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Developing A Campus Information System For Manipal Institute Of Technology, Manipal Campus, Manipal

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Article History	*Abstract*
	Organophosphorus based pesticides are chemical pesticides which are widely used in India for controlling the pests, insects and plant pathogens. The mode of action of pesticides belonging to this class is on neurotransmitter inhibition as well as muscle suppression by which the target organisms are killed. But since the use of these pesticides is in an uncontrolled and indiscriminate manner in agriculture sector, there is a need to degrade the m to protect their harmful effects on environment. Biological degradation of these pesticides are considered as better alternatives as this method is both economical as well as eco-friendly. Bioremediation of organophosphorus pesticides in the vicinity of soil has gained much attention recently because the microbes involved in this process are naturally having the potency to degrade the pesticides in their habitat which is called principle of infallibility. This property was explored for the biological degradation of pesticides. The microorganisms have a special gene known as organophosphate hydrolase or 'oph' whose enzyme product when come into contact with the organophosphorus compounds readily degrades them. This organophosphate hydrolase enzyme is well known for its broad spectrum of substrates hydrolysis activity. This activity was taken as a tool for screening of potent bacteria form agriculture soils towards organophosphorus degradation in the present study. Serial dilutions of the soil samples collected from three different regions of Telangana state were done to decline the microbial load and then through spread plate and streaking techniques, isolated bacterial colonies were obtained. Screening of these colonies for the presence of OPH enzyme was done by mixing the OPDs onto OP medium. After screening for the potent isolates showing OPH enzyme, it is revealed that the potent isolates which were successful in degradation of organophosphorus pesticide Chlorantraniliprole indicated by bacterial growth even in the presence of pesticide and also due to the presence of 'oph' gene which produced OPH enzyme.

INTRODUCTION

Map applications have gained popularity in the past decade due to their immense usefulness. They are handier than paper maps and are easier to navigate through with options for zooming and locating. The better maps have several more choices in viewing maps – such as the terrain, or traffic condition of a geographical location. GIS or Geographic Information System is a conceptual framework administering the abilities of spatial and geographic data capture and analysis. It allows the creation, storing, editing and management of spatial and non-spatial data, further analyzing the outputs of spatial information and presenting visual results as maps. It can be applied in a variety of fields such as planning, mapping, engineering, business etc. It is also often used for GIS mapping to map data like spatial locations, quantities, population densities etc. Data tied to spatial points can be layered for the visualization and identification of data patterns to eventually aid in decision making. GIS, being an integration of database technology, statistical analysis and cartography, can be extensively applied to diverse fields in Civil Engineering, such as structures, Environmental, Construction management, Transportation, Site analysis, CAD integration and surveying. There are several other applications of GIS such as, for Disaster Management, Spatial and Data Management, Infrastructure Operation and Management, Urban Planning etc. With developments in technology and increased need of efficiency, accuracy etc., GIS is proving to be a necessity in different civil engineering fields, aiding in various aspects of a project life cycle, from organization and distribution of data to the creation of coherent reports and visualizations. The necessity of map applications becomes more apparent when dealing with large areas such as big campuses, such as that of Manipal Institute of Technology, Manipal. An interactive campus information system provides rapid and easy access to personal and sharable information about the locations of hostels, academic and administration buildings, fire exits, staff information, etc. for the students, academic and administrative staff. With this in mind, the present paper is an attempt to develop such an application using Quantum GIS (QGIS)- a User-Interface framework and PyQGIS which is a Python binding for QGIS. QGIS is a free and open-source Geographical Information System.

CHOICE OF SOFTWARE

There are many popular open source Graphic User Interface (GUI) softwares that are available – Visual Basic, NetBeans, Java and so on. Likewise, there are many GIS softwares available too – for example, Quantum GIS, GRASS GIS, ArcGIS, JUMP GIS, SAGA GIS, etc. However, for GUI software Qt (Quadtree seemed the best choice since it has a very extensive arena of functionalities. Moreover, it provides for Python bindings such as PySide and PyQGIS. For the present work, Quantum GIS is made use of as it can import libraries from Qt which will aid in GUI development. PyQGIS is a python binding (an integration of Quantum GIS and Python) - which depends on PyQt4 allows me to access satellite images through the GUI, something which Java and NetBeans do not allow. PyQGIS allows for spatial queries also.

CHOICE OF PROGRAMMING LANGUAGE

A binding from a programming language to a software is an API (Application Programmer Interface) that allows the software to use the language.
Qt provides bindings for several languages – Python, Java, Perl, C++, etc.

Readability and Ease of programming

Python is a widely used high-level programming language. Its readability is very high and code can be written relatively easily in comparison with other languages such as C and Java.

More functionality

It also provides an option to use several other important bindings such as QtSQL.

CHOICE OF OPERATING SYSTEM

At first glance, it seems a better choice to use the Windows operating system as it is by far the most popular one. However, Linux Ubuntu is used for the present work as it provides for a much easier way to install and set up dependencies through the Synaptic Package Manager, which are very important for the project.

SCOPE OF THE PROJECT
Study Area
Manipal Institute of Technology, Manipal is located in Udupi District of Karnataka State, 5 km East of Udupi. It lies within the latitude of 13 20' 00" N to 13 22'10" N and Longitude of 74 46' 45" E to 74 48'35" E. The Institute Campus is spread over 200 acres within Manipal University Campus on the table top of Manipal hill situated at an altitude of 330ft. River Swarna flows in the north of Manipal. Mannupalla Lake is located in the west and lush green view all around the campus. (Fig 1)
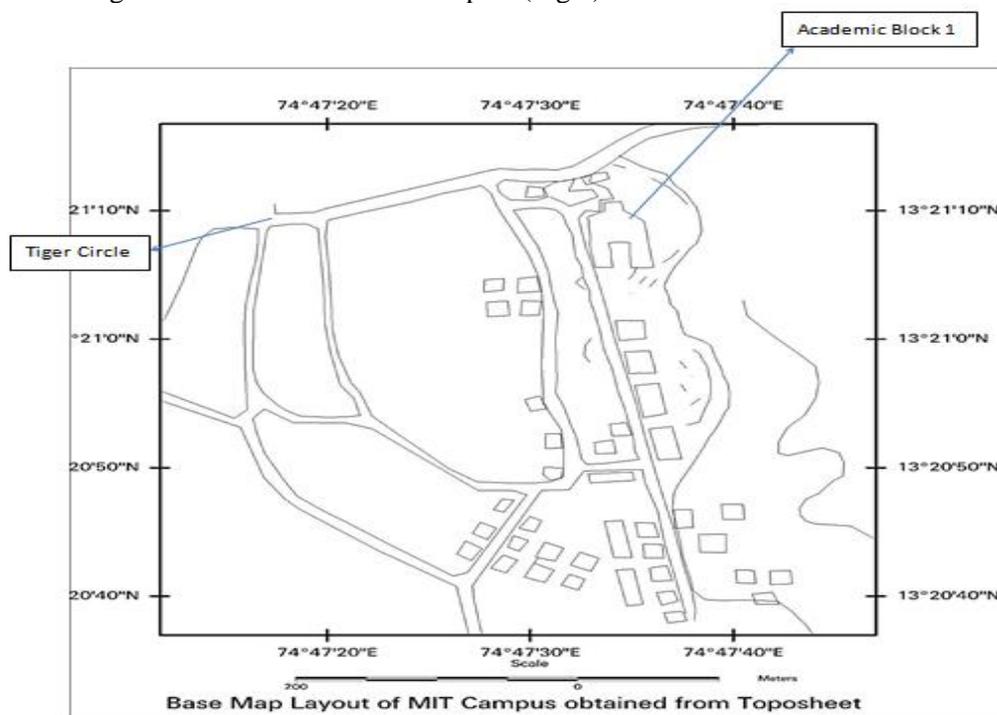

Figure 1 Base map of study area

LITERATURE REVIEW

Education is gradually proving to be a very important factor in today's society, having the capability to determine the quality of an individual's lifestyle. According to Lockheed M. et al (1991) [1], literacy, numeric, and problem-solving behaviors are just some of the various dimensions of cognitive capacity that education plays a major role in developing. Due to such importance of education, proper planning of improved facilities, along with their operation and maintenance, is also equally vital for its support.

For the competent operation and maintenance of standards of an educational system, facilities such as buildings, equipment, open areas, materials and other similar tools which facilitate and encourage educational programmes are essential resources. The quality of education offered by an institution is highly dependent on the availability of relevant tangible facilities along with its overall atmosphere, for seamless working of the education process and the attainment of its goals.

In the paper by Castaldi (1997) [2], educational facilities were defined to be all facilities, whose provision would result in a higher level of effectiveness of instruction by skilled teachers, than compared to its absence. Oyedeji (2000) [3] defined such facilities to include site locations, buildings and other infrastructures, also consisting of semi-permanent and permanent structures in his paper. Mbipom (2000) [4] definition consisted of the environment in addition to the equipment and buildings used in the teaching and learning processes. Ogdobgo (2004) [5] also summarized these facilities to be material objects that would support the institutions processes of both teaching and learning. Adaja et.al (2015) [6] further referred to educational facilities as all physical properties of an institution in their paper, namely the sites and infrastructures, both inside and within the institution boundaries.

Uduak Ekpoh (2018) [7] has categorized all these educational facilities as direct teaching facilities, having direct applicability to processes of education and non-teaching facilities which have indirect applicability to the educational process.

Increase in societal demands for better education and facilities has given rise to many problems in educational administration, maintenance, facilities, operations etc. With rapid developments in communities, many have turned to the utilization of information technologies for solutions for different education systems or processes. Nowadays, such database management systems are being used across several disciplines for the storage of data, both spatial and non-spatial, in a common database to ease the sharing of information and also its maintenance. Geographic Information Systems (GIS) is one such product of this technological growth that can be combined with traditional database systems to solve and analyze several difficulties regarding educational facilities. According to Mustafa G. (2012) [8], GIS is being used across varied academic disciplines as search tool at university levels. This mapping technology can form 'clever maps' and aid in planning and decision-making processes across different fields and projects. It combines digital maps, which are outputs of satellite images or photogrammetric methods, to base maps, giving it new and more advanced functions. Along with disclosing the need for organized storage of data, these 'clever maps', which are used as raster or vector data and stored in digital forms, also allows varied forms of data analysis ((Söğüt (2001) [9]).

GIS has the capability to both analyze and convert formats of stored and organized data, to provide the desired output according to the user's purpose. The usual display of a GIS is a map-based image where separate layers are used to denote distinct information or other components. The layers are added according to user preferred sequences, on whose basis, visualizations and analyses are carried out on the available data (Thomas R. Baker (2010) [10]). Hence, it not only collects and stores location-based data, but also analyzes and presents it, thus meeting a wide variety of geometry, location and attribute information-based applications in different fields as a powerful interactive information system.

Nowadays, GIS is also being used in the education sector for various purposes such as facility mapping, operation, management etc. and its usage continues to rapidly grow with the inclusion of remote sensing, GPS, internet-based mapping etc. GIS technology, which possesses competent spatial visualization capacity, when incorporated with GPS and satellite imagery that has been remotely sensed, it can aid the user to evaluate their practices in management, operation etc. and facilitate them to make well informed decisions (Milla et al. (2005) [11]).

Integrated and extensive information technology like Remote Sensing, Digital Photogrammetry, GIS, GPS etc. is highly in demand for countless projects, both large and small scale, including modern urban infrastructure, analysis of locations, management of transportation routes, smartphone applications, web applications etc. Further, management of assets and facility maintenance notifications can be achieved if building layouts are created in GIS and given the form of a desktop application. GIS can help in the optimum planning for decisions regarding site management and geographical data queries can be carried out to obtain visual and detailed applications for information and network analysis. (R. Manonmani (2012) [12]

Although digital photogrammetry is capable of collecting data, by semiautomatic processes along with overcoming issues of costs and processing time of analytical approach, it is still quite expensive and depends on the aids from high resolution data. This drawback can be overcome with GIS due to its conventional and simple data collection system which also allows easy updating of points at any desired time. (Kraus (1998) [13]; Pesci et al. (2004) [14]; S. Anbazhagan (2013) [15]).

Due to such versatile and feature intensive nature of the Geographical Information System(GIS), it can be considered ideal Facility Mapping for the purposes of management, mapping, optimization, operation and building of facilities.

METHODOLOGY

1. Base map is prepared based on SOI toposheet and using satellite image. The Resourcesat satellite image is used for extracting the information (Fig 2)
2. Information on available facilities inside the campus of Manipal Institute of Technology, Manipal were identified and divided into different categories namely Academics, Residential, Recreational etc.
3. The coordinates of different features are noted down using a GPS system.
4. These coordinates are then entered into an EXCEL Sheet with the data in an X'Y'' Latitude and A'B'' Longitude format.
5. A map of the campus is developed along with its known coordinate ranges, which is imported into QGIS.
6. The coordinates in the Excel sheet is also directly imported into QGIS, thus plotting them on the map.
7. Different maps are made for the data in different categories of the facilities. For example, Fig 3.

8. A database containing different information inside the campus of Manipal Institute of Technology, Manipal is created.
9. This database can be used as a reference for a variety of future projects for the ease of the population of the campus and better efficiency in the operation of campus life.
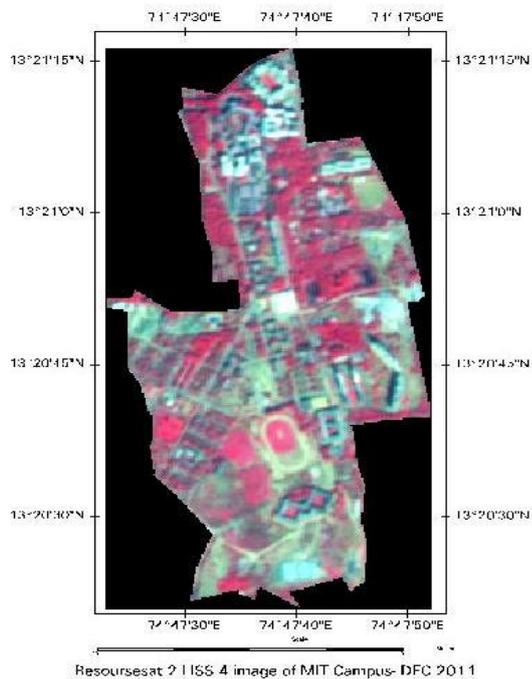

Figure 2 Satellite image of the study area

RESULTS AND DISCUSSION

In the present study, the infrastructure facilities in the Institute campus documented through various geoinformatics techniques including remote sensing, GIS and GPS, which provided quality outputs in various aspects. The data collected which comprises of the latitudes and longitudes of the relevant destinations are given below in the form of different maps, of Manipal Institute of Technology. The academics blocks, laboratory and library locations are given in the Fig 4. The institute has 5 academic blocks, some isolated laboratories such as central workshop, Irrigation lab, and a library, were also shown along with dustbin locations, parking areas, recreational facilities, hostel blocks and recreational facilities and utility areas.
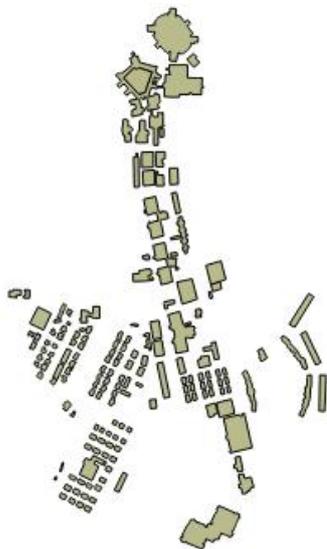

Figure 3 Extracted vector layer for buildings from satellite image
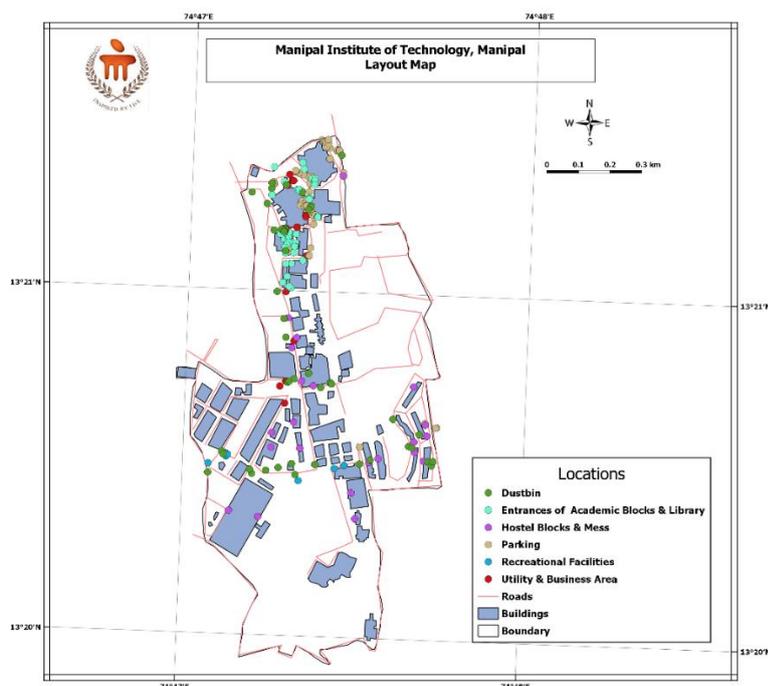
Figure 4 Final integrated map having all the information

The QtSql module allows to access information from the maps using queries to obtain properties of the objects in the map and their attributes. Navigation can be implemented through QGIS using the Open street map plugin. This plugin worked with vector layers, however raster layer navigation can be implemented also. (Fig2 and Fig 3)

Future research in the project can be done in the following areas:

a. Implementing real-time navigation using the software by downloading GPS data from the device. There already exists a QGIS plugin which performs this operation; but it is relatively new to implement this using PyQGIS.

b. The QGIS software is available for Android Operating System now. This can be used to develop a similar application for use on mobile devices.

CONCLUSIONS

The softwares QGIS and Qt are a good choice to develop map applications at campus level. They are very useful for staff, students and newcomers and allow extensive usage capability for people at the administration level to understand the terrain of the environment and make good planning decisions regarding campus development, etc. The software can and will be extended to include details about layouts of buildings also. This will help students and faculty in navigating through complicated structures. Faculty data can be included to show qualifications, position and location of the cabin. Student data will be included so that students and parents can access information.

ACKNOWLEDGEMENTS

REFERENCES

1. Lockheed, M., & Verspoor, A. (1991). "Improving Prima- ry Education in Developing Countries: A Review of Policy Options. Washginton DC: Oxford University Press.
2. Castaldi, B. (1997). Educational facilities, planning, remodeling and management. Boston: Allyn and Bacon.
3. Oyedeji, N. B. (2000). The role of school plant in educational productivity. In E. O. Fagbamiye and D. O. Durosaro (eds). Education and productivity in Nigeria. Ilorin: haytee press and publishing company.

4. Mbipom, G. (2000). Educational administration and planning. Calabar: University of Calabar Press.
5. Ogbodo, C. M. (2004). Managing educational facilities in schools. In V. F. Peretomode (ed). Introduction to educational administration and planning and supervision. Ikeja: Joja Educational research and publishers
6. Adaja, C. F. & Osagie, R. O. (2015). Politics of school mapping and facility provision in higher education in Nigeria. In N. M. Abraham, D. O. Durosaro, M. Nwadiani, G. G. Kpee, J. E. Okon and I. A. Odiba, Politics of education and national development in Nigeria (pp,81-86). Port Harcourt: University of Port Harcourt Press.
7. Uduak Ekpoh(January, 2018) SCHOOL MAPPING AND FACILITY PLANNING
8. Mustafa G. Korucu (2012)GIS and types of GIS education programs
9. Söğüt, S. (2001) Yerel Yönetimlerde Kent Bilgi Sistemi ve İnternete Aktarılması, Y. Lisans Tezi, Gebze Yüksek Teknoloji Enstitüsü, Gebze.
10. Thomas R. Baker(2010). The History and Application of GIS in K-12 Education
11. K.A. Milla, A. Lorenzo and C. Brown. GIS, GPS, and Remote Sensing Technologies in Extension Services: Where to Start, What to Know. Journal of Extension, 43(3), 2005.
12. R. MANONMANI, S. PRABAHARAN, R. VIDHYA & M. RAMALINGAM (2012) Application of GIS in urban utility mapping using image processing techniques, Geo-spatial Information Science
13. K. Kraus. Fotogrammetria. Levrotto & Bella, Torino, 1998.
14. A.Pesci, Paolo Baldi, Alessandro Bedin, Giuseppe Casula, Nicola Cenni, Massimo Fabris, Fabiana Loddo, Paolo Mora and Massimo Bacchetti. Digital elevation models for landslide evolution monitoring: application on two areas located in the Reno River Valley (Italy). Annals of Geophysics, 47 (4):1339-1353, 2004
15. S. ANBAZHAGAN, V RAMESH AND M BALAMURUGAN(2013).Geoinformatics in Infrastructure Facility Mapping and Development Planning in an University Campus
16. *www.qgis.org*
17. *www.qt-project.org*
18. *http://docs.python.org/2/using/windows.html#setting-envvars*
19. *www.riverbankcomputing.com/software/sip/download*
20. *http://pyqt.sourceforge.net/Docs/sip4/installation.html*
21. *PyQT tutorials on youtube:*
22. *http://www.youtube.com/watch?v=sSSk6Rg1U40*
23. *PyQGIS sample codes on github*
24. *https://github.com/NathanW2/pyqgis-playground/blob/master/canvas/canvas.py*