Synchronised Encoding of GPS NMEA Messages onto High Definition Video Streams

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Abstract

Consumer awareness and retail penetration of High Definition (HD) technologies has increased dramatically over the last few years. This has led not only to increased interest and expectation of these technologies but also affordability of equipment. Global Positioning Systems (GPS) have also seen a very dramatic increase in consumer exposure and affordability with in car navigation systems, as an example, becoming more common place. The integration of HD Video (HDV) and GPS offers new research and development directions in many of the application areas that spatial video has played a role in to date. These include many mapping and navigation application areas such vehicular route corridor surveys, aerial and marine studies and Location Based Services (LBS).

In the past, work on integrating these systems has typically involved technologies that have lower quality spatial accuracy and much lower image resolutions, which has restricted spatial video to enhanced visualisation roles in Geographical Information Systems (GIS). A number of research project [4][2][3] have developed such system integration, while propriety commercial applications, such as [1][6][7], have also successfully deployed survey and analysis products in this area.

Many application areas, especially in GIS, will benefit from using integrated HDV and GPS National Marine Electronics Association (NMEA) Spatial data. The high resolution progressive scan nature of HDV will facilitate many research avenues that apply image processing techniques to GIS analysis and operations. A pilot project has begun by collecting two and half hours of route corridor surveys using a vehicle mounted system where GPS NMEA data and HDV progressive scan 1280 x 720p format data sets have been simultaneously recorded. In integrating these data sets a number of difficulties have been encountered. These include the specific data integration methods that are possible and time synchronization problems. Existing GPS and Video systems integration include frequency shift modulated audio encoded systems [5], however our approach is to investigate both MPEG-2 and MPEG-4 formats for Spatial data integration and the possibility of HDV in a MPEG-7 format which supports Video and Audio object metadata fields. Synchronising 1Hz GPS spatial data signals with 24 to 60Hz HDV frames is a problem affecting the positional accuracy of the location information with the HDV image location. Following on from this, the latency involved in signal propagation through an integrated capturing system will present some more technical problems.

References

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