Large Scale Mapping/Digital Photogrammetry and its Security for Planning a Smart City

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Abstract:
The focus of this paper is on use of information systems (GIS/GPS) involving large scale mapping along with digital photogrammetry which plays a very important role in providing necessary data and information for making apt decision making by the decision makers in various fields. Today almost half of the world’s population is in urban areas. Urban Population is growing 2.5 times faster than its rural counterpart. It is estimated that by the year 2025 urban areas are expected to be home for more than two-thirds of the world’s Population to show this data large scale mapping becomes a must and publishing this data in various mediums there is a imperative need to shield the digital data during communicating/transacting/advertising or any other online activity. Because of the advent of internet and increase in global connectivity, it is a must for securing the digital data and intellectual property. First part of this paper speaks about the need for large scale mapping and digital photogrammetry, energy and time utilized by both architects and planner to produce the raster rasters which are called as Master plans of both Macro and Micro planning settings the projects they are working on and second part establishes the need for protecting raster rasters data generated by architects and planners also discusses the need for the tools to establish authenticity of the data by watermarking techniques in rasters with copyright protection and their applications.

Keywords: Disaster management, Mitigation, Infrastructure, Services, Geographic information systems, Response, Planning, Record management, prevention, Preparedness, Recovery.

I. INTRODUCTION

Man has almost and always dominated life on the earth and tried to know the secrets of earth, its composition, continents (conquering them), continental drifts, topography, and gather all possible information possible and want the control of every thing, though he learned about earth and learned to harness the power of it to some extent, never was able to dominate and control Mother Nature. Among the five elements of nature, earth has always been the backbone for the development of civilizations since the beginning of the mans’ existence. We enjoy the fruits of the nature and it is in our best interest to study it and know the behavior patterns of it and demarcating it of utmost importance for various reasons.

II. LARGE SCALE MAPPING AND DIGITAL PHOTOGRAMMETRY

Scale is a relative measure when we term "Large Scale mapping” is not fixed and the limits are specified depending upon the local conditions and topology, Different scales are used in different areas depending on the practice of topography mapping in that area.

“Digital Photogrammetry” is the science of making accurate measurements using the technology available after acquiring and analyzing aerial photography.

Chemical print photos have to be scanned this is extra procedure involved when compared to pictures taken by a digital camera. Grain problem does not occur In digital pictures giving a better quality for the rasters taken and the radiometric resolution is of higher quality which facilitates location of elements in shadows similar to analogue rasters.

III. NEED FOR LARGE SCALE MAPPING AND DIGITAL PHOTOGRAMMETRY

a) Your Land conflicts:
Conflicts about land is a social conflict that can occur at the level of a community, state or country. The risks of conflicts on land are due to the fact, that land is the back bone for the existence of the mankind and all the living beings with out it there is no way anything can exists, and due to urbanization, excess population and quest for the most valuable land and the scarcity in the land availability has to meet rising demands over time. These make the competition among land users intensify. This is more destabilizing on land that crosses political boundaries digital photogrammetry is a boon for mapping.

b) Decision making:
land conflicts are very important which need workable monitoring provisions, enforcement mechanisms, and specific land allocation provisions that address various other problems. Among many land conflicts, the most prominent type of land conflicts is Control of land.

c) Utility mapping:
To have economic and social impacts of limits being set on the total amount of land that can be allocated. To generate Allocation policies and inter-regional attitudes towards different uses of land can be done only by utility mapping.

Security and control of land:
The Lack of proper attention on the security of Water land, misunderstanding in connections between land and security by “experts” and authorities, mislead policymakers and the requirement of ways of reducing tensions and violence by the
public, has led to a great need to put an effort on understanding the connections between land, and utilization of land at the level of international security and conflict management.

d) Importance of GIS:
GIS Technology can take large scale mapping to places where they have never gone before, GIS technology illustrates relationships, connections, and patterns that are not necessarily obvious in any one data set, enabling large scale mapping to better and help decision making relatively easy and come up with best alternatives based on all relevant factors.

The decision maker (manager) may be one authority or a governing body depending on the area and the magnitude of the area. Knowing the strength, weakness, opportunities and treats involved in the process of large-scale mapping and digital orthophotography.

e) GIS Capability:
- Allows Cities to calculate demand and supply in their area and conduct urban planning and infrastructure planning more accurately,
- Identifies sociological conditions of the area,
- Help facilitates transportation planning, infrastructure planning, disaster management and for crime prevention,
- Enable data integration and policy making,
- Monitor the location and growth of settlements,
- Facilitate data collection and integration, map presentation and report generation,
- Enable rapid land assessment.

V. NEED FOR DIGITAL SECURITY

We review a few of the major applications of digital watermarks here.

1.1.1 COPYRIGHT PROTECTION. Copyright protection is one of the major forces which drive the research in watermarking. Data can now be distributed in digital format with ease due to the existence of the Internet. The objective here is to embed copyright information into the data so that the rightful owner of a piece of data can at least prove his/her ownership in the case of a dispute. The watermarks in this scenario obviously require a high level of robustness and should resist attempts in removing them. Note that watermarks for copyright protection do not prevent people from copying the digital data, they simply exist as a means for owners to assert ownership over some digital data. Typically these watermarks are used in conjunction with a buyer-seller protocol in online distribution of digital data.

1.1.2 COPY PROTECTION. In contrast to copyright protection, a copy protection mechanism actually prevents users from making unauthorized copies of the digital data. This is difficult in open systems like the Internet but it is possible to enforce copy protection in a controlled system like the DVD player. For example, the watermark which exists on a DVD tells a compliant to DVD player whether a user is allowed to copy the video.

1.1.3 FINGERPRINTING FOR PIRATE TRACING. Watermarks are used in fingerprinting applications to identify the legal recipient of the digital data. The existence of differently watermarked copies of the same data allow the collision attack and so fingerprints must be designed to be collision secure. Watermarks for fingerprinting otherwise have identical requirements to that of copyright.

1.1.4 FOR AUTHENTICATION. Delicate watermarks are used to validate digital data. For example, if a digital photograph is to be used as evidence in a court, we must prove that the photo has not been manipulated. A delicate watermark can be inserted into the digital data. If the data is modified maliciously, distortion of the watermark will happen. If watermark can be retrieved then the data is authentic, otherwise, it should be discarded as fake

1.2 WATERMARKING REQUIREMENTS
1.2.1 PERSISTENCE. Watermarks should not be changed while, Scaling, Filtering, Cropping, and Raster Compression.

IV. DIGITAL SECURITY

Watermarking describes techniques which are used to convey information in a hidden manner by embedding the information into some innocent looking cover data. With the advance of the Internet and the ubiquity of digital data, it is natural to extend the idea of digital watermarking to digital data like digital rasters. Typically, this information is required to be robust against intentional removal by malicious parties. Since the internet has opened opportunities for the writers, musicians and artists to take advantage of the worldwide publishing where by audio and raster data is easily available in these public channels, which can easily be copied online with out permission Digital watermarking, allows copyright owners to incorporate the same to their digital property, this is done with means which is not visible to nake eye authenticating the digital property, once water mark is incorporarated we can even track and find piracy and curb it from its roots.

IV. DIGITAL SECURITY
1.2.2 PERCEPTUAL TRANSPARENCY. When watermark inserted it should make any change in the quality of the raster or data.

1.2.3 Robustness. Robustness is a measure of the ability of the inserting algorithm to introduce the watermark in such a way that it is retained in the raster despite several stages of raster processing.

1.2.4 Decodability. Inserted watermarks should be easily detected by concerned authorities and decoding process which was established prior to introducing watermark should work.

1.2.6 Security. If unauthorized personals know the algorithm for the embedding, the security of the algorithm lies in the selection of key as in cryptographic techniques.

1.2.7 Payload of watermark. In intellectual copyrights such as ISBN or ISRC a length of 60-70 bits would be sufficient as a payload.

1.2.8 Speed. Low level obligation of a watermarking arrangement is speed.

1.2.9 Statistical Imperceptibility. The watermarking algorithm should modify data in such a way that the statistics of the data are not modified in any fashion that create problem to the presence of a watermark.

VI. STUDY OF WATERMARKING TECHNIQUES

2.1 Spatial Domain Techniques

2.1.1 Least Significant Bit modification. This method is based on the fact that most of the significant raster information is stored in the most significant bits and modifying the LSB’s does not degrade the data considerably.

2.1.2 Correlation based techniques. These techniques for watermark embedding exploit the correlation properties of additive pseudo-random noise patterns as applied to an raster.

2.1.2.1 Threshold-Based Correlation. In this method if the correlation exceeds a certain threshold T, the watermark is detected, and a single bit is set.

2.1.2.2 Comparison-Based Correlation. In this method two separate pseudo-random noise patterns are designated for each for the logical “1” and “0” for embedding the watermark. And for recovery the pattern with the higher resulting correlation is used and the bit corresponding to the pattern is set.

2.1.2.3 CDMA Spread-Spectrum. CDMA spread-spectrum technique is used to scatter every bit arbitrarily all over the raster, increasing the capacity and improving resistance to cropping.

2.2 Frequency Domain Techniques

Since Dilapidation in uneven regions of the raster is more clear to the HVS than at the edges hence it is usually desirable to conceal watermarking evidence in noisy areas and edges of raster, rather than in uneven regions.

2.2.1 Comparison of mid-band DCT Coefficients. This technique utilizes the comparison of mid-band DCT coefficients to encrypt a lone bit into a DCT. Here the mid band frequencies (FM) are selected as the embedding area as to provide extra resistance to lossy compression techniques, while evading important alteration of the raster.

2.2.2 Comparison-based correlation in the DCT mid-band. In this technique a PN sequence W is embedded into the middle frequencies of the DCT block. We can modulate a given DCT block I(x, y) using the equation

$$I_{Wy, y}(u, v) = \begin{cases} I_{x, y}(u, v) + k * W_x(u, v), & u, v \in F_M \\ I_{x, y}(u, v), & u, v \not\in F_M \end{cases}$$

where K is the gain factor. Coefficients in the low and middle frequencies are pasted over to the transformed raster unaffected. Each block is then inverse-transformed to get the output of the final raster.

2.3 CDMA Spread-Spectrum in the wavelet domain

Another domain for watermark embedding is that of the wavelet domain. The DWT (Discrete Wavelet Transform) separates a raster into a lower resolution approximation raster (LL) as well as horizontal (HL), vertical (LH) and diagonal (HH) detail components. The process can then be repeated to compute multiple “scale” wavelet decomposition.

2.4 Wavelet Domain Techniques

The watermarking technique is used to scatter every bit arbitrarily all over the raster, increasing the capacity and improving resistance to cropping.

2.4.1 Comparison-based correlation in the DCT mid-band. In this technique a PN sequence W is embedded into the middle frequencies of the DCT block. We can modulate a given DCT block I(x, y) using the equation

$$I_{Wy, y}(u, v) = \begin{cases} I_{x, y}(u, v) + k * W_x(u, v), & u, v \in F_M \\ I_{x, y}(u, v), & u, v \not\in F_M \end{cases}$$

where K is the gain factor. Coefficients in the low and middle frequencies are pasted over to the transformed raster unaffected. Each block is then inverse-transformed to get the output of the final raster.

VII. CONCLUSION

large scale mapping and digital phogemmetry using GIS/GPS can help the Urban Planners and various other decision makers in making a better community by providing sustained information system of geography, demography, basic services etc. This paper thus identifies and discusses the importance of Information Systems in decision-making to stress on mitigation being the top priority and be able to provide best management possible in development of a smart city. A study of the basics techniques of digital raster watermarking has been made and it is observed that LSB substitution is not a very good candidate for digital watermarking due to its lack of even a minimal level of robustness and transform domains are typically better candidates to implement watermarking for largescale mapping and digital photogemmetry for the security. And there is a lot of scope for the development of adaptive and more robust techniques that can cater to the real time requirements.
VIII. REFERENCES


