A Review on Geospatial Technologies for Education in Aurangabad City

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Abstract— **In Today`s world, day by day new technology had invented as per the user requirement. Information Technology (IT) is developing very rapidly. Remote sensing (RS) and Geographic Information System (GIS) is one of the new technologies. In GIS people have the scope to solve many geographic problems quickly and effectively. These technologies are capable to analyse spatial data about the schools, colleges, university, Hospital, Tourism, traffic etc.**
The purpose of this project is to examine the different categories of schools in Aurangabad city, Maharashtra, India. It checks the compatibility of GIS with education facilities. We classified four different categories of schools in Aurangabad city, mapped them using Google Earth and KML. We traced these all schools with their exact longitude and latitude and detail information about the particular school is also shown using Google Earth API. People can see covered area about the particular school and area where actual schools are required.

Keywords— *Geographic Information System (GIS), Google Earth, Open Geospatial Consortium (OGC), (Keyhole Mark-up Language) KML, School Location Analysis, Aurangabad city*.

I. INTRODUCTION

Smart city can be defined as 'smart' when investments in human and social capital traditional transport modern and information communication technology sustainable for the economic development and a high quality of life, with a wise management of natural resources, through participatory action and engagement. [1]

Education in its general sense is a form of learning in which the knowledge, skills, and habits of a group of people are transferred from one generation to the next through teaching, training, or research. Education frequently takes place under the guidance of others, but may also be autodidactic. [2]

The main objective of this project is to locate all the schools such as CBSE, English medium schools, Urdu medium Schools and Marathi medium schools of Aurangabad City through KML on Google API. In this project, the detail information contains address of school i.e. location and website of school if any, contact detail of school, school building image, medium of schools, school facilities. Due to that people or parents may get the actual information about the schools and choose proper schools for their son or daughters. For making the actual growth of students initially choosing right school is very important.

In the early years of schooling, the focus is generally around developing basic interpersonal communication and literacy skills in order to further ability to learn more complex skills and subjects. After acquiring these basic abilities, education is commonly focused towards individuals gaining necessary knowledge and skills to improve ability to create value and a livelihood for themselves. [3]

Actual Working with the KML and Google API for locating the available & analysing their properties for school information system in the Aurangabad city is important. KML is an abbreviation for Keyhole Mark-up Language, which is an XML format for managing the display of geospatial data for school information system. The format is created by Google and used by Google Earth and Google Maps and by many other geographical & developing a GIS enabled KML for an education in Aurangabad city.

The designing provides school information using Google earth and KML language. Collect the information about the schools and their facilities available in the study region. Analysing more and more data and generating useful information with help of GIS. The application developed was simple and made in such a way that even a non-GIS professional can use it.

The KML quickly understands the power of spatial data and to bring more and more spatial data to KML. The OGC has accepted KML into their fold, essentially cementing KML into the record books as a powerful format for spatial communication. KML files allow data to be visualized in Google Earth and Google Maps. Analysing more and more data and generating useful information will be imported on Google earth it will easy for making decision and analysis.

II. LITERATURE REVIEW

According to Ethlers, M.; Jadkowski, M.A.; Howard, R.R..; Brostuen application of SPOT data for regional growth analysis and local planning, the fusion of Remote sensing with the Geographical Information System (GIS) technologies has been vastly implemented and recognized effective in the Urban analysis and modelling. Geospatial data and GIS are the primary components in referencing framework of virtualization which helps to map the information and creation of the smart cities. [4]

Educational institutions, universities, colleges, schools, libraries, and other centres of learning are physical entities. Typically when we picture these places, we see people, the learners themselves and the persons who support that learning. Possibly a bit more invisible to our eyes is the actual geography these people inhabit, experience, and

navigate the physical environment of buildings, campuses, and districts.

This study presents the modeling of the system of educational facilities included in a large city or a municipality, to facilitate a decision regarding the optimum location of a new educational facility. As will be shown, the allocation of a new educational establishments is a multidimensional one and for this reason, a particularly complex decision will have to be made, based on examining a large number of variables, relating both to the deficiencies in areas shown per each educational level, as well as the available land for erecting schools located within the urban area of study. The complexity of this decision necessarily leads to the modeling of the educational system and its management, using GIS. Specifically, the analysis data, which needs to be integrated into the GIS, is presented along with the process of analysis, interpretation and the conclusion drawing relating to the problems of the existing situation in conjunction with the methodology of finding those critical spatial entities, where the construction of a new, and of a particular level, educational installation, is more urgent. For the application of the methodology, the educational system of Thessaloniki, Greece, will be used as a case study.

This study focuses on the planning of educational facilities, using as a case study the educational facilities in the municipality of Thessaloniki in Greece. Specifically, the interest relates to the modelling of the system of educational establishments, but, primarily, to the methodology, which is used to find the optimal location of a planned school. It is important to note that this application has taken into account the specificities of both the Greek education system and the Greek urban planning system, which may differ more or less in relation to those of other countries. [5]

The educational system of Greece is divided into three levels: primary, secondary and higher education. The first level includes only the elementary schools, to which children aged 6 to 12 are admitted, while the second level includes lower-secondary and upper-secondary schools, which accept children aged 12 to 15 and adolescents between 15 and 18 respectively. Attendance in elementary and lower-secondary schools is mandatory, as opposed to upper-secondary schools which is optional. Concerning the institutional status of the provider of educational services, in the 2007-8 school year, 94% of students enrolled in public schools, which offer free education (Eyrydice 2009: 1-2), while the rest 6% of the students enrolled in private schools. It is worth mentioning that the operation of public schools in elementary and secondary education is the responsibility of each municipality in which these schools are located. This study is focused on the planning of new public educational facilities of these two tiers (elementary and secondary education).

According to the Constitution of Greece, the provision of education is an obligation of the state to all citizens and is compulsory for at least nine years. Also, according to the *Code of Municipalities and Communities*, which defines the responsibilities of local government, the expropriation of land for the construction of schools, the construction of

these schools, their operation and maintenance is decentralized from the central state and is, henceforth, responsibility of municipalities (Ph.EK 114/08/06.2006, paragraph 1 and 15). As is clear from the above, educational facilities included in a municipality are required to meet all the educational needs of their citizens. This requirement means that schools must register and provide educational services to all students of the municipality who choose to attend them. However, for lack of a sufficient number and/or size of educational facilities to serve the educational needs of the citizens inevitably leads to one of the following two options.

The first option is the deterioration of the educational services offered, by registering a greater number of students from that which corresponds to the building capacity of each school. Such deterioration can be calculated by measuring the ratio between the build area of the school and the number of students attending them and comparing this ratio with the corresponding planning standard. Such standards exist in almost every developed country is provided in Ph.EK 285/D/5.3.2004. For example, if a primary school has a 1.000sq.m. built area and serves 200 students, this means that the occupation ratio is 5sq.m. per student. . This ratio is then compared to the corresponding standard, which for Greece is set to 6 sq.m. of built area per student. As it is understood, comparison of the current occupation ratio to the planning standard suggests that this primary school does not provide adequate educational services.

The second option is to operate the school in two shifts, so as half school population will attend school in the morning and the other half in the afternoon. Of course, the operation of schools in two shifts constitutes an indirect degradation of educational services; as schools should be operate only during the morning hours.

According to available accounts, school mapping originated in France in 1963 (Caillods, 1983; DaGraça, 1998; Galabawa, Agu, & Miyazawa, 2002; Govinda, 1999). School mapping (SM) is a normative approach to the micro-planning of school locations. SM is also used to investigate and ensure the efficient and equitable distribution of resources within and between schools systems, when large-scale reform or significant expansion of an educational system takes place (Caillods, 1983).

In another definition of GIS it is abbreviation of three words: Geography + Information + System. Geography relates to all the features and process that occur on the surface of the earth. Information is the hearth of GIS, where vast amount of data are stored and analysed (Audet & Ludwing, 2000, p. 6). Therefore GIS makes geographic analysis and location analysis easier, so users of GIS application increase and the scope expands. The trend towards using GIS and school mapping to support decision making for Ministries of Education and educational facilities are becoming very important for planning purposes. GIS is in the implementation stages in many developed countries of the world, and also in the developing countries. (Yoko, Watanabe 2002) have decided that GIS is a very useful tool to analyse the school-planning situation. Besides the simplification of educational

administration, and expansion of compulsory education, enforcing the clear school planning policies, and creating the digital database that can be used in GIS, will have more positive influence on improving school services and qualities for the current and future children. [6]

According to (Hite J., 2004) school mapping as a technical exercise has become a relatively normalized and institutionalized practice in education's micro planning. More than simply being a tabular, graphical or cartographical representation of a particular space or place, school mapping involves the consideration and inclusion of various forms of technical data that impact and populate the physical and social context of analysis. As a process that produces specific functional products, school mapping is fundamentally an educational micro planning effort focused on increasing school resource efficiency and equity (Caillods, 1983).

Another use of GIS in Education involves combining statistical inferences to geographic information. Statistics in education might be used with GIS to present a clear picture of educational facilities and activities. Ratio of students to teacher, number of students in a class and student density in school, schools distribution in a district to find lack of schools and in time processing education facilities and so on. GIS might be used for supporting educational decisions by senior administration and how to use statistic for this system. Some approaches in GIS that might be used for education facilities and policy with statistical inferences in the districts of Izmir (Temiz, 2007). [6]

III. GIS TOOLS IN EDUCATION

A. OGC (Open Geospatial Consortium)

The Open Geospatial Consortium (OGC), an international voluntary consensus standards organization, originated in 1994. In the OGC, more than 400 commercial, governmental, non-profit and research organizations worldwide collaborate in a consensus process encouraging development and implementation of open standards for geospatial content and services, GIS data processing and data sharing.[7]

The Early success of GIS led to a problem no vendor could solve alone; by the mid -1980s geographic information system (GIS) software was heavily used in the natural resources and defence domains especially within government agencies. Other market sectors, such as state and local government civil engineering, transportation and business marketing were seriously exploring the technology. The future looked bright but there were frustrations brewing among the users.

B. KML in Google Maps

Google Maps supports the following KML elements, When KML content containing a large number of features (place marks, polygons, and lines) is loaded into Google Maps, and a server-side decision is made about whether or not to render the document's features on the server or in the user's web browser. The user experience including feature appearance and interactivity will not be affected by this decision; the content will look and behave the same way, regardless of the chosen method.
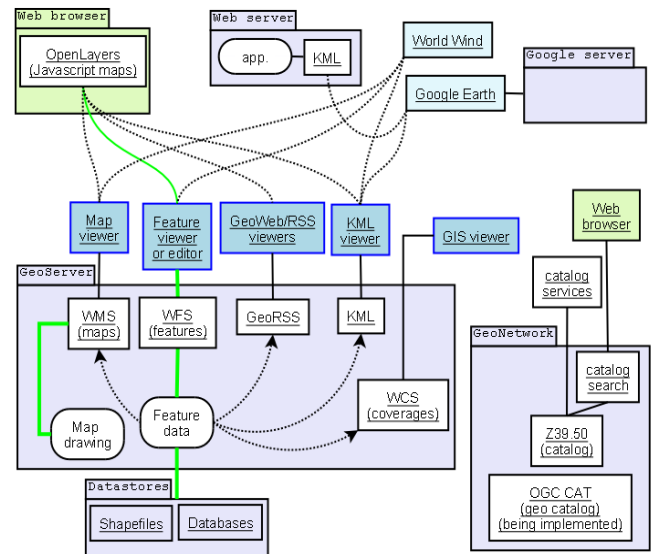

Fig. 1 Relationship between clients/servers and OGC protocols

C. Google Earths

KML was originally developed for Google Earth. Originally called Keyhole Earth Viewer Originally created by Keyhole, Inc Acquired by Google in 2004. The first program to view and graphically edit KML files. Maps the Earth by superimposing images obtained from satellite imagery, aerial photography, and GIS 3D globe. Easy navigation using the mouse and control button. Most of Earth is available in 2D imagery only, but some places have 3D available. 3D images of buildings and terrain are made available through digital elevation model imagery collected by NASA's Shuttle Radar Topography Mission. The ability to overlay images for comparing different types of information .The scale must be accurate, but image conforms to the topography.

D. KML (Keyhole mark-up language)

KML is another type of mark-up language based on XML. KML is defined as a, "Schema for expressing geographic notation and visualization on existing or future web-based online maps (2d) and earth browsers (3d)". KML is an XML file format used to display geographic data in an Earth browser such as Google Earth, Google Maps, and Google Maps for mobile. XML-based language schema describing a geographic vocabulary used by geo browser applications on two or 3D Earth maps.

The word Keyhole comes from an American military reconnaissance satellite program developed in the 1970's. The Google Earth program both produces and consumes KML files. KML uses the three-dimensional geographic reference system of longitude, latitude, and altitude to describe a basic point of view in space over or on the surface of the Earth; then adds more specific control over that view with heading, tilt, and roll factors. [8]
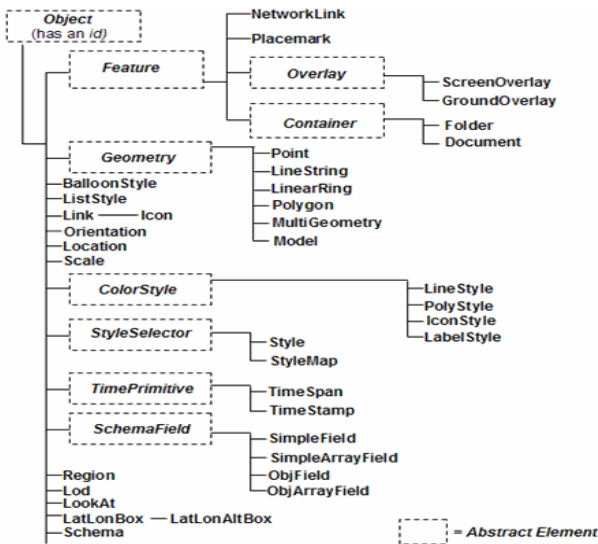
Fig. 2 Elements of KML

Figure 2 shows the elements which are used in KML. The elements are categorised in various levels. We can use these elements as per the requirement. There are some famous elements such as Geometry, color style, overlay, container etc.

IV. PROPOSED SYSTEM

In this project, we have to cover maximum schools of Aurangabad city and these schools divided into four different categories. In Aurangabad city, there are more than 100 schools which may be public or private under some educational welfare societies. Population of Aurangabad city is increasing rapidly, it crossed the figure of 1500000 that`s why schools are increased as per need.

Our main purpose of this project is to show the maximum schools with their detail information by using Geospatial technologies. The detail information of single school shows the actual location of school which is identified by longitude and latitude. It can be used to develop a model for the education system in Aurangabad city which can help the people to select proper or accurate schools for their children's for their bright future. Any user can use this application without any restriction.

In this project, people will get the detail information which contains address of school i.e. location and website of school if any, contact detail of school, school building image, medium of schools, school facilities.

Figure 3 shows the actual working of proposed system of this project. We have to use Google Earth and KML to map it on Google API. Followings are the some steps of working of this application.

1) Collect the information of maximum schools such as CBSE, English medium Schools, Urdu medium schools and Marathi Medium schools.
2) We have to map all these schools on Google API.
3) We have used four different colours to identify these schools.
4) Analyse each category of schools.
5) Apply two different management systems on these mapped locations of Aurangabad city.

6) First management system is to consider the random point in Aurangabad city area.
7) It shows the availability of nearest school with detail information about the schools for students or parent.
8) As a result it shows more than one school from random point and one special school which is actually nearest to this point.
9) Then parent has to decide about the admission of their children.
10) The second management system of this project is to use Range Ring tool at specific school.
11) It analyse the surrounding area from that specific school and made the Rings as 1KM, 2KM, 3KM etc. like circles.
12) Result shows the name of colony or area from that specific school i.e. the maximum students from surrounding area takes the admission to that specific school.
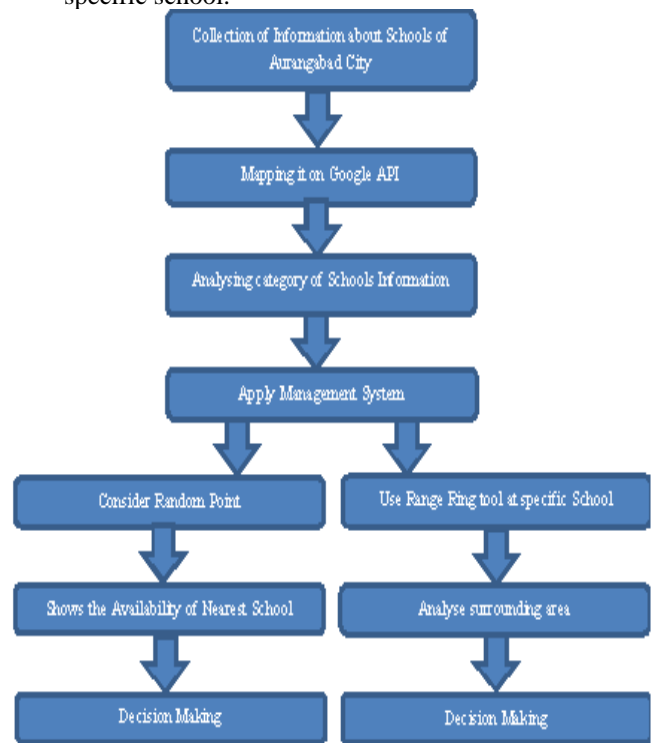

Fig. 3 working of proposed system

V. CONCLUSION

In this paper we mainly focusing on the search approach over the Google API. People don`t know anything about the education system because they didn't have any source to see about facilities of schools which are provide by the school. Now a day's people are trying to get actual information for education of their children's. This project is really helpful for the people for choosing accurate school for better education. We have studied multiple journal papers related to this domain and identifies its need and limitations

KML is the international standard the OGC and Google have agreed to harmonize KML and GML further GML is Geography Mark-up Language an XML based encoding

standard for geographic information. The language allows Internet browsers the ability to view web-based mapping without additional components or viewers.

The Google API is the specification used by software components to communicate with each other. An API may describe the ways in which a particular task is performed. Mapping the places of the city and also providing a better view for the users a smarter the information about the city. Smart Cities need to be able to integrate themselves into national, regional and international infrastructures. Requirements address a number of technologies, beyond the ones related to mobile and fixed networks. The needs for mobility in urban areas result into a number of problems .The information being managed in this area can be relevant to other domains which increase its potential.

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