

Research Paper

GIS ENABLED HOSPITAL SERVICES AND FACILITIES INFORMATION SYSTEM FOR COIMBATORE CITY (G-HIS FOR CBE)

R Ramya^{1*}

*Corresponding author: R Ramya  dsh6489@gmail.com

Readily available authentic Information about services and facilities are very vital to the Citizens. In case of Hospitals, the information is still more critical as even the slightest delay in decision making can have serious impacts. Such a comprehensive information base is absent in the case of the services and facilities offered by hospitals. The present study aims at developing a GIS based information system for all available services and facilities of hospitals in city. GIS allows the integration of geographic and non-geographic (attribute) information to facilitate realistic decision making. The GIS environment also allows exploring the availability of services, various options based on proximity, availability of doctors, etc., in a user friendly interactive interface.

Keywords: Database, GIS, Hospitals, Information system, User friendly interface

INTRODUCTION

Readily available authentic information about services and facilities are very vital to the citizens. In the case of hospitals, the information is still more critical as even the slightest delay in decision making can have serious impacts. As medical industry is getting more and more advanced and sophisticated with diagnostic, healing and other healthcare services, providing such information to the citizen as well as those working in the industry itself, helps better and timely decision support.

The specific objectives of the study were the following:

- To develop a GIS based spatial database of Coimbatore city.
- To survey and map the hospital locations.
- To carry out a detailed primary survey on hospital services and facilities.
- To develop a Relational Database Management System (RDBMS) of the hospital information system.
- To establish a desktop based, integrated GIS and RDBMS environment.

METHODOLOGY

The methodology of the study involved two major components; GIS and RDBMS.

¹ Civil Engineering, Indus College of Engineering/ Anna University, India.

The base map of the city was digitized in GIS environment, keeping the scanned survey of India map as backdrop image. The image was georeferenced using the Ground Control Points (GCPs) collected using Global Positioning System (GPS) at various landmark locations of the Coimbatore city.

The geographic coordinate locations of 32 identified major hospitals were collected using GPS. The data was stored as MS ACCESS table and the same was added in GIS environment as a new layer with proper identification numbers.

After a few discussions held with an expert community working in the various sectors of medical industry such as hospital administration, public health, healthcare etc., a data entry form was designed. This form

consisted the details such as name, address, contact number, category type and website ID of hospitals and second part being information on services, doctors, etc.

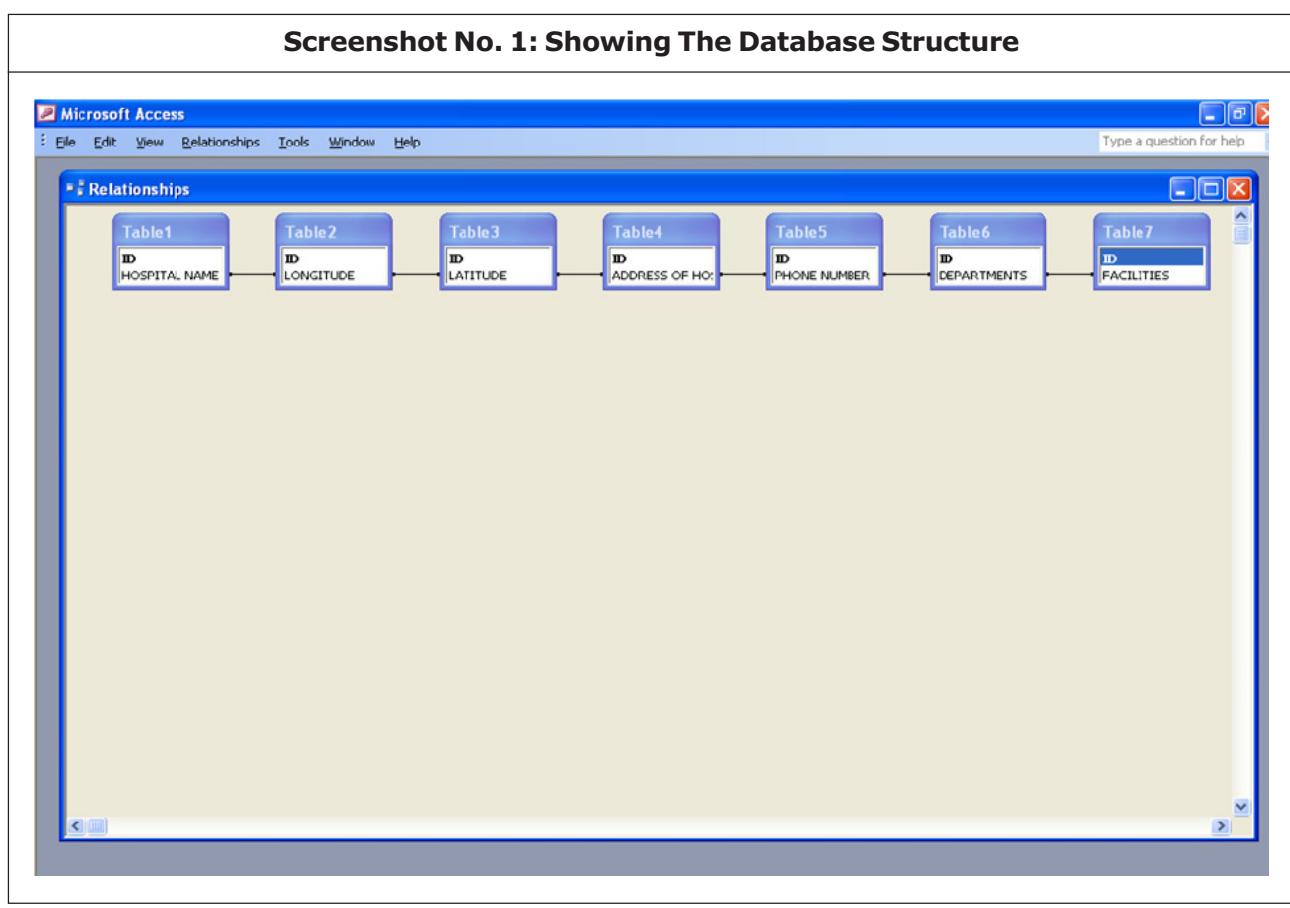
The database consist the following tables

- Hospital – basic profile
- Departments
- Services and facilities

A database schema was designed in MS ACCESS containing multiple tables, structures and various logical relations among tables. (Screenshot No. 1)

In the desktop GIS environment all the spatial and RDBMS data were added. The hospital layer was connected with the RDBMS using appropriate foreign key.

Screenshot No. 1: Showing The Database Structure



Since the hospital information included multiple tables, one-to-many relationship was established in the GIS information that connected the detailed tables with the hospital layer.

The G-HIS is used technologies such as Arc GIS 9.1 for digitization and Microsoft Access for database creation, Table and Spatial Query Analysis by use of Arc View 3.2a .Network Analyst for network analysis and coordinate collection with the help of Magellan Sportrak GPS.

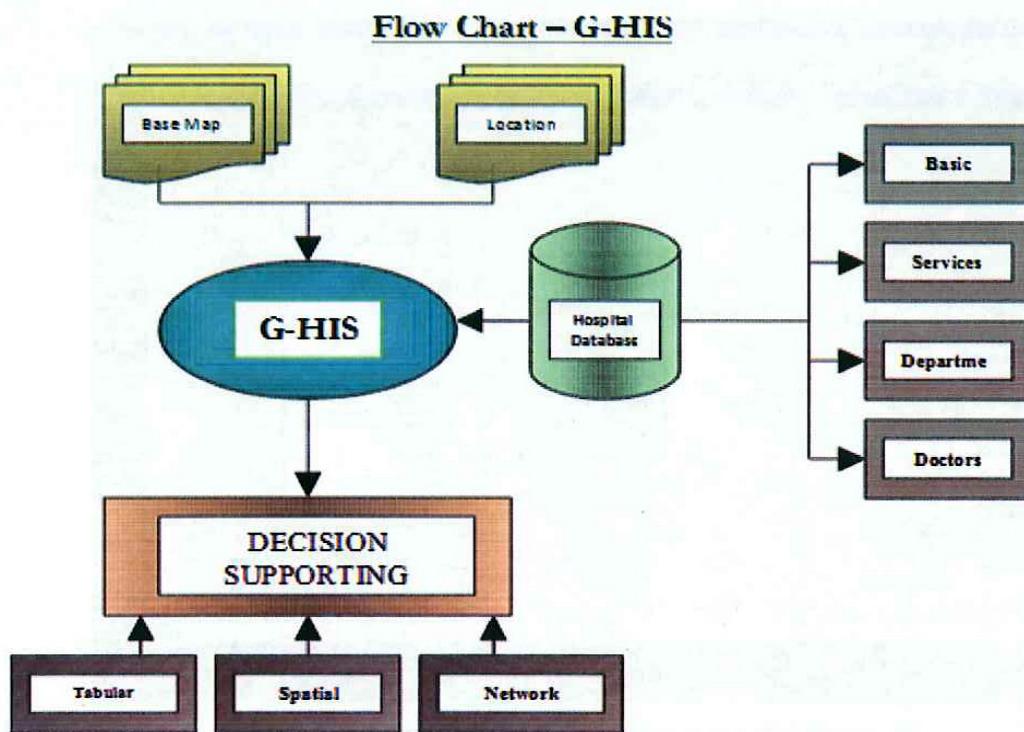
The GIS-RDBMS integration was achieved in Arc View by using "SQL connect" function. The analysis such as spatial query, Tabular query and network analysis were carried out in the Arc view 3.2a.

RESULTS

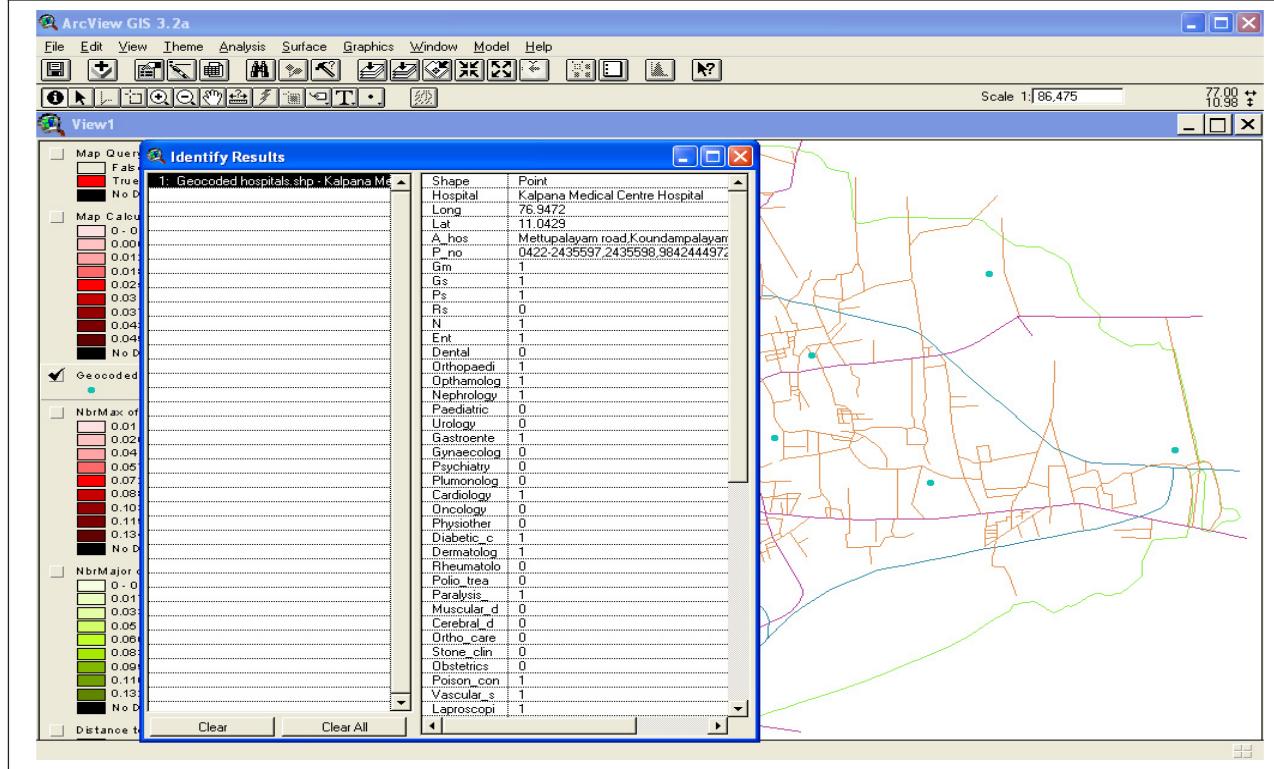
The analysis results a GIS enabled Hospital Services and Facilities Information System (G-HIS) which provide desktop GIS based application facilitating user friendly query of basic information regarding the nearest hospital, available services and departments and an interactive shortest route application to any selected hospitals (Screen shot No. 2).

The results involved three analyses, such as tabular query, spatial query and network analysis. The tabular query is based on attribute value. A location satisfying the query is highlighted and attached record will also be highlighted. For example if a user wants to know the hospitals having cardiology department, the user has to execute a simple

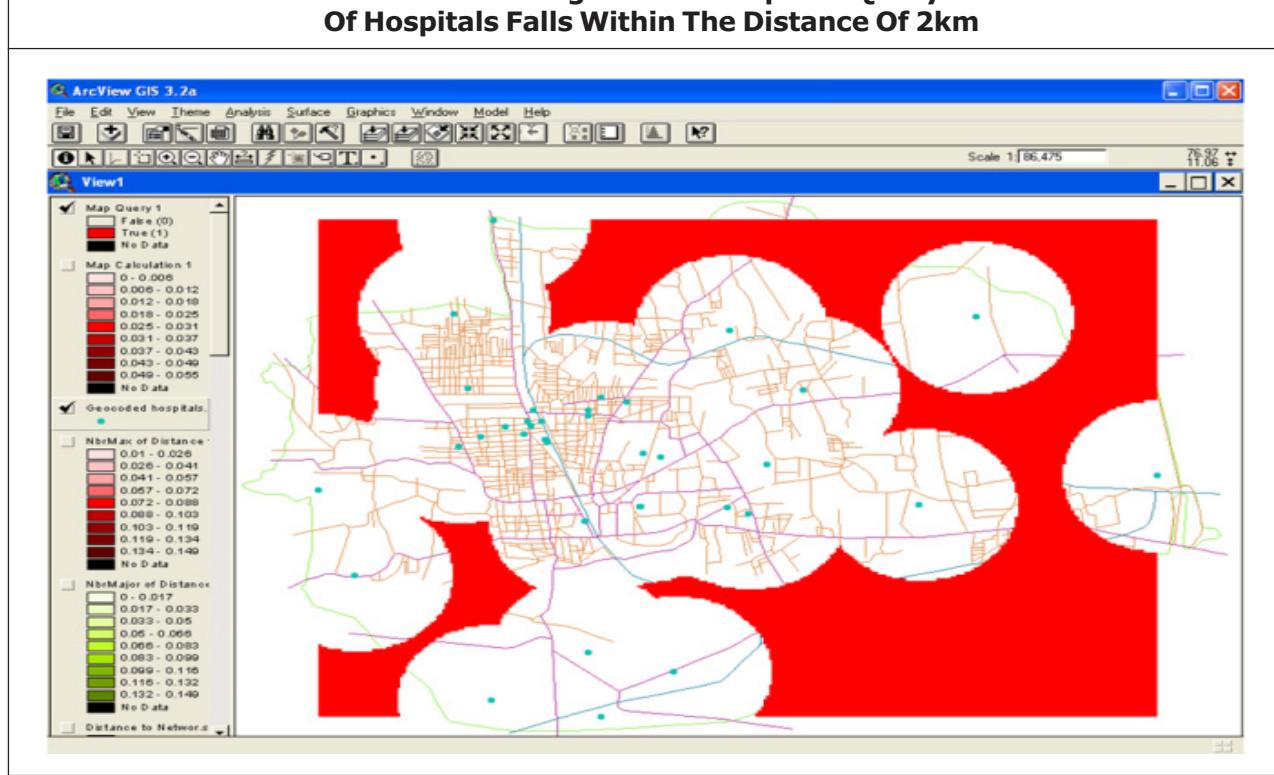
Figure 1: Flow Chart-G-HIS



Screen Shot No. 2: Of G-his Facilitating User Friendly Query Of Basic Information Regarding The Selected Hospital, Address And Departments



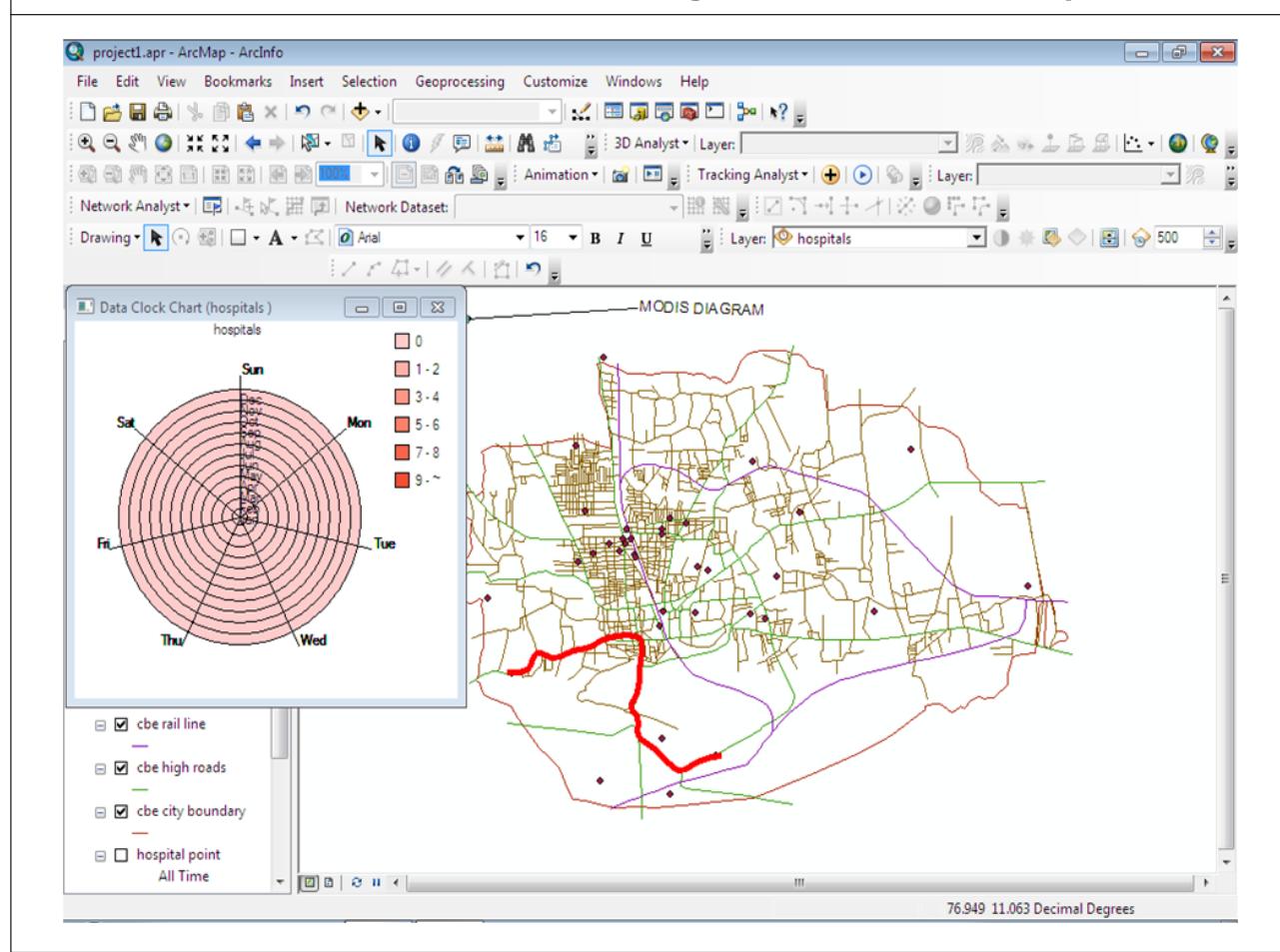
Screen Shot No. 3: Of G-his Showing Results Of Spatial Query To Find The Number Of Hospitals Falls Within The Distance Of 2km



Screen Shot No. 4: Attributes Detail In Arc View

Attributes of Geocoded hospitalship																
Chapt	Hospital	Longt	Latit	Altitude	Address	Dist	Loc	Alt	Env	Area	District	Districts	Community	Adressing	Researched	Updated
Point	Ashwin Hospital	76.9730	11.9241	1	Alexina Nagar Road,Combattur	0422-25252524	0422-2418135	1	1	1	1	1	1	1	1	1
Point	CMC Hospital	76.9702	10.9583	2	Techy Road,Combattur	0422-2301393	0422-2301294	1	1	1	1	1	1	1	1	1
Point	ESI Dispensary	76.9708	10.9565	3	Varadharajapuram,Combattur	0422-2521212	0422-25215920	1	1	1	1	1	1	1	1	1
Point	EllaM Hospital	76.9708	11.9231	4	No 284, Satya Road, Gudhipet	0422-2521212	0422-25215920	1	1	1	1	1	1	1	1	1
Point	GJM Hospital	76.9805	11.9116	5	Post Box No 6327, Netthala Road	0422-2405300	0422-22250000	1	1	0	1	1	1	1	1	1
Point	IPM Hospital	76.9805	11.9116	6	Post Box No 6327, Netthala Road	0422-2405300	0422-22250000	1	1	0	1	1	1	1	1	1
Point	KG Hospital	76.9813	11.9000	7	No 2, Amin Road,Netthala Road, Coimbatore	0422-2212121	0422-2212121	1	1	0	1	1	1	1	1	1
Point	Kovalam Hospital	76.9808	11.9177	8	No 75, Gemini House,11th Street	0422-1313000	0425-34843800	1	1	0	1	1	1	1	1	1
Point	Kovai Medical Centre	76.9633	11.9147	9	PBI No 320, Avinashilingam	0422-2327279	0422-2327779	1	1	1	1	1	1	1	1	1
Point	Lathika Hospital	76.9663	11.9175	10	No 828-A, Crosscut Road, Gani	0422-1499533	0422-24996976	1	1	0	0	1	1	1	1	1
Point	Majestic Medical Centre	76.9800	10.9597	11	232, Place course, Coimbatore	0422-2220663	0422-2221765	1	1	0	1	1	1	1	1	1
Point	Sheela Hospital	76.9662	11.9188	12	Old No 46, New No 117, East 1	0422-1498381	0422-43845000	1	1	0	1	1	1	1	1	1
Point	Sri Ramakrishna Hospital	76.9775	11.9230	13	No 305, Samrao Road, Road 3	0422-4500000	0422-4500156	1	1	0	1	1	1	1	1	1
Point	Telegeopathyam Hospital	76.9297	10.9841	14	302, Perumal Road,Teleguppalayam	0422-3481150	1	1	0	0	1	1	1	1	1	
Point	Kumaran Hospital	76.9032	11.9033	15	Coolay Brown Road,RS Puram	0422-3526461	0422-36236365	1	1	0	1	1	1	1	1	1
Point	Vedavagayam Hospital	76.9519	11.9120	16	No 52, Old No 193, East Bath	0422-2312121	0422-2312121	1	1	0	0	1	1	1	1	1
Point	Velachery Medical Centre Hospital	76.9619	11.9129	17	10, Velachery Main road,Chennai	0422-2345670	0422-2345670	1	1	0	0	1	1	1	1	1
Point	V.G Hospital	76.9541	11.9038	18	Metcalfe Road, Anna road, Thiruvalluvar	0422-3542071	0422-3727228935	1	1	0	0	1	1	1	1	1
Point	PG Hospital	77.0066	11.9249	19	Periyarivakkam	0422-5701770	0422-582211995	1	1	0	1	1	1	1	1	1
Point	Ganga Hospital	76.9534	11.9156	20	No 31,Neer station,Periyarivakkam	0422-4571444	0422-4571444	1	1	0	1	1	1	1	1	1
Point	KTVR Hospital	76.9497	11.9281	21	Post box no 2750,Narasimangalam	0422-3454545	042531124588	1	1	0	1	1	1	1	1	1
Point	Ajama Hospital	76.9538	10.9561	22	#50,40,Palghat Main Road,Kudalur	0422-2872622	0422-28312248	1	1	0	0	1	1	1	1	1
Point	GRI Hospital	77.0022	11.9091	23	No 30,Ram Garden,Sowparivar	0422-7315717	1	1	0	0	1	1	1	1	1	
Point	NIS Hospital	77.0029	11.9000	24	No 577,Naar Sangamalai police	0422-3595963	04865095629	1	1	0	0	1	1	1	1	1
Point	Geen Hospital	76.9462	11.9554	25	45-A, near Ramanathapuram	0422-3341010	0422-3241605	1	1	0	0	1	1	1	1	1
Point	N.M Hospital	76.9463	11.9680	26	Ramanathapuram,(Combattur)	0422-1316212	0422-2317533	1	1	0	1	1	1	1	1	1
Point	Sairamth Hospital	77.0018	11.9120	27	No 152,Chennai main road,periyarivakkam	0422-23123000	1	1	0	1	1	1	1	1	1	
Point	Prakash Hospital	76.9478	11.9030	28	Periyarivakkam	0422-23123000	1	1	0	0	1	1	1	1	1	
Point	Bethelkotham Hospital	76.9629	11.9188	29	No 250,Neer kuppam,compl	0422-1497114	1	1	0	0	1	1	1	1	1	
Point	Surya	76.9668	11.9251	30	No 134/2A,near Dhanshikulam	0422-2517397	1	1	0	0	1	1	1	1	1	
Point	Bethel Hospital	76.9611	11.9213	31	No 223,DR Rajendra prasad road	0424-3425227	1	1	0	0	1	1	1	1	1	
Point	Sree Abhiram Hospitals pvt ltd	76.9730	10.9525	32	No 33, opposite to vigneswaram	0422-3672972	0422-3672972	1	1	0	0	1	1	1	1	1
Point	Park Hospital	77.0091	11.9422	33	New Sathya , Kalpathi road,Chennai	0422-3626829	0422-3626829+91-96	1	1	0	0	1	1	1	1	1
Point	spt Hospital	76.9635	11.9141	34	No 50, Vellore Anna Road ,F	0425-1232555	1	1	0	1	1	1	1	1	1	
Point	st. Marios Hospital	76.9658	10.9625	35	opposite to Railway kalyana M	0422-1416832	1	1	0	0	1	1	1	1	1	

Screen Shot No. 5: Of G-his Showing Results Of Network Analysis



query using mouse and by selecting the department cardiology from the list, the query satisfying hospitals are highlighted (Screenshot No. 3).

Tabular query also facilities combination search such as hospitals having both cardiology and neurology departments. The location of kalpana hospital, Ellen hospital, KG Hospital, etc., will be highlighted.

The spatial query is based on a spatial relationship of objects. For example , to execute a query to find the number of hospitals falling within a specified distance from a selected point, the “select by theme” function may be used.

Network analysis module of GIS provides shortest path between two specified locations. The shortest route function between two hospital displayed in red colored route. (Screenshot No. 5)

CONCLUSION

Hospital service is one area where information is very critical. Unfortunately the information is either incomplete or disintegrated. GIS and Database enabled information system not only manages the information systematically, but also allows the user to adopt effective decisions.

REFERENCES

1. Aurangabadkar Rahul, Eswara Prasanna Rao P and Sanjeev Shekar Singh (2003), Spatial information system for medical services in Chennai city.
2. Bamford E J, Dunne L, Taylor D S, Symon B G, Hugo G J and Wilkinson D (1991), “Accessibility to general Practitioners in rural South Australia: A case study using geographic information system technology, *Medical Journal of Australia*, Vol. 171, pp. 614–616.
3. Bentham G, Hinton J, Haynes R, Lovett A, and Bestwick C (1995), “Factors affecting non-response to cervical Cytology screening in Norfolk, England,” *Social Science Medicine*, Vol. 40, No. 1, pp. 131-135.
4. Bhana A and Pillay Y G (1998), “The use of geographical information system to determine potential access and allocation of public mental health resources in KwaZulu-Natal,” *South African Journal of Psychology*, Vol. 28, No. 4, pp. 222–233.
5. Brabyn L (2002), “Modeling Population access to New Zealand Public hospitals”, in *International Journal of health Geographics*, Vol. 1, No. 3, pp. 1-9.
6. Brabyn L and Gower P (2003), “Mapping Accessibility to General Practitioners”, in O Khan and R Skinner (Eds.), *Geographic Information Systems and Health Applications Idea Group Publishing*, Hershey, PA., pp. 289-307.
7. Brabyn L and Skelly C (2002), “Modelling population access to New Zealand public hospitals,” *International Journal of Health Geographics*, Vol. 1, No. 3, pp. 1–9.
8. Bryant J, Browne A J, Barton S and Zumbo B D (2002), “Access to health care: Social determinants of preventive cancer screening use in Northern British Columbia,” *Social Indicators Research*, Vol. 60, pp. 243–262.

9. Burt J, Hooper R and Jessopp L (2003), "The relationship between use of NHS Direct and deprivation in southeast London: An ecological analysis," *Journal of Public Health Medicine*, Vol. 25, No. 2, pp. 174–176.
10. Carriere K C, Roos L L and Dover D C (2000), "Across time and space: Variations in hospital use during canadian health reform," *Health Services Research*, Vol. 35, No. 2, pp. 467–487.
11. Church R L (1999), "Location modeling and GIS ", in Longley P A, Goodchild M F and Maguire D J (Eds.), *Geographical Information Systems, Principles, Techniques, Application and Management*, 2nd Edition, John wiley, New York, pp. 293-303.
12. Davenhall Bill (2003), Spatial medicine to better health, www.esri.com/library/reprints/pdfs
13. Ekbal B (2000), *People's campaign for decentralized planning and health sector in Kerala*, in Columbia University Press, New Delhi.
14. Ghosh Mil (2005), "Spatial Decision Support System using GIS based infrastructure: Planning in Health and education for Ranchi district", www.gisdevelopment.net/application/healthoverview/health0008.htm
15. Jagadish S (2003), "The use of GIS for the Emergency Medical Care System (EMCS)", <http://www.gisdevelopment.net/application/health/overview/mi03144.htm>
16. Sadiq M G S and Zaffer M (2005), GIS for public health management, www.gisdevelopment.net/application/health/overview/health0004.htm
17. Shankar K N and Sathish Selvakumar (2003), Spinfo Health Map-A Health GIS Application, <http://www.gisdevelopment.net/application/health/overview/mio3178.htm>