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GIS and its Role in Strengthening Rural Areas

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ABSTRACT: **In this paper the authors want to describe the use of Geographical Information System in various aspects of Real Life of Rural Areas. Geographical Information System is a science and technology based on disciplines such as Computer Science, Biology, Mathematics, and Engineering. A major application of GIS is in the development of any Organizations, States etc. But, GIS can play an effective role in the development and strengthening of Rural Areas. This Particular Research Paper includes the basics of GIS, its properties, various components of GIS. How GIS can play an important role in strengthening rural areas? This Paper also provides some evidences where GIS can play an important role in solving some real life challenges. GIS uses ZIP Code Identification through software and in addition to it, uses GISNET, AUTOCAD, ERDAS IMAGINE and other unique tools for data processing, being discussed in the paper.**

Keywords: GIS, ZIP Code, GHz, GISNET, AUTOCAD, ERDAS IMAGINE

I. INTRODUCTION

GIS can play an important role in various fields. In this paper the author wants to describe the use of Geographical Information System in various aspects of Real Life. Geographical Information System is a science and technology based on disciplines such as Computer Science, Biology, Mathematics, and Engineering. A major application of GIS is in the development of any Organizations, States sectors fields across the globe.One such sector is the development of rural areas by providing various data like :

-Information about the climate which includes humidity,temperature etc by sensing changes occurs around the environment.

-GIS can also locate places of higher signal strength or places where signal strength is not exist and accordingly,report it to the government agencies to take appropiate action.

-It also provides information about the sites where land's cultivation is very poor,this prevent farmers to do not use it for agriculturing purposes rather use it for construction of Homes, Towns, Cities etc.

-GIS can also measure the quality of the soil and can identify that whether it can be used for mining purposes or not.

-GIS also help government to identify the problems of rural areas like improper sanitation conditions, no electricity etc, so that, government can

GIS used to track animal and human migration patterns.

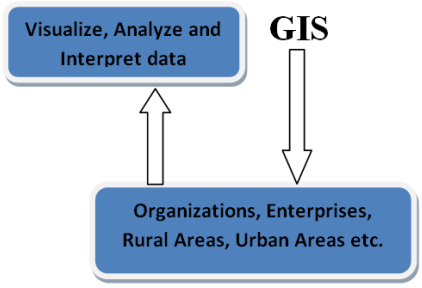

Fig. 1. Basic working of GIS.

II. GIS AND ITS PROPERTIES

GIS is a system with latest technology which captures and maps various events and accordingly analyze the data in the form of database.

-It can handle any type of data or information. For example-Locations, Latitudinal and Longitudinal, ZIP code, Spatial images, Numerical data, Map data,Statistical data, Images, Videos, Digital data, Geographical data, Biological data etc.

-GIS can interact with the humans for requesting services and providing response accordingly.Robotics : Robotics is a branch of AI, which is composed of Electrical Engineering, Mechanical Engineering, and Computer Science for designing, construction, and application of robots.

-GIS involved the use of DBMS and a robotized cartographic framework for efficiently connecting map elements to property information.

-It consists of various GIS components (Client, Web Server, Application Server, Information server, Mapping Server, GIS Database.
-It must have the ability to sense climate change, environment variations from one point to another as well as physical changes like *Analog* Signals , Digital Signals availability of various technical Apparatus.
-GIS system can also take use of various Artificial Intelligence techniques to somewhat behaves like humans so that it can take simple decisions and under emergency conditions, It immediately informs to the related authority to take subsequent actions.
-Examples Alert rural peoples about natural calamities like Earthquake, Hurricane etc and help police to handle crimes.
-GIS system must also have the ability to interact with satellite data to study how much area of a rural place is polluted or green, how much of the polar region is covered with ice etc.
-GIS must have the ability to manipulate data using projections. It also uses GIS software development tools like Microsoft's DOTNET framework for Windows as well as Non Windows Operating System etc.

III. HARDWARE REQUIREMENTS

-Fastest computer like Tianhe-2,aka Milky way 2, a supercomputer with a performance of 32.86 petaflops(quadrillions of calculations per second) on the linpack benchmark,with 3 millions Intel Xeon E5_2692V212C Cores running at 2.2GHz etc for faster data Manipulation.

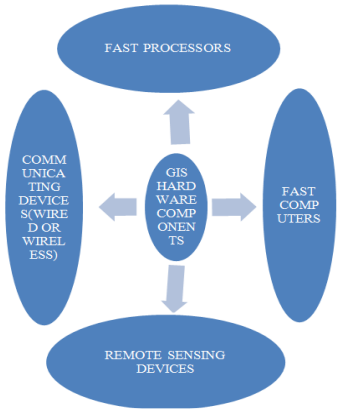

Fig. 2 Basic components of GIS.

-Fastest Processors for faster processing of Data . For Ex-Overclocked beast -8 core Bulldozer FX processor clocked a record speed of 8.429 GHz with the help of Liquid Nitrogen and Helium.
-Remote Sensing Devices for sensing changes and variations in weather, climate etc.For ex-IRS.
-Mass storage devices for storing and managing databes, RAM like DDR4 memory kits for parallel computing etc.
-Wide range communicating devices, Wireless devices to communicate with satellites, government agencies computer systems, and other Hardware devices.
-GIS system must be resistant to various chemical Reactions, physical Effects etc., by using Resistive metals or nonmetals, very strong etc.

IV. SOFTWARE REQUIREMENTS

Below Software Requirements for GIS are taken from the Internet. [1]
AUTOCAD, Map Guide Software package for processing on maps and it's mapping in to data.

- For changing oblique 3D images in to an Ordered -way, Pictometry, Software are used.
- For Environmental, Climatic and Weather relate processing; Hydro Geo Analyst Software is used.
- For Geographical Information, Geo media web map called Intergraph are used.
- For Geospatial collaboration capabilities so that emergency response and military environments.
- GISNET-To connect GIS system with Net.
- ERDAS IMAGINE-For Remote Sensing, Photogrammetry, Software Development by ERDAS Incorporation.

V. APPLICATIONS OF GIS

-In land use Planning, in the coastal Mekong Delta of Vietnam .In this, proper land utilization and planning, analysis. In this two villages in the coastal area of Mekong Delta(MD) ,Vietnam are case study .In this,3 approaches was used PLUP(participatory) to integrate the acquired spatial and attribute data from farmer discussions and cross-section walks etc, FAO-MCE-to combine biophysical and socio-economic characteristics for land evaluation , LUPAS-an optimization model was used By N.H.Trung [2].
-The rebuilding of a country : Role of GIS in South Africa. GIS play important role in development planning and resource allocation in the country.GIS assure technology's long term-contribution to reconstruction and development process. It also play role in to support participatory planning for the allocation of land to allocate low income people**.** By Dr. Machevette, RJ Fincham, GG Forsyth [3].

-In Urban Planning based on urban space and fire Disaster .GIS can do quantitative research to the growth of urban space, as well as assist city guard against fires, assessment of city regional disaster risk is helpful to plan for disaster prevention to reduce accident loss and improvement prevention to reduce accident loss and improvement in urban safety management for the city, fire risk assessment, city fire control Application based GIS Fire Alarm system and its sceduling.GIS manages all kinds of Spatial and Non-Spatial data management, operation and spatial data analysis. By Pei. Chan, Meng. Xi, Xaping. Huang [4].

-Role of GIS in travel and tourism Digital guide development .This results in comfortably and easily decided to organize any Trip or Tour, by provided related Information of a particular place like vehicles, Restaurants, hotels, towns etc. By Rikita D. Patel [5], Asst. Professor, Anand Institute of Information, Gujarat Technological, Ahmadabad.

-It is not as if the use of geospatial is something very new. Many government ministries, as well as private industries, have been using geospatial systems as early as the 1970s. The Ministry of Agriculture has been one of the earliest proponents of the use of remote sensing. Among the initiatives in using space technology for their activities, the latest is the setting up of the Mahalanobis Center for using space imagery for various applications. Dr Shibendu S. Ray, Director of the Mahalanobis National Crop Forecast Center, Ministry of Agriculture, adds that, agriculture has been a driving force for Indian remote sensing program since early ’80s and most of Indian remote sensing satellites cater to agriculture applications.

-Pre-investment Survey of Forests was an aerial survey project way back in the ’70s. Forest Survey of India has the distinction of being the first institution to use remote sensing in a big way. Dr Anmol Kumar [6], Director General, Forest Survey of India (FSI) states that the FSI has been mandated to produce the State of Indian Forests report every two years and they have been doing so using geospatial data for more than 40 years. They have kept pace with technology and currently use IRS LISS 3 and 4 digital data for computer-based analysis.

-The India Meteorological Department (IMD) [7] is another long time user of remote sensing using INSAT and other data. Some of the significant contributions of the IMD, according to its Director General, Dr L.S. Rathore, are GIS platform-based RAPID for viewing satellite products and CRIS for giving rainfall information on real-time basis. Recent initiatives have led to the development, in collaboration with Metro France International, of a comprehensive GIS-based ecosystem like ‘Varsmana’, an end-to-end system that puts processed and raw weather data from all national and international observational resources, on near real-time basis, at the forecaster’s desk. The data flow from the field observatory to its digital visualization and analysis has been automated so as to enable issue of timely weather forecast and warnings. The IMD has also developed an app called Indian Weather, which provides current weather and four days forecast for 310 cities.

VI. GIS DATA FOR INDIA

Currently, GIS data are used in various companies of India. Some of the companies and their products are:

- Geo Community- This Company provides data for Hyderpgrapy, DEM etc.
- BHUVAN- This company provide data through 3D Visualization, 2D Visualization, Streets map overlays, WMS services for land use and land cover, flood inundation (events Wise rapid assessment and annual inundation, geo hazards, forest fire (daily Environmental Information Center Comprehensive environmental dataset from The Ministry of Environment and Forests (MoEF), India.
- India Map store- This Company is leading GIS and Vector Map Development Company. Our team is specialized in GIS and vector data processing.
- Transworld Compressor Technologies Ltd. - This Company has collected database of Cellular Base Stations across India, geo-referenced.
- RFVERSA- This Company supply digital maps of various Indian cities including navigable streets, clutter data, administrative boundaries and business Geographic.
- MPGIS- This Company is available for all kinds of GIS mapping and custom based GIS software solutions.

There are several other companies which take advantage of GIS Technology to accumulate various forms and kinds of data. Data may be in the form of alphabets, numbers, images, videos, graphs, tables etc. These are very helpful in analysis of conditions of particular areas like city, villages etc. These data are provided to Governments, Scientists, and Organizations according to their purposes and demands. These data are then manipulated to bring out some informative details which further results in taking various decisions and actions [9].

VII. ADVANTAGES OF GIS

- All the various applications like Google Earth, Navigation System etc. rely on GIS.
- It eases the way how the data are collected.

- It helpful in the field of Agriculture to provide appropriate and situation based information related to irrigation, cultivation etc.
- It helps in Weather forecasting.
- It makes collections of various types of Data and their Manipulations very easy and fast.
- It can process the real type data and accordingly takes optimized decisions.

VIII. DISADVANTAGES OF GIS

-One Disadvantage of GIS is that as GIS involves latest technology which results in computations which are more reliable than they actually are i.e. Data are manipulated to make it more precision. This manipulation of Data involves ignoring of errors etc. This result in lack of questioning into the results.
-The Analysis of GIS data results to be accurate for that place only from it are calculated. This causes the data to be not applicable for all contexts i.e. not applicable for all areas of a country. For instance, if the input data on a GIS is entered at the county level, the results in the GIS will only be usable for the county level, not any other level, such as the district or ward levels. Data availability, in itself, is also a major issue. If the data is not available, than the GIS system is useless.
-GIS programs are not very simple. They are very complex and costly in design and coding. Because they must be constructed and assembled to a user design. So, their creation and implementation undergoes rushed and required a effective planning.
-GIS Systems are also very complex because of expanding of functionalities. It requires large amount of Technology. Due to involvement of different varieties of hardware, GIS programming become more and more complex. It is very tough to make GIS programs fast and user-friendly.

The various disadvantages of GIS that are written above are taken from the References [8].

IX. SOLUTIONS TO DISADVANTAGES

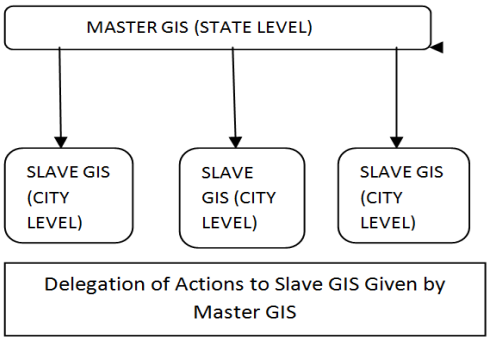

Fig. 3. Delegation of Actions to Slave GIS Given by Master GIS.

- It results in more accurate and less erroneous geographic information as each area has its own GIS.
- It also serves data as state as well as city, village level so that it serves for all contexts as data entered by GIS is at smallest level.

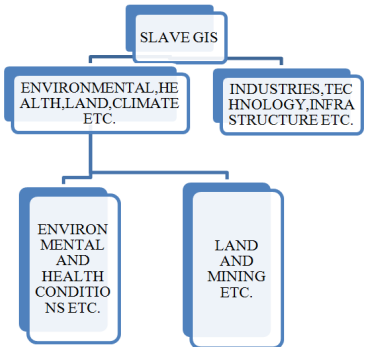

Fig. 4 Individual working of Slave GIS.

- As, we delegate actions and processing in different GIS system which results in less complexity as well as easy management. Now as Analyzing, Visualizing and Interpreting of Data occurs at specific points by specific area programmed GIS. So, incomplete, erroneous data will be least occurring.

X. HOW GIS SYSTEM CAN HELP IN STRENGTHNING OF RURAL AREAS

Now, we have discussed all about GIS and its components, properties and functions, advantages and disadvantages, also we have given solutions to solve the disadvantages of GIS. We can implement the GIS system in rural areas in following ways:

- GIS analyze the physical environment by using its sensors for gathering information about the climatic conditions like Temperature, humidity, moisture etc.
- Also, it uses its previous data about physical condition of a particular place and combines them to take an optimized solutions and decisions.
- It also alarms the rural people for the correct time to begin irrigation, cultivation etc. so that a maximum amount of production they can achieved.
- It also gather information of the infrastructure of rural areas by visualizing the presence of towers, electricity etc. and then sends it to the government or responsible authority of that place.
- It also help to increase the development of rural areas by gathering the pictures of that place and then, maps it to 3D images etc.

- It can play an important role in surveys of Villages and provide the data of surveys to the village panchayat.

MAPMYINDIA [10] is one of the implemented and developed tools by GIS for strengthening rural areas in following ways:

- MAPMYINDIA-GIS-This tool gathers data and maintains database of Districts. With the help of it provide services to rural areas.
- Land Records-GIS- With the help of this tool, it maintains land records and provides land management solutions for rural areas to perform activities like land acquisition, taxation, revenue collection.
- Natural Resources Management (NRM)-.It performs activities like investigation and management of crops, land use, forestry resources, soils, land mining.
- Panchayati Raj-GIS where Map my India nation-wide GIS Asset can form the base for Panchayati Raj Spatial Asset Mapping and for Panchayati Raj project management.
- Rural-GIS-It involves the watershed management, road conditions in rural areas, it also emphasises on village development and other government development policies.
- Map my India can be used in urban and rural areas for navigation support for rural fleets of municipalities, local police, bus transport etc.

There can be various ways to use GIS for the development of rural areas.

XI. CONCLUSION

GIS provide us a vast vision for Real Data Collection OF RURAL AREAS and process them for the purpose of References, Actions and interpret them according to the given situation. It requires the management to properly handle GIS Technology. It greatly involves in the Government Strategies, Infrastructure and Sectors. It is a costly Technology during its implementation but afterwards it reduces the time involved in data collection and it's processing. Also, as we partitioned the GIS into Master GIS and Slave GIS, so it requires Technicians to manage and control them. This increases the requirements of Engineers and Technicians, hence, increases Jobs. GIS Technology is a very helpful tool in the developing countries like India. Map My India [11] is one of the important step implemented by the use of GIS in modifying the rural conditions by Land Management, Natural Resource Management, proper planning for the development of villages. Map My India also considers the appropriate management of watersheds, Transport System which play an effective role in advertising rural areas. Data provided by Map My India helps the panchayats for Panchayati Raj project management etc.

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