No. 98-362-10, 11,12), "Strengthening the Criteria for Admissibility of Fingerprint Evidence," Judicial Opinion. Retrieved from www.paed.uscourts.gov/documents/opinions/02D0046P.htm
- Queensland Government Chief Information Office (2010). Standard IS34, Retrieved from <http://www.qgcio.qld.gov.au/products/qgea-documents/548-information/2458-metadata-is34>
- Queensland Police (2013a). Operational Procedures Manual s17.5.1: Service Responsibility - Search and Rescue. Queensland, Australia.
- Queensland Police (2013b). Operational Procedures Manual, 17.5.3. Adequate Records. Queensland, Australia.
- Strawn, C. (2009). Expanding the Potential for GPS Evidence Acquisition. *Small Scale Digital Device Forensics Journal*. 3(1). Retrieved from <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.187.1135&rep=rep1&type=pdf>
- Tomaszewski and MacEachren. (2006). A Distributed Spatial Temporal Cognition Approach to Visualisation in Support of Coordinated Group Activity. Retrieved from http://www.geovista.psu.edu/publications/2006/ISCRAM06_DSTC_final.pdf