Weather Master:Mobile Application of Cyclone Disaster Refinement Forecast System in Location Based on GIS Using Geo-Algorithm

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Abstract- Cyclone is the serious geological disaster,and effective way to prevent cyclone disaster is forecasting weather changes.Development of wireless networking technologies provides a straight forward approach to collect live Geospatial data from service provider's API services and shared through internet to present weather data on Android Smartphone.In this paper,a new algorithm is proposed to integrate the different service provider's API services and use cloud to carry the management of these services. An application of WeatherMaster provides a location based mobile weather forecasts during the cyclone disaster in GIS. It depends on the user selected location via Google Map. A new algorithm is proposed that helps to find the nearest neighbor, possibilities of weather changes and finds out the causes of the changes of near cities. The nearest neighbor and weather data are passed to the Google Mapping Services that are integrated with an existing outline database to set their range gives information of cyclone disaster rating.The main function of this system is to achieve results of cyclone disaster risk rating forecast and cyclone disaster information management. Forecasting results, helps to give early warning to public take response and reduce losses to prevent from cyclone disaster.

Index Terms- API ,Cyclone Disaster, Database, Forecasting ,Geospatial Data Collecion, GIS,Google maps,

1 INTRODUCTION

A geographic information system helps to analyze large quantity of data within a single database according to their location.GIS is used for providing information about disaster and will manage huge level of data for vulnerability and hazard management.GIS is well developed and successful tool that is applicable in disaster refinement and forecasting.Weather forecasts cover large regions and weather status may change every minutes during the natural disaster.Weather forecasting,disaster management and warning are also major service provided by GIS.

Cyclone is one of natural disaster that make the area of closed,circular fluid motion rotating in the same direction as the earth.Cyclonic circulations mostly appear in an large scale that are centered on low atmospheric pressured areas.Cyclone disaster may cause severe weather events and problems that create wind speed more than 200 km/hour and sea waves as high as a few metres.cyclone disaster make severe weather changes that damage property and disturb the daily lives.The main objective of cyclone disaster refinement and forecast system is to monitor the changes and refine the complicated disaster occurrence as accurately as possible.

Spatial database stores a huge amount of space-related information such as maps, medical imaging data, pre-processed remote sensing data, and VLSI chip layout data.GeoSpatial data is the data that relates to the geographic location of features that mainly required for GIS. The amount of GeoSpatial data will be collected in disaster refinement and forecast system is also increasing exponentially.The complexity of spatial database is that it is not possible to analyze and collect data completely.

Cyclone disaster refinement and forecast system have two aspects: Monitoring the situation and recording the real weather changes and any chance for the disaster such as a cyclone. Other is occurrence prediction of cyclone and causes of cyclone disaster. In this system,we are going to find out any possibilities of cyclone and due to any weather changes by real-time GeoSpatial data collection. In this system,API services for collecting live data from service providers such as google, yahoo are used.The resource integration may use own API for integration of useful resources.Service providers observe every GeoSpatial change through satellite and gather weather data.

Google map is a free web mapping and location based service.Google service provider provide a free web API for using the google map web interface.In this system,we are using the v2 mapping service provided by google that can be used for an GeoSpatial data visualization.Natural disasters make extreme weather changes in earth surface that give lots of losses and

damages to valuable goods,buildings,and that result in death or injury to humans. Weather forecasts during natural disasters are made by collecting quantitative data about the current state of the atmosphere.wind speed and sea level pressure on a given place.

An Android Weather App with current technological advancement that enables the weather prediction and climate detection during a natural disaster with low-cost sensing capabilities. weather forecast and disaster refinement forecast is assessed which involves weather related data such as temperature, air pressure, rainfall, solar radiation, relative humidity,wind speed,sea level pressure,ground level pressure and their location related latitude and longitude. A major part of cyclone disaster refinement and weather forecasting are the severe weather alerts and advisories to people that severe or hazardous weather is expected.The emergence of smart phones has led to the development for a variety of innovative data-driven mobile applications. One useful mobile application is Cyclone disaster refinement and weather forecasting which provides minute-to-minute forecasts.

The aim of this paper is collecting geospatial data and integrating the graphic resource and then it is fed onto the cloud and nearest neighbor of change in cities are found and the climate will visualize it on Android Smartphone via google map. The Google map is input to the system. This paper is organized as follows. Section 2 gives the review of previous work on the weather data collection,Algorithm forfinding nearest neighbors,Natural disaster rating and forecasting.Section 3 describes the problem statement of the existing work. Section 4 elaborates proposed methods and analysis and the discussion about our work is noted in Section 5. Section 6 presents our conclusions and gives a brief overview of future work.

2 RELATED WORKS

A few works related to spatial data collection and visualization are Koko lwin et al.(2014)[1] proposed illegal disposal sites and parking events on campus using global positioning system. In [2], Anbao WANG et al.(2009) introduced the resource integration and management systems to Handle the development interfaces. In [3],Jing yuan zhang and Hao shi suggested a visualization technique of spatial data on a Google map to extract the spatial features. In [4],Dilip kumar krishnappa et al.(2012) executes a Cloudcast weather forecast using a campus radar to deliver data at 15 minute. In [4],Genong Yu et al. provide a framework to detect severe weather event with the help of a sensor web. In [5],Nathaniel bayode.(2014) the climate is analyzed using remote sensing and Geographic information system to analyze large quantities of data depending on their location. In [6], Zhou zhen-min et al,(2011) provide a basis of the rainfall runoff forecast method for the GIS model consisting of large amounts of data to utilize possible rainfall information.In [8], Genong (Eugene) Yu et al.(2007) proposed sensor technology for authoring,deploying and exeuting geospatial workflow.In [9], Mohhammed Otair gives brief discussion about the spatial indexing and spatial clustering and then compare the performance of brute force algorithm and kd tree algorithm.In [10],Md.sohel rana et al.(2010) has developed the application that performs cyclone disaster management using GIS and remote sensing technology.In [11],Yongjin Xu et al.gives the prescribed study of landslide disaster application and forecasting in the district level based on the Geographic Information system that determines the landslide disaster risk rating in district level.In [12],Ke Wang,et al(2013) that focuses on integrated SAR and optical satellite imagery to locating the tropical cyclone to analyze positions and formations acquired by multi sensor satellite. Our project focuses on the cyclone disaster rating,information management and forecasting that collect the real-time GeoSpatial data and then integrate the resource to use cloud services,visualization of spatial data using the Google maps to know the status of weather of a particular location during cyclone disaster without delay.

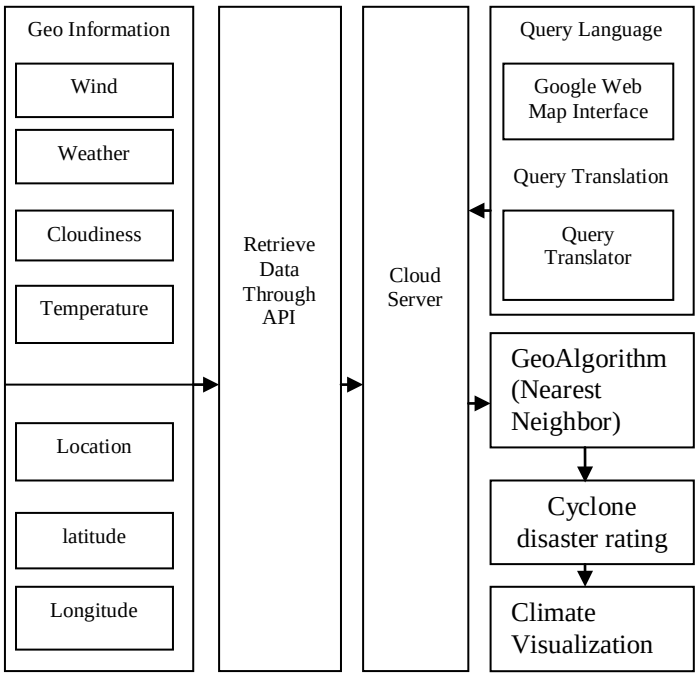
3 PROBLEM STATEMENT

Although a variety of technologies inferred, and location based solutions exist, many of them do not meet the user requirements in terms of efficiency, security, usability and more costly. In an attempt to address these drawbacks, this system that utilizes current technological advancement free API service and location based mapping services with low cost sensing capabilities.This relay lot of failed systems without necessitating any changes to the traditional detecting usage model.

4 PROPOSED WORK

This system proposes a general research direction of cyclone disaster refinement and forecasting.This may reduce processing time and delay to forecasting the changes as accurate as possible.The system utilizes the free API services from service providers for Real-Time GeoSpatial data collection and use location based web mapping service. A new algorithm is proposed to find the nearest neighbor and then provide ratings for the cyclone disaster based on the existing outline database.Any possibility of cyclone disaster visualizes the changes with weather data in real time. Google map is used for choosing the location and getting latitude and longitude and Geo-information that will be taken near ten cities and the weather information will be forecasted. The Geospatial data will be visualized. The Geo-information or weather information includes temperature, pressure(sea level and ground level),humidity, cloud status,rain range, wind speed etc.

System Architecture



Step 1: Geospatial Data is collected in real time using Google API services.

Step 2:Useful Resources will be integrated (API) and managed.

Step 3: The resource Management System Will be fed on to the cloud.

Step 4:User can query about the weather changes or status of their location through Google map.

Step 5: Query will be translated through the Web mapping interface of Google and passed to a cloud server.

Step 6: Location related latitude,longitude of near cities are passed to the Geo-Algorithm for finding nearest neighbour

Step 7: To provide cyclone disaster rating that include location related information and weather data.

Step 8: Then the status of weather will be forecasted and Geospatial data to be visualized.

4.1 Real-Time Geospatial Data Collection

Geospatial data will be collected in real-time from three different service providers such as open weather map,yahoo!weather and weather background.The service providers manage and maintain all the services through an API.The Google API services are free at present.These three API services are combined to make as an own API as a librarythat will used to get actual data from the above API services.

The steps followed for the collection of GeoSpatial data in Real-Time are as follows

1) People(Developer) who want the API services should register their own details and the purpose of usage.

2) The registered users are permitted to add labels on webpage to request the service providers for access.

3) Service providers provide API key. The developers can use the key to obtain the resource of Geo-Information.

Obtaining location information is a main task

1) In this system catching nearest BSC by collecting raw data that put into own algorithm *(*Confidential*)* get accurate GPS information.

4.2 Feed Data On Cloud

The cloud server is one of lightweight framework that work as a medium to store data.The API services data feed into the cloud by using the Internal Language (PHP). To store the data on a cloud can share the data anywhere.Cloud makes this application as centralized application.

4.3 GeoSpatial Visualization Using Google Maps

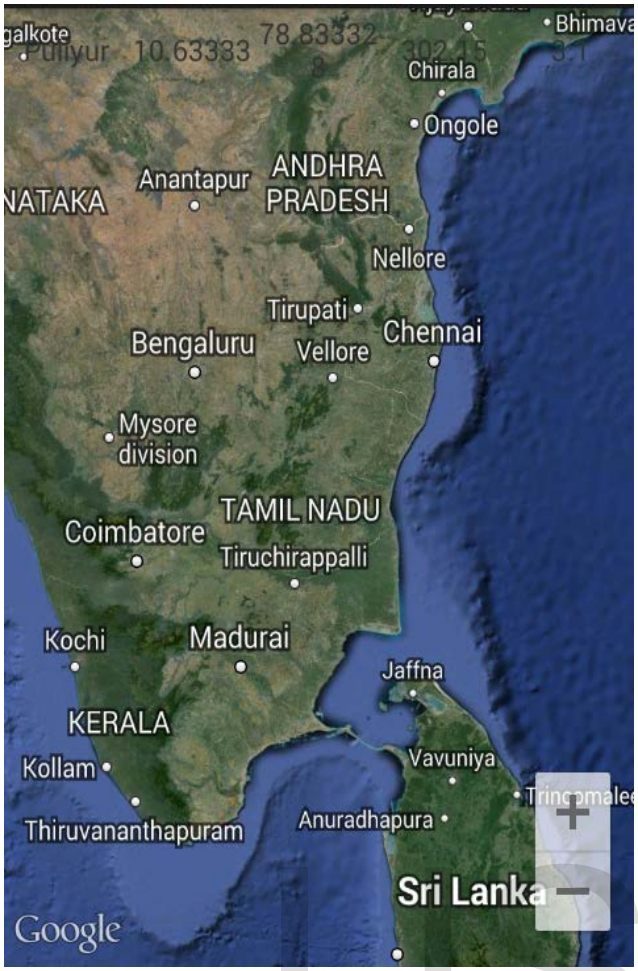
A Google web mapping service is one of the free web mapping service that can be used to visualize the GeoSpatial data. Provides location based mobile weather forecast for mobile users to know the weather status and changes and visualize the GeoSpatial data. Geographic information mapping has the component of web interface, web server and Google map server. Web user or mobile user browses the location in the map information layer. Web server maintains website,query database and generate features of the map. MySQL database maintains geographical location information for each country and region. The Google map server is used as a map server, which provides the geospatial visualization on Google Maps..

The steps for GeoSpatial visualization using google map as follows

1) People (Developer) who are interested to use Google Map in their application to apply for a Google Map key.

2) Service providers provide a map key that gives control and options their use mapping service as per user's request.

3) Service Providers have some policies that have to be satisfied by the developer and define purpose of usage for avoiding illegal usage of the map.



4.4 Geo-Algorithm

In this system.a new geometric algorithm that helps to find the nearest neighbor to know the weather changes of near cities is proposed.The mobile user selects the location via google map that passed to the cloud the Geospatial data collected around ten cities.Location related latitude and longitude of ten cities passed to the algorithm proceed as follows:

Step 1: Get the input latitude and longitude from the user then selecting a location via Google map.

Step 2: Construct kd tree start with the user selecting a city as root city contains points as a latitude and longitude.

Step 3: Then move down the tree the new city points being inserted.

Step 4:Consider a set of points in the level of even x-value as splitting criteria. Newly added points have the x-values less compared root points add in left else add in right.

Step 5: otherwise consider y dimension as the splitting criteria

Step 6: N number of points to built kd tree each tree links with another tree. Merge all the trees.

Step 7:To find Nearest Neighbor in a Kd tree, consider that the level is even a nearest city is the of the point otherwise value of the point.

Pseudocode:

```
Create kd-tree(int level,set coordinates)
Assign city(lat,long) as set of coordinates
if level is even:
    Calculate the x-val of the root node of tree
    Insert a set of coordinates in left that have x-val less than the x-val of the root node of tree.
    Insert a set of coordinates in right that have x-val greater than or equal to x-val of the root node of tree.
else:
    Assign current node as root node.
    Calculate the y-val of the root node of tree.
    Insert a set of coordinates in left that have y-val less than the y-val of the root node of tree.
    Insert a set of coordinates in right that have y-val greater than or equal to the y-val of the root node of tree.
treeLeft = kd_tree(level + 1, coordinatesLeft)
treeRight = kd_tree(level + 1, coordinatesRight)
return(root, treeLeft, treeRight)
No_of_trees=n
Each tree have an outgoing edge that connects to another kd-tree
Merge all trees to form a one tree and update their coordinates to new coordinates and their root.
create function search_kd_tree(int level, tuple tree, tuple coordinate):
if level is even:
    comparisonValue = the x-val of the coordinate
else:
    comparisonValue = the y-val of the coordinate
if comparisonValue < the value of the root node of tree
    subtree = left-hand subtree of tree
else:
    subtree = right-hand subtree of tree
finally nearest neighbor found
end;
```

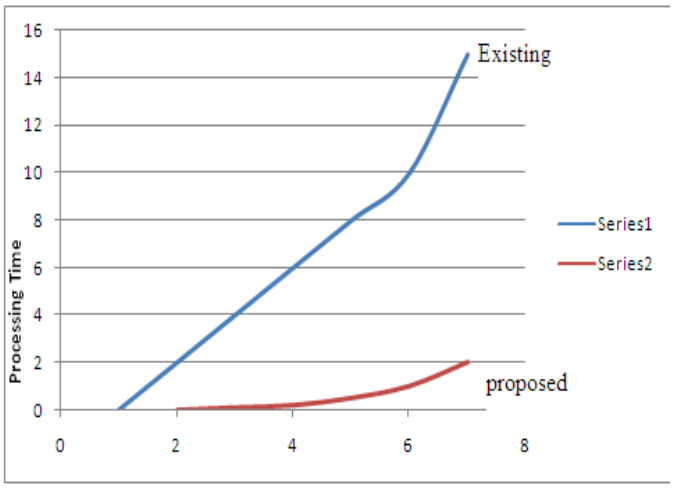
4.5 Cyclone Disaster Rating

The determination of cyclone disaster rating means to set their range or rating based on the existing outline database and give information about the changes and which can forecast cyclone disaster at any point. Cyclone disaster combined with map view and internet interface. Colors are differentiated and define the range of disaster and forecast the information about cyclone.

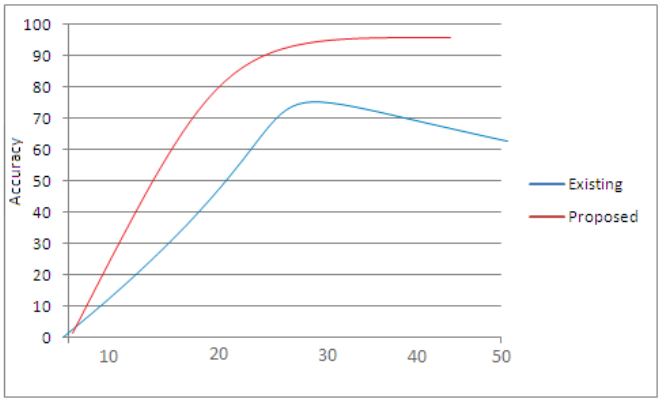
4.6 Evaluation

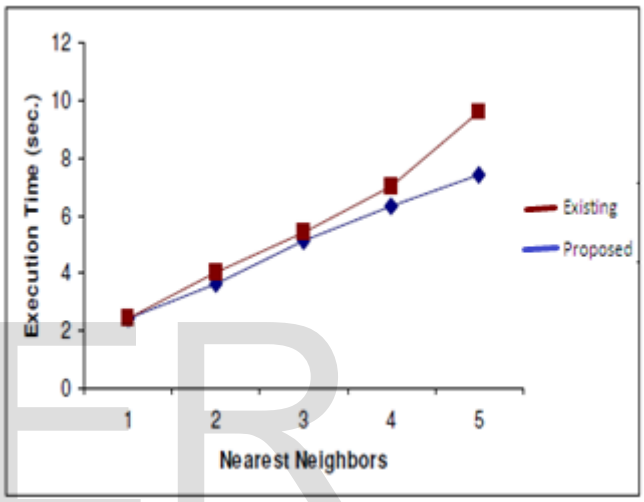
1) Reduce process Time

Process time= Time taken for data collection / Visualization time



2)Accuracy





5 DISCUSSION

The proposed scheme ,collects live geospatial data quickly and reduce processing time to provide an accurate forecast during a cyclone disaster. Evaluation chart for rough estimates defines that the improvement of proposed technique when compared to the existing technique[4],reduces processing time and delay to present the weather data. Previous work will not meet's some of the constraints. They employ Global Positioning System, that consumes more power.They use Remote Sensing for collecting data on GOES that will not provide live measurement. In [10],the system uses a remote sensing technique for collecting the data that use sensor which is invisible at night time and they collect data as fixed and they are higher cost of data. In this system, they gather live data measurement with GOES-R and provide client details who is requesting for services. This system can spot the location without using GPS and use this application when mobile does not have GPS specialties. The Cloud cast mobile forecast is used on campus radar to generate data. It will take more than 15 minutes for data collection. It is a

major drawback since the tolerance of mobile user is less 2 minutes. Service providers provide data as a free service. A Lot of work already for the weather forecasting they will provide service in a single location. In this system, single touch will provide the weather status of near 10 cities. It helps the mobile user to know the weather status of near cities and they plan for traveling and it can also be used for commercial purposes. This application provides a status of weather changes during a cyclone disaster.

Technique	Accuracy	Processing Time
Existing	75%	15 minutes
Proposed	95%	2 minutes

6 CONCLUSION

In this paper,a location based mobile weather forecast application of a cyclone disaster refinement and forecast system is proposed.Geospatial data are collected in real time using service providers API services.Useful Geographic resources are integrated and managed by the system to spread out and focused on the area of weather forecasting.Cloud services are used to feed resource integrated service.To propose Geo-Algorithm for finding nearest neighbors, then nearest city weather is passed to the map that gives cyclone disaster rating to predict weather changes and successfully visualized with Smartphones using Google map. Proposed scheme provides good result in order to collect live data quickly with low computation time.The result of our proposed work when compared to existing work is better. The application for location based mobile weather forecast provides very accurate weather prediction services during cyclonedisaster.

In future, we plan to carry the work for a storm and various natural disasters. This study helps to analyze and model the hazard management.

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