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Integration of Geographic Information Systems (GIS) and Spatial Data Mining Techniques in Fight against Boko Haram Terrorist in Nigeria

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Abstract: ***A GIS is a computer system capable of capturing, storing, analyzing, and displaying geographically referenced information. GIS works by relating information from different sources. The power of a GIS comes from the ability to relate different information in a spatial context and to reach a conclusion about this relationship. Most of the information we have about terrorism today is locational base and can be reference to a spatial location. Spatial data play a very important role in the fight against insurgent and terrorism. The integration of Geographic information systems (GIS) and spatial data mining technique will greatly help the Nigerian military and other security agency to classify and predict likely terrorist hit spots. The goal of the integration is to accurately predict the targets of Boko Haram Terrorists in Nigeria. GIS and spatial Data mining technique have been applied in a wide interdisciplinary research area spanning several disciplines such as expert system, database system, statistic, security modeling, environmental studies and intelligent information systems. The goal of this paper is to presents the integration of Geographical information systems (GIS) and Spatial Data Mining Techniques in Fight against Boko Haram Terrorist in Nigeria.***

Keywords: Geographic information systems (GIS).Spatial Data Mining, Boko Haram, Terrorists, Nigeria

1. Introduction

The Boko Haram uprising in Nigeria in July 2009 started as small riot against western education which have now metamorphosed into a major terrorism Islamic sects[1,5,6,] stated, that the group has recently expanded its terrorist attacks to include international targets such as the United Nations building. Fighting the Boko Haram insurgency in Nigeria needs a new approach of intergration of GIS and spatial data modeling techniques to predict likely hit spots by the sects.

Geographic Information System (GIS) uses geography and computer-generated maps as an interface for integrating and accessing massive amounts of location-based information [4, 7,]. GIS have been applied widely in the mapping of crime hot spots, security monitoring, and crime scenario predicting [4]. However, [4] opined that GIS allows police personnel to plan effectively for emergency response, determine mitigation priorities, analyse historical events, and predict future events. It is used world over by police departments, both large and small, to provide mapping solutions for crime analysis, criminal tracking, traffic safety, community policing, Intranet/Internet mapping, and numerous other tasks. GIS helps crime officers determine potential crime sites by examining complex seemingly unrelated criteria and displaying them all in a graphical, layered, spatial interface or map.

[3] Stated that Statistics are an important tool in crime analysis and police forces are using it in a more effective way to discover useful information, reduce crime and maximize the use of resources. Statistics help strategic decisions and turn vast amounts of meaningless numbers into a general picture (geographically and temporally identified) of crime events.GIS has strong Geostatistics functionality which are also crucial when working with spatial data. That is, only through the use of geostatistics, the true value of information can be extract. By assuming that every crime point has a geographical location (in space) and that every point has a considerable amount of information added to it, we can relate all the individual information (point) with all the others to construct a complete analysis scenario.[3,4,]

Integration of GIS and data mining techniques when combined with capabilities of areal surveying and tracking the movement of suspected suicide bombers, It is more cost-effective for the crime analyst to come up with the information than for patrol officers to do it themselves. [4.3,]

2. Data Mining

Technologies are used by humans to adequate in there society. Everyday a vast amount of data is used and these data are in various forms. It may be in the form of graphical formats, may be documents, may be the records (varying array) or video. In the real world different data is available in the different formats so that the proper actions have to be taken for better utilization of the datasets available. The data should be stored such that when the humans need that data it can be retrieved easily.[2,7,]

The technique of extracting knowledge from any type of data is called data mining or knowledge hub. [2] opined that the perception “Data Mining” is due to the quote “we are data rich but information poor”. A wide variety of rich data is available but we can hardly turn them into useful information and knowledge for decision making in the industry.

3. Spatial Knowledge Mining

[7] Opined that spatial knowledge mining is a derivative of Knowledge Discovery in Databases (KDD). Spatial knowledge is stored in geographic information systems

(GIS), which are databases with additional functionality for performing spatial manipulations and queries from the data. Spatial knowledge mining merges the techniques of data mining and GIS to form high dimensional analysis, the results of which are then projected onto the two dimensional geographical view. This synergy is important because it allows the results of sophisticated multivariate analysis to be presented in an intuitive display for the user.

4. Spatial Data Moelling Integration Task

[6] Identified eight spatial data modeling tasks which can be integrated into a GIS database. This include, multidimensional analysis of spatial temporal data, mining dynamics of spatiotemporal data streams, spatiotemporal data classification, trend prediction for spatiotemporal data, spatial temporal data clustering, spatial temporal outliers analysis, frequent pattern or correlation spatiotemporal data analysis and discovery of sequential pattern for moving objects. The whole of these tasks can be integrated into a GIS database for Geo profiling of the Boko Haram sects and their activities in Nigeria. [9] stated that Geoprofiling is a disciplinary technique for determining the typical spatial patterns of an individual with the goal of predicting that person's behavior or targeting them for surveillance. With geoprofiling maps can easily be made of crime hotspots and coldspots.

5. Flow Chart of Integration Model for Figthing Boko Haram in Nigeria

This paper propose a model for the integration of spatial data mining platform with GIS database in predicting hit spots and hit maps of the Boko Haram sects(Fig 1). This will help the security agency of the federal government to plan anti terrorist measures to the activities of the sects. The model is an integrated flexible multi-purpose data tool designed for the urban scale with a high geographic resolution primary suitable for planning purposes within population exposure to the Boko Haram sects' activities. Exploring the visualisation and analytic features of GIS the model gives a geographic dimension to input and output data. Data may be displayed as points e.g. data related to addresses polygons e.g. data related to buildings or contour plots., lines e.g. data related to streets., and grids e.g. population density.

The model gives population exposure estimates to the Boko Haram terrorism activities based on estimated hourly time series of the spatial data captured for three microenvironments separately: residences, working places and streets. [3,4, 8,10]

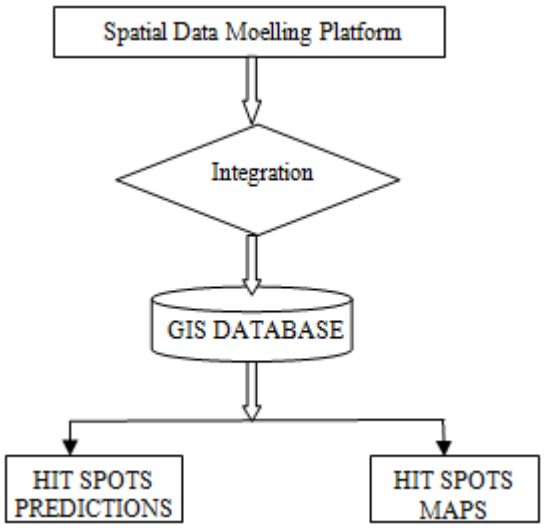

Figure 1: Flow Chart of Integration model for fighting Boko Haram in Nigeria

6. Conclusion

This paper introduces an integration model for spatial data modeling platform and GIS database for the prediction of hit spots and hit maps as a tool to fight the Boko Haram terrorist sects in Nigeria. The integration of spatial data modeling and GIS is a promising research frontier in the fight against the Boko Haram sects in Nigeria.

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