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Inside this issue:

Editor's Desk

Dear Members,

This issue touches the timeline closely and for that we thank our contributors and columnists. As usual Gaurav has put everything together nicely.

This issue has some interesting articles. Sashikant Sharma brings out his SDSS work on how open source and ISRO sourced data can be used for drought monitoring. Ritesh, Sreejith and Rajawat share some initial results on SAR interferomentry of Nepal earthquake and bring out a spectacular view of upheavals the land has gone through as a consequence of crustal movements. It delineates the boundaries of the great tragedy in colors. Utkarsh and Pushpalata describe their MOSDAC App in great details. It should immediately be uploaded on your Android devices - you don't know when its going to help you. Mehul Pandya shows how heat wave conditions can be charted on national level using Kalpana VHRR data and an ingenious algorithm. This could well be your next operational product on MOSDAC.

In the regular column Dr Udani brings out EIA related postings which may be useful to many members. The issue ends with a brochure of National conference of ISG/ISRS where we hope to see you all.

Please keep reading and writing to us with your side of geomatics story. We always look forward to your contributions.

Please keep reading and continue your support.

R. P. Dubey, Editor
(rpdubey@hotmail.com)

NATIONAL SYMPOSIUM ON GEOMATICS FOR DIGITAL INDIA

and

Annual Convention of Indian Society of Geomatics &
Indian Society of Remote Sensing

December 16 -18, 2015

Jaipur, Rajasthan

Information Boucher

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Web GIS based Spatial Decision Support System for Drought Monitoring

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Introduction

Drought is most complex hazard where the conditions are much more difficult to identify, analyze, monitor and manage than other natural hazards. Due to its intrinsic nature of phenomena, many researchers and scientist have defined it by different definitions. Drought is a slow accumulating regional phenomenon and its characteristics vary from one climate regime to another. India Meteorological Department (IMD) defines drought as an occasion when the rainfall for a week is less than half of the normal rainfall. This article attempts to develop a web based Decision Support System (DSS) for Drought Monitoring. The development and availability of powerful Geographic Information Systems (GIS) and visualization tools in conjunction with internet have played an important role in the emergence of web-enabled Spatial Decision Support Systems (SDSS). To support decision-makers a responsive system that can generate different scenarios is required for timely and effective planning and management. The SDSS typically uses a variety of spatial and non-spatial information, like temperature, rainfall, soil moisture and NDVI from various satellite and ground stations. SDSS are becoming important tool for planning and decision making for vegetation monitoring. GIS enable a familiar interface paradigm for specification of decision scenarios and presentation of maps along with time series charts providing means for scientific analysis of decision scenarios.

Objective

This study aimed to develop an SDSS dealing with the development of vegetation monitoring and providing the decision-support for agricultural activities in India. Therefore, the main objective is to develop a web GIS based vegetation monitoring system for continuous assessment of crop growth, precipitation conditions, temperature and soil moisture conditions at weekly, fortnightly and monthly time scale.

Tools

The web based system is developed using various open source software and libraries along with other desktop GIS applications, that were used in preprocessing of spatial database and advanced analysis. Table 1 enlists various tools and technologies used in development of SDSS.

Data used and Methodology

Remote sensing techniques have been used for monitoring present and post conditions of drought. Similarly a large amount of meteorological data acquired from IMD viz. station rainfall and temperature have been used. The spatial database includes satellite Remote Sensing images (SPOT NDVI, MODIS NDVI, INSAT NDVI, NOAA-CPC rainfall and AMSRE-2 soil moisture content), preprocessed for statistical analysis using various GIS software. NDVI values are represented as a ratio ranging in value from -1.0 to +1.0 but in practice extreme negative val-

Table 1: Tools and Technologies Used

Tools	Description
PostgreSQL	PostgreSQL is a Database Server for storage and transaction management. The open source database PostgreSQL with PostGIS extension has been used in this application.
PostGIS	PostGIS is a socket between PostgreSQL and GIS engine. This spatially enables PostgreSQL server to store spatial database.
Geoserver	Geoserver is a GIS server for interoperability and publishing OGC web Services. It is an open source web map server that allows users to share and edit geospatial data.
OpenLayers	Open Layers is an open source, client-side JavaScript library for making interactive web maps, viewable in nearly any web browser.
GeoExt & ExtJS	Geospatial Extension (GeoExt) is used for rich web mapping. GeoExt is built on top of the robust OpenLayers JavaScript mapping library and rich graphical components of ExtJS.
Highcharts	Highcharts is a charting library written in pure JavaScript, offering an easy way of adding an interactive charts to our web site or web application.

ues represent water, values around zero represent bare soil, and values over +0.3 represent green vegetation. In order to assess, visualize and analyze NDVI images, NDVI deviation is analyzed in 16 days interval for seasonal crop monitoring from previous year and Short Term Average (from last five years), at grid, Taluk and district level spatial scale.

MODIS NDVI: Global MODIS vegetation indices are designed to provide consistent spatial and temporal comparisons of vegetation conditions. The MODIS NDVI provides continuity for time series historical applications. Global MOD13A1 data are provided every 16 days at 500 meter spatial resolution as a gridded level-3 product.

SPOT NDVI: Satellite for observation of Earth (Satellite Pour l'Observation de la Terre-in French, SPOT) is a high-resolution, optical imaging Earth observation satellite system operating from space. Synthesis NDVI data has been downloaded on one decade (10 Days) period at 1 km spatial resolution for entire west Asia, from January 1, 2001 to May 31, 2014.

INSAT NDVI: INSAT 3A, launched in 2005, covers one-fourth of the globe in a single snapshot mainly the Asia continent (44.5°E to 105.3°E, 9.8°S to 45.5°N). It has CCD payload that was specifically designed to monitor vegetation and snow cover conditions over Asia regularly at spatial resolution of 1 km X 1 km. The 10 day composite NDVI data has been available through MOSDAC web portal. The system contains INSAT NDVI data from November, 2010 to till date.

NOAA-CPC Rainfall: Daily rainfall data was archived for the region though the data available on the National Oceanic and Atmospheric Administration (NOAA) Climate Prediction Centre (CPC) FTP web portal. Daily data extent for south Asia is; 70.0-110.0°E;

Table 2: Standardized Precipitation Index Classification

SP Range	Drought Class
> 3.00	Exceptionally Wet
2.00 to 3.00	Extremely Wet
1.50 to 1.99	Very Wet
1.00 to 1.49	Moderately Wet
0.99 to –0.99	Near Normal
–1.00 to –1.49	Moderately Dry
–1.50 to –1.99	Severely Dry
–2.00 to –3.00	Extremely Dry
<–3.00	Exceptional Dry

5.0-35.0°N and spatial resolution is 0.1 X 0.1 degree. The rainfall database has been prepared to compute standardized Precipitation Index (SPI) from satellite data. SPI was developed in Colorado by McKee et al. in 1993, to quantify the precipitation scarcity for multiple time scales which reflect the impact of drought on the availability of the different water resources. The SPI values can be classified as shown in Table -2 to describe drought classes.

Temperature: IMD provides daily minimum and maximum temperature. A script is written in java which downloads daily rainfall, minimum and maximum temperature data for entire day from IMD's Website (www.imd.gov.in). Minimum and Maximum Temperature deviation represents the relative change in thermal condition in terms of hot spots, relatively cold and normal temperature condition from long term average. Weekly temperature deviation has been generated and kept with SDSS-DM.

Soil Moisture Content (SMC): Soil moisture content indicates amount of water present in soil. SMC is obtained as AMSRE-2 product in 0.1X0.1 degree spatial resolution. Daily / weekly soil moisture profiles and images are available for comparison.

Process implementation of SDSS-DM

Geoserver is configured with Apache tomcat (Web Server)

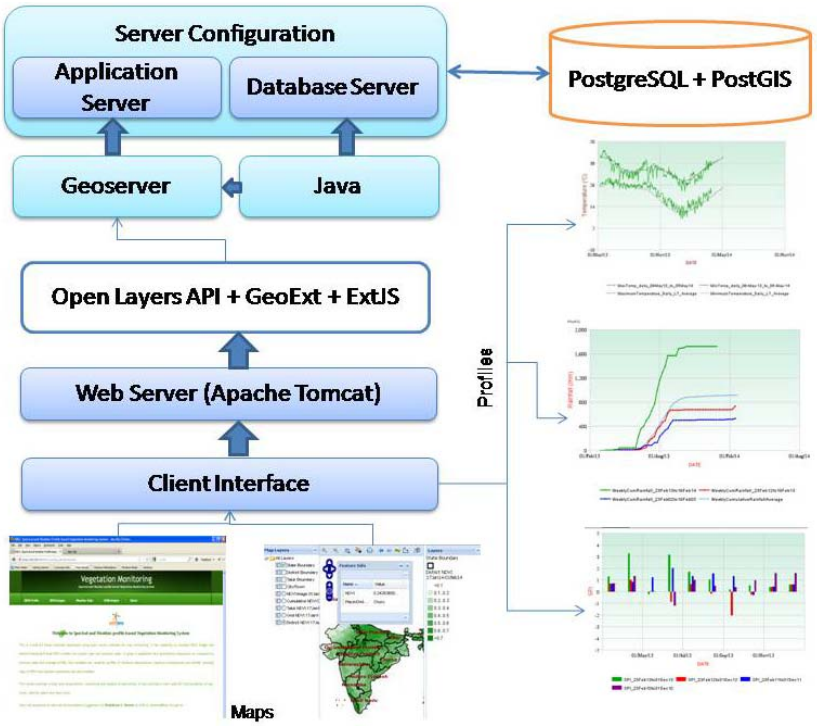

Figure 1: Implementation Flow Chart of SDSS-DM

for map rendering over internet. The spatial database comprises administrative boundaries of India (State, District and Taluka), along with meteorological and agricultural parameters at grid level. Basically three tier architecture has been implemented for development (1) Data Tier, (2) Server Tier and (3) Client Tier.

The home page is classified into different tabs, whereas separate tab redirects to a separate page. Components of user Interface for map browsing include: (i) Map Window, (ii) Layer Panel, (iii) Legend Panel and (iv) Toolbar.

Results and Discussion

The monthly SPI for one of the drought year (2009) and one of the wet year (2013) are hereby discussed. Taking two different years in consideration shows the SDSS-DM's strength and its capability to support in decision making process.

The year (2009) was the third highest deficient all India monsoon season rainfall year during the period 1901-2009. As per the IMD's report the highest ever monsoon rainfall deficiency during this period was observed in 1918 (-25% of Long Period Average (LPA)) followed by 1972 (-24% of LPA). Year 2009 was also the third deficient monsoon rainfall year of the present decade (2001-2009) after 2002 & 2004. Figure 2 and 3 illustrate the spatial distributions of monthly SPI from NOAA-CPC rainfall data for the year 2009 and 2013. The spatial distribution of SPI shows considerable difference for monsoon months

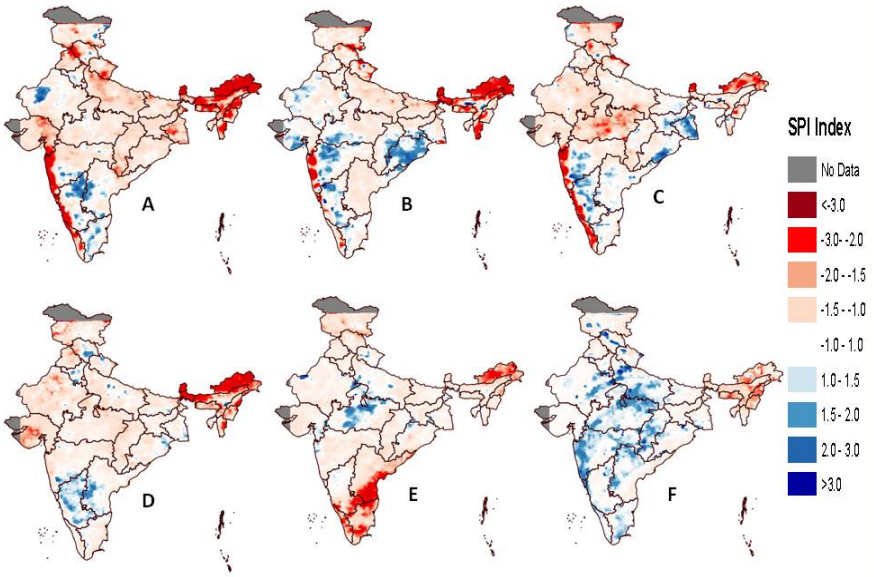

Figure 2: Monthly SPI for Year 2009, (A) June, (B) July, (C) August, (D September, (E) October, and (F) November

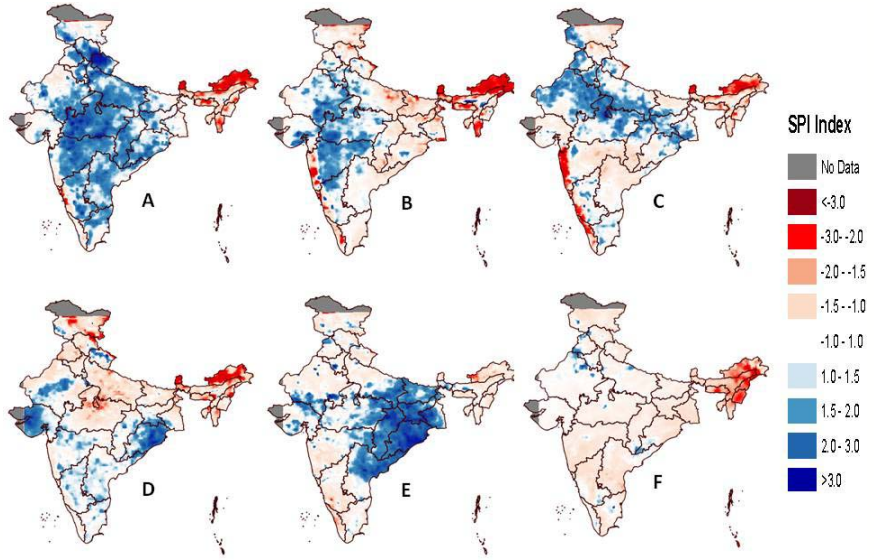

Figure 3: Monthly SPI for Year 2013, (A) June, (B) July, (C) August, (D September, (E) October, and (F) November

of June, July, August, September, October, and November in year 2009 and 2013. Figure 2 illustrates year 2009 drought situation in all monsoon months for entire India whereas the differences in figure 3 are visible in month of June, where an excessive rain in Uttrakhand State, which caused disaster during "Kedarnath Yatra". Analysis of SPI Indexes in month of October for year 2013, shows the cyclonic activities causing heavy rainfall over Orissa state and surrounding areas. The figure 3 represents over all wet situation in India for year 2013. SDSS-DM, thus developed, contains cumulative weekly SPI indexes for monsoon season for continuous monitoring of precipitation and which may lead to effect on crop during "Kharif" season and water availability for crop.

The SDSS-DM is developed for visualization and analysis of NDVI images, temperature images, rainfall images, SPI images, NDVI deviation images and temperature deviation images. The developed system contains the facility for analysis of multi satellite remote sensing data as well as in-situ data. The system provides the facility to view profiles for NDVI, rainfall, temperature & SPI data from previous years.

Conclusions

The paper has presented the application of web GIS for developing SDSS using open

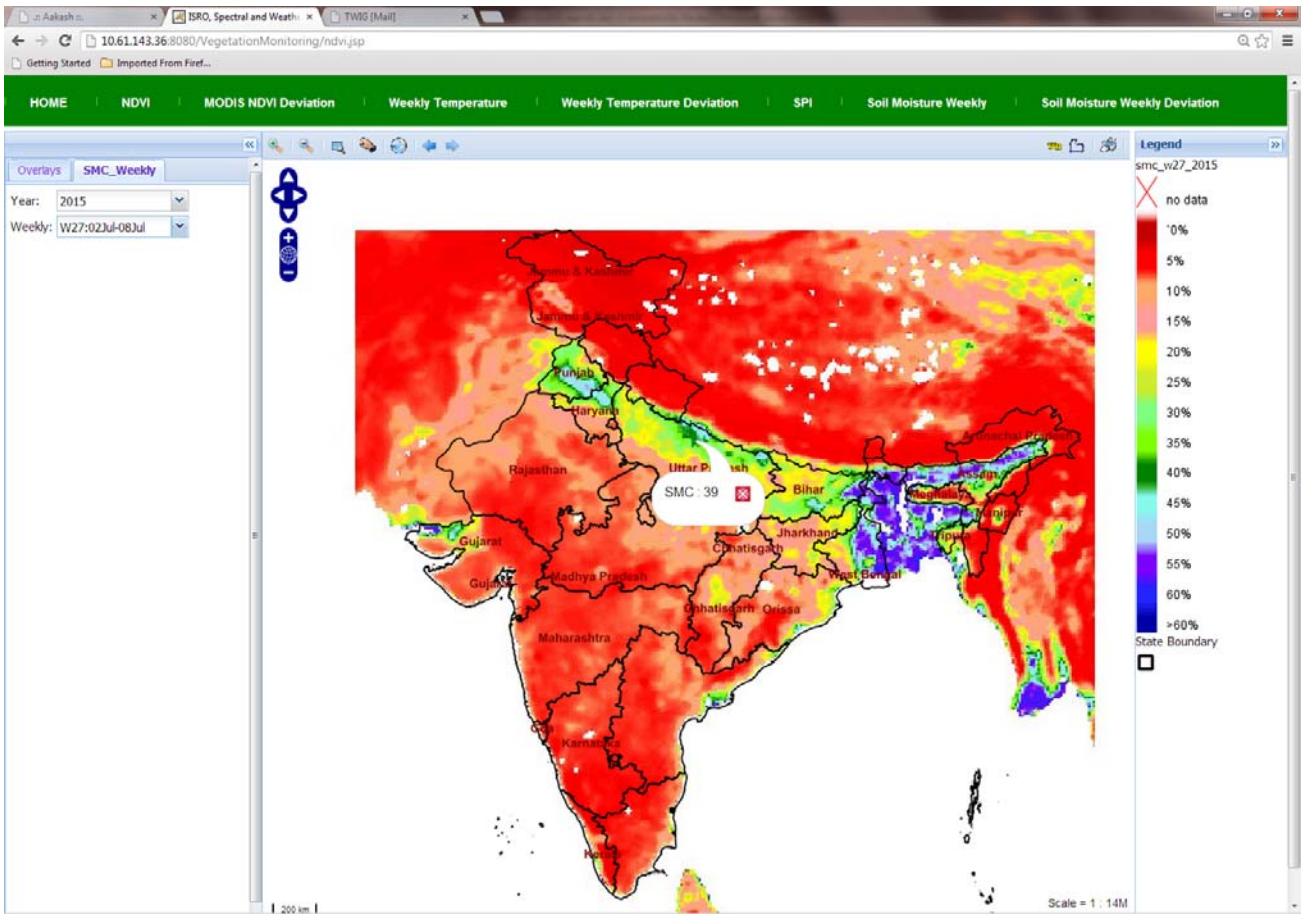

Figure 4: Weekly Soil Moisture Contents 02-08 July, 2015

source technologies. The use of SDSS is of great interest in the field of agricultural planning and drought management. The potential of SDSS in determining the vegetation condition with the help of different indices have been demonstrated in this paper. SDSS-DM will help in identifying districts, taluka or grids with drought situation and classifying drought based on generated indices. This study is an attempt to develop a DSS for spatial planning in the field of drought management,.

Furthermore the study has scope for future advancements in the system capability by adding some indices and modules to account for drought assessment which can be calculated from other important agricultural and meteorological parameters.●

Acknowledgements

The authors would like to thank the Director, Space Applications Centre, Deputy Director, EPSA, SAC and Group Director, ADVG, for their kind support. The data distribution Websites for MODIS NDVI, SPOT NDVI, INSAT NDVI, AMSRE, NOAA/CPC rainfall are also thankfully acknowledged.

Interesting Web-resources Related to Location Based Services

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SN	Web-site Link	Description
1	http://geoawesomeness.com/security-and-privacy-issues-of-lbs-geo-apps/	Security and privacy issues of LBS (geo- apps)
2	http://www.computerworld.com/article/2503577/location-based-services/location-based-services-are-they-there-yet-.html	Location-based services: Are they there yet?
3	http://www.academia.edu/5850713/Location_ Privacy_in_ Location_Based_Services _Unsolved_ Problem_and_ Challenge	Location Privacy in LBS: Unsolved Problems and Challenge
4	http://www.mosdac.gov.in/tools/MOSDACApp.apk	Location based weather forecast
5	http://yourstory.com/2012/06/location-based-services-whats-next/	Location Based Services are suffering from the “last-mile” problem
6	http://readwrite.com/2010/08/13/geofencing_ whats_ next_ for_location-based_services	Geofencing: What's Next For Location-Based Services
7	http://www.pingmobile.com/blog/top-benefits-of-location-based-services/	Benefits of location based services
8	http://www.governing.com/columns/mgmt-insights/col-location-based-services-smartphones-government.html	Shaping public services for the mobile citizen
9	http://www.spreedinc.com/blog/location-based-services-the-pros-the-cons-and-where-to-go-from-here	LBS: Pros, Cons and where to go from here
10	http://in.norton.com/yoursecurityresource/detail.jsp?aid=risks_of_location-based_services	Stay safe using location based services

Co-seismic deformation field of the 2015 Gorkha, Nepal Earthquake

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Introduction

Synthetic aperture radar interferometry (InSAR) is a space based geodetic technique to measure topography and deformation of earth surface. In this technique two SAR images are used to produce a radar interferogram, which can measure minute changes in the range distance between two image acquisitions. This technique has been successfully used to map surface deformation due to earthquakes for the last two decades. InSAR technique is particularly important in remote areas were ground based geodetic survey using Global Positioning System (GPS) becomes difficult due to accessibility issues. Further, InSAR is proven to be an efficient way to understand earthquake fault geometry and slip distribution.

The 25th April 2015, Gorkha earthquake (Mw 7.8) occurred with an epicenter 77 km (48 miles) northwest of Kathmandu city. The earthquake destroyed homes, buildings and temples, causing widespread damage across the region and resulting into widespread destruction in Nepal and parts of India and China with a total death toll exceeding 8000. The earthquakes also triggered a major avalanche on the southern slopes of Mt. Everest, located approximately 160 km east-northeast of the epicenter. In this paper, we report the co-seismic deformation associated with the 2015 Gorkha earthquake using Synthetic Aperture Radar Interferometry (InSAR) using sentinel-1 InSAR data.

Data Used

ESA launched sentinel-1A in continuation of the C-band SAR Observation of ESA's ERS-1, ERS-2 and ENVISAT. ERS-1 and ERS-2 shared the same orbital plane for tandem mission to collect interferometric data one day apart. The Sentinel-1 mission is designed to provide enhanced revisit frequency, coverage, timeliness and reliability for operational services and applications requiring long time series. It provides an operational interferometry capability through stringent requirements placed on attitude accuracy, attitude and orbit knowledge, and data-take timing accuracy. In order to perform interferometric applications towards the land deformation, reference orbit is maintained within an Earth-fixed orbital tube of 100 m (RMS) diameter during normal operation. With the Launch of Sentinel-1B the repeat cycle of the satellite will be enhanced from 12 days to 6 days, and the orbit positioning control for Sentinel-1A and 1B will be enhanced within an Earth fixed orbital "tube", from 100m to 50m (RMS) radius, around a nominal operational path.

The primary mode of Sentinel-1A over land region is Interferometric Wide Swath (IW), which acquire data using Progressive Scanning SAR (TOPSAR) imaging technique. Technique applied is similar to Envisat ASAR Widelan ScanSAR SLC products. The study used Sentinel 1A data in IW mode with 12 days repeat cycle of VV polarization of descending pass acquired on 17th April 2015 and 29th April 2015 for displacement analysis over Nepal region.

Methodology

InSAR technique is used to measure very small changes in elevation (2-3 mm) over very large areas of the Earth's surface. These elevation changes arise due to volcanic activity, ground water subsidence or deformation associated with active faults. Interferrogram is the phase channel corresponding to fractional wavelength of the echo where each pixel value represents the difference between phases of the corresponding pixels in two co-registered SAR images. This phase is expressed as sum of the contributions by deformation, topographic, atmospheric, and orbital components of the differences between two SAR images of the same location. From those components, the deformation and topographic phases are used to derive InSAR products. The topographic phase can be corrected via an external digital elevation model (DEM) or by combining two interferograms of the same region (one interferogram, being acquired over a short time period to ensure there is no surface deformation). After the removal of topographic component the remaining phase is proportional to surface displacement, atmospheric and orbital component. The final steps in generating displacement maps from corrected interferrogram involve phase unwrapping and geocoding. The

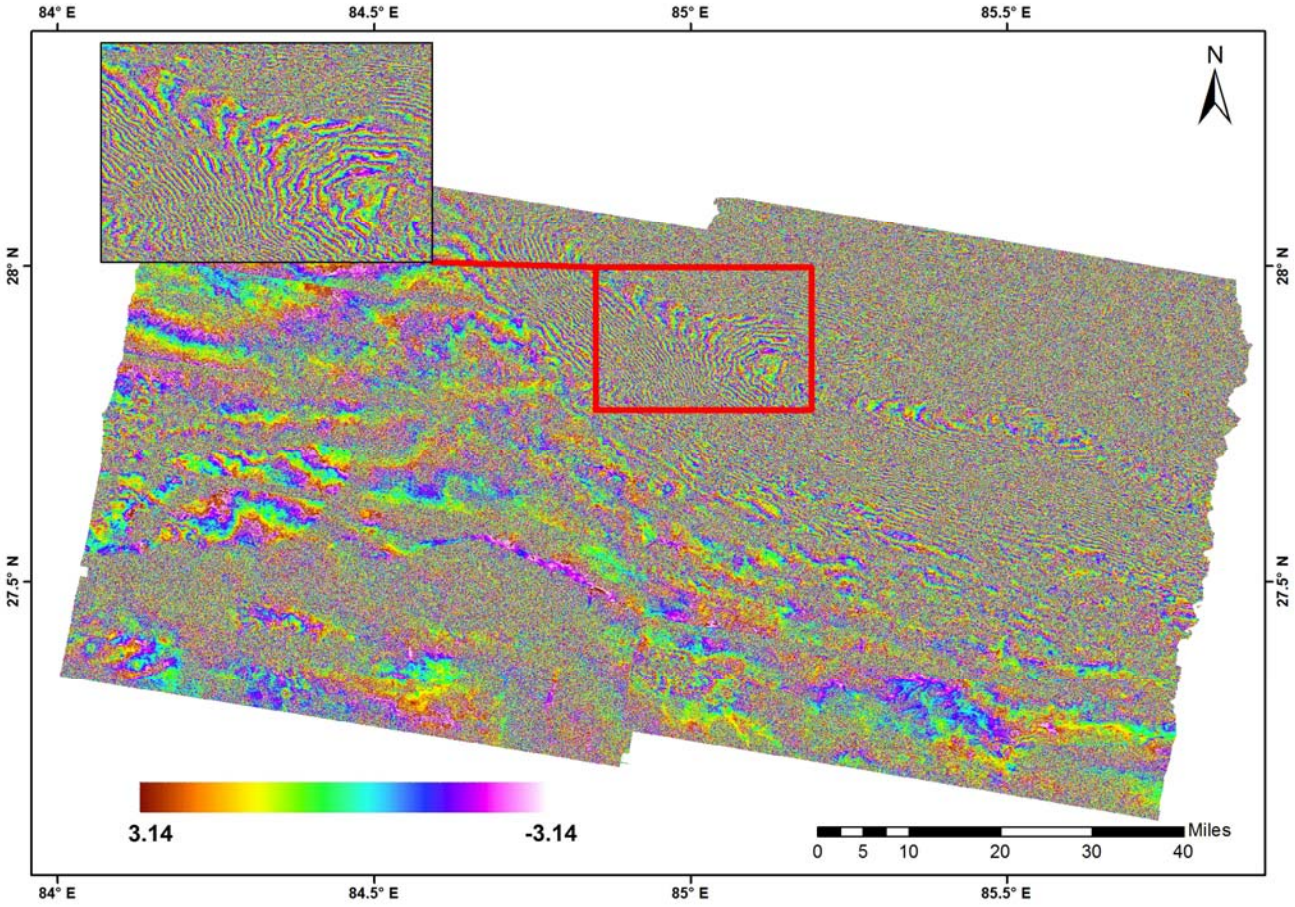

Figure 1: Co-seismic interferogram of the 2015 Gorkha, Neplal earthquake (1 color cycle = 28mm displacement in LOS direction)

phase unwrapping calculates integer coefficients needed for computing the line-of-sight displacement values. The geocoding process converts the resulting displacement map (that is, the unwrapped interferogram) to real world coordinates.

InSAR Analysis and Conclusions

Co-seismic interferogram were generated using SAR data acquired during the descending passes on 17th April and 29th April 2015 (Figure 1). The pattern of the interferometric fringes clearly indicates surface deformation associated with the earthquake. Each interferometric fringe corresponds to about 2.8 cm movement along the line of sight of the satellite.

The deformation map generated from the interferogram (Figure 2) suggests about (+) 1.0 m uplift near Kathmandu and about (-) 0.8 m subsidence towards north. However, the subsidence pattern towards north is completely imaged in the interferogram. It is interesting to note that maximum deformation occurred east of the epicenter. This is consistent with the distribution of aftershocks and clearly indicates eastward propagation of the sub-surface rupture as suggested by the inversion of teleseismic data (USGS, 2015). The relatively smooth interferometric fringes across the scene suggest that the earthquake rupture did not reach to the surface. Further it could be inferred that the earthquake must have been caused by a north dipping fault buried deep in the crust. Elastic dislocation modeling could be carried out to understand the source parameters of the earthquake and fault geometry. ●

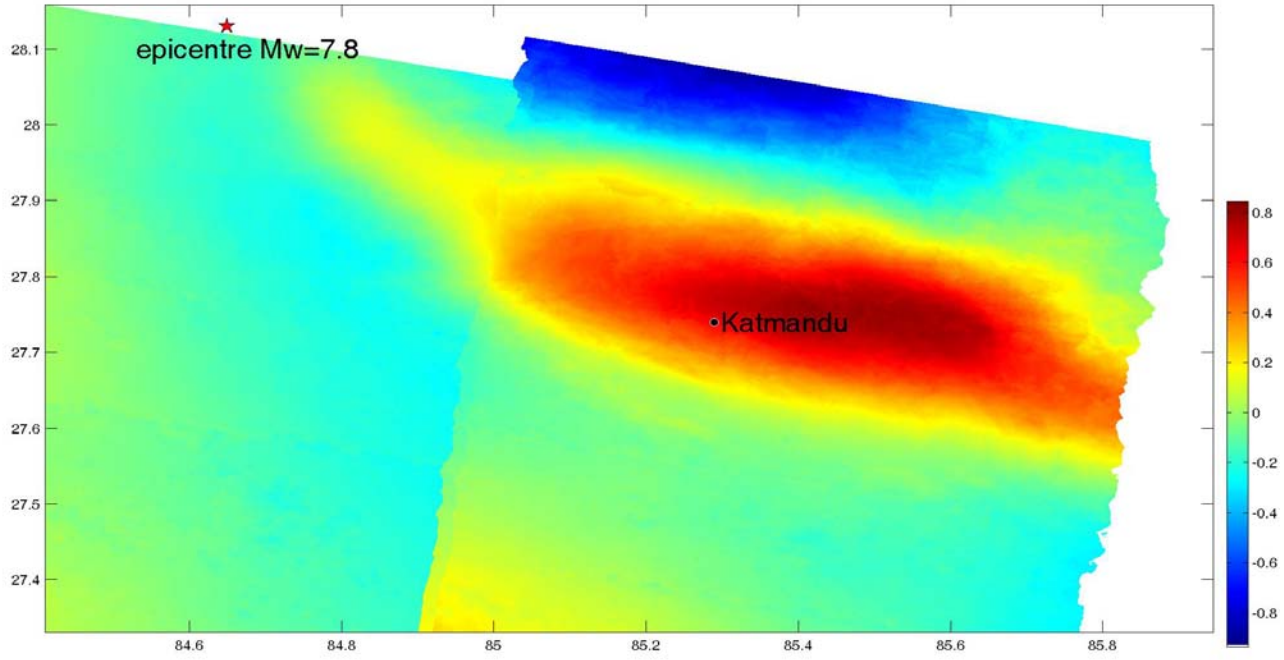

Figure 2: LOS deformation map of the Mw 2015 Gorkha earthquake. The locations of the earthquake epicenter and Katmandu city are indicated

Location based weather services on Android Devices

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Introduction

The era of mobiles and cell phones with 2G, 3G and 4G network and variety of Operating Systems has set a new trend for internet based mobile transactions and information services. The Android OS dominated the Worldwide Smartphone OS Market Share by 78.0% and still is the fastest growing mobile platform. This OS was initially developed by Android Inc. and in 2005 was bought by Google. In 2007 Android was unveiled along with the founding of the Open Handset Alliance - a consortium of hardware, software and telecommunication companies devoted to advancing open standards for mobile devices.

One of the fastest growing areas in Android applications is Location Based Services (LBS). LBS is a platform that provides information services based on the current or a known location, supported by the mobile positioning system. Presently, MOSDAC (Meteorological and Oceanographic Satellite Data Archival Centre) disseminates the weather forecast information through web. Weather services in terms of current outlook as well as a future forecast (next 48 or 72 hours) are a necessity. Extreme weather alerts such as heavy rains, cloud burst or dense fog are required by Administrators for taking preventive measures.

The Weather App

An Android based Weather App has been developed at SAC-ISRO, Ahmedabad. This app provides 3 hourly forecasts for next 72 hours. The parameters considered are Temperature, Humidity and Rainfall and sky condition. The numerical weather forecast with a 5km resolution grid has been a regular feature on MOSDAC web site (www.mosdac.gov.in) [1]. The associated validation results are also hosted on a monthly basis. This forms the basis and source of information for the weather forecast on Android.

The technologies adapted for the weather app are Android Application Development, Location Based Services, Web Services and Java. The application is initially developed and implemented on Android Development Tool (ADT) in Version 4.4 environment. This is a plug-in for the Eclipse IDE that extends the capabilities of Eclipse to quickly setup Android Projects. The app is based on Service Oriented Architecture (SOA) and thin clients are the Android devices. The services are self contained and communication is through the Message Exchange Format – JASON. Connection between client and server is established using HTTP over Sockets as the latter requires higher CPU and memory usage.

There are various application areas where weather forecast is required regularly. The Aviation industry is mostly sensitive to the weather, and accurate weather forecasting is essential to manage and control air traffic. Farmers rely on weather forecasts to plan their day to day farming tasks. Forestry Departments require weather fore-

cast of wind, precipitations and humidity for preventing and controlling wildfires. Electricity and gas companies rely on weather forecasts to anticipate demand which can be strongly affected by the weather. Other commercial companies pay for weather forecasts tailored to their needs so that they can increase their profits or avoid large losses. All these examples have been a motivation for carrying out research on the field of location based weather information dissemination on smart phones.

Weather information to be disseminated in MOSDAC weather app is listed below:

i. Forecast - Current weather conditions and detailed 24, 48 and 72 hour forecast for parameters such as temperature, humidity, rain, wind speed and sky conditions. Topographical information (land, mixed, and ocean) is provided at the user's point of interest.

ii. Weather alerts for cyclone, and expected as well as observed cyclone tracks for visualization over a map.

iii. Events - Disseminating information for heavy rain, fog, smoke and fire covering India at each half an hour.

iv. Nowcast (half hourly forecast valid for 6 hours)

v. Cloudburst alerts over Western Himalayan Region.

vi. All India heavy rain alerts

Philosophy Adopted

It is very important to keep the application lightweight by analyzing the techniques for minimizing mobile device limitations such as memory capacity, security, response time, and battery consumption. The client server architecture has been adopted for development of MOSDAC weather app along with RESTful web service, HTTP as a data exchange protocol, and JSON as a data exchange format for keeping the application lightweight. An algorithm has been proposed for minimizing battery consumption and response time [2].

Similar Apps available

Top free weather apps offered in Google store are Weather & Clock (Devexpert.NET), AccuWeather (Accuweather.com), GO Weather (GO Launcher EX) & Weather (MacroPinch). Some of the apps require access to the USB storage for modifying and deleting the contents which may not be appreciated by most users. Others provide season dependent wall papers which can consume local storage as well as impact the load on bandwidth. Also the validation of forecast provided is also not available at respective websites. Accuweather [3] provides subscribers, access to the location based weather data via a simple RESTful interface. Accuweather Application provides access to current weather data for any location on earth including 200,000 cities. Data is available in JSON, XML or HTML format. This service collects data from professional and private weather stations. Most of them are professional stations which are installed in airports, large cities etc. They also collect weather data from non-professional stations that are assembled and installed by fans and weather enthusiasts. The parameters for current weather conditions are temperature, humidity, pressure, sea-level, wind speed, cloudiness and rain.

Weather Bug [4] is an Android application that brings the current weather as well as the forecast right to your android

device. The app uses either your device's GPS or a manually-set location to determine the region for fetching weather information. The application also updates its information every hour by default, but update frequency can be adjusted. In this application, the useful feature is the battery monitoring option, which will disable updates when the app detects that battery, is below a certain level. This application provides information on the current temperature, as well as wind speed and direction, recorded highs and lows for that day, wind chill, humidity level, amount of rain, and the sunrise and sunset times for that day. They collect data from their own sensors and integrate data from sources such as the National Weather Service (NWS) and the World Meteorological Organization (WMO), providing users access to the biggest global network of professional weather stations.

In the application such as Accuweather and Weather Bug, originating source and dissemination source of data is different. In MOSDAC weather app, originating source and dissemination source of data is same. MOSDAC majorly uses Indian National Satellite (INSAT) Series data in conjunction with MEGHATROPIQUES data and initial boundary conditions from NCMRWF (India) and data collected from ISRO's Automatic Weather Stations (AWS). The parameters for weather conditions are temperature, humidity, wind speed, cloudiness and rain. Other applications do not provide multiple weather alerts such as cyclone, heavy rain, fog, smoke, fire over Indian region.

Architecture

Location-based MOSDAC Weather App is implemented on Android which is an open source operating system for mobile devices such as smart phones and tablet computers developed by Open Handset Alliance led by Google. It allows the developers, wireless operators, and handset manu-

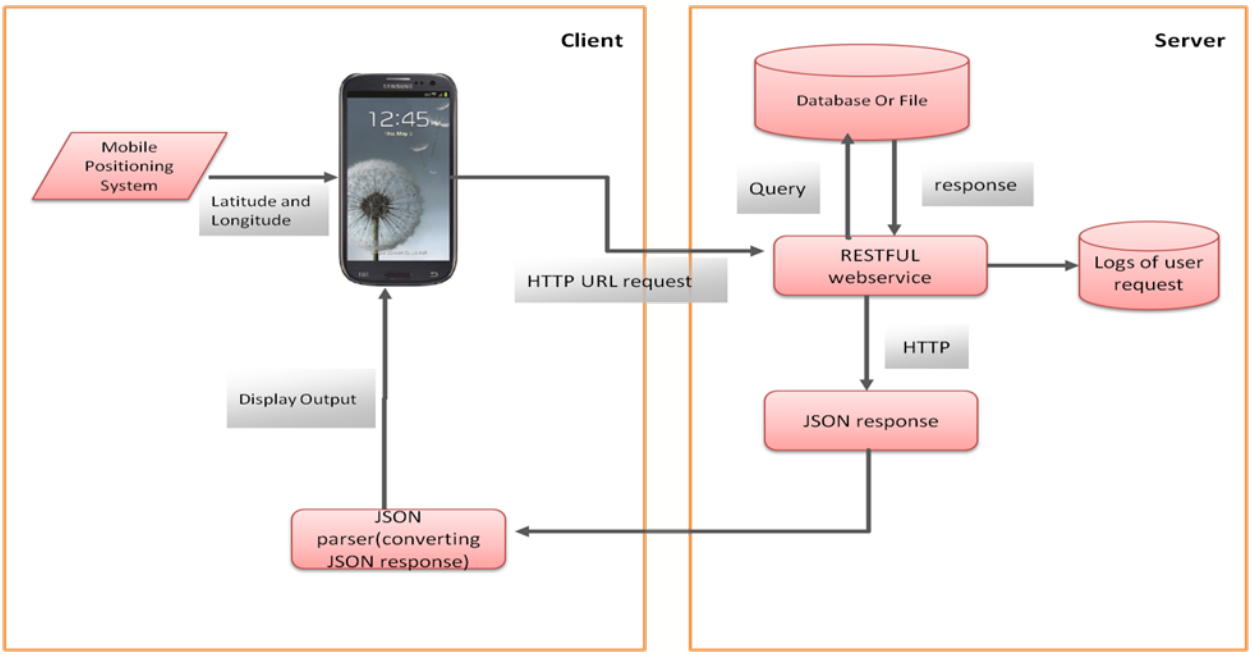

Figure 1: System Architecture

facturers to make new applications and products at lower cost. Samsung, HTC, and a lot of other companies now use this open source operating system for their smart phones, thereby capturing the major market share. Android also has its own language to develop application which is very supportive to develop a system based on location based service and internet [5].

The current mobile application is based on Service Oriented Architecture (SOA) where we have thin client like Android Phones. Services are self contained and communicate using messages like JSON and XML. They are cross platform, asynchronous, reliable and secure. Web service at the remote server with centralized database can be used for different clients such as Android, iPhone, Blackberry, Windows phone, Symbian phones, etc. Different clients can use the common web service to save or retrieve the data. The architecture adopted for developing the Android application is shown in Figure 1.

Components of Architecture

While developing a client-server application, the communication between client and database server becomes imperative. Therefore, it is important to select appropriate web service, data exchange protocols, data exchange format and Mobile positioning technologies for client-server application. There are mainly four components in the application architecture.

Web services

The Web services maintain client and service provider communications through protocols where client makes a request and service providers provide the responses. Examples could be RPC, SOAP and REST [6].

Data exchange format

Data exchange format defines the data structure for communication between the requester and the service provider to formulate requests and responses in a simple way. Examples could be XML, JSON and KML [7].

Data Exchange Protocols

For establishing connection between client and server in Mobile application, it is important to decide the best way to exchange information between client and server for minimizing the limitation of mobile devices such as response time, network traffic and resource utilization. Examples could be Sockets and HTTP [8].

Mobile Positioning Technologies

Location based services are

HAVERSINE FORMULA

$$d = R \times c$$

$$c = 2a \tan^2(\sqrt{a}\sqrt{(1-a)})$$

$$\Delta\theta = \theta_2 - \theta_1 \quad \Delta\phi = \phi_2 - \phi_1$$

$$a = 2\arcsin\left(\sqrt{\left(\sin^2\frac{\Delta\theta}{2}\right) + \cos\theta_1 \cos\theta_2 \left(\sin^2\frac{\Delta\phi}{2}\right)}\right)$$

Where, d is the distance between locations of two places; R is earth's radius (mean radius = 6,371km); θ1, θ2 are the longitudes of the two points; Φ1, Φ2 are the latitudes of the two points; Δθ and ΔΦ are respectively difference between longitudes and latitudes of the two points.

mobile services in which the user's location information is used to provide a service. The location information consists of latitude, longitude, and altitude generated by any given positioning technique [9] Examples could be Cell-ID, GPS and Wi-Fi Based positioning.

Flow of Architecture

Android device fetches the inputs such as user's current location (latitude-longitude) by using different mobile positioning technologies and or manual latitude and longitude for any location in India and any location (latitude-longitude) from the Google map. Android device then creates URL with run -time parameters (latitude-longitude) and calls the RESTful web service. Device use HTTP to open the URL and awaits response. RESTful web service is responsible for querying database, retrieving results, converting them into JSON format and sending JSON response by using HTTP protocol. Device receives JSON response and parses JSON objects.

For system perspective of MOSDAC Weather App, a central server is maintained, where a database containing wide range of information of weather stations and information related to weather parameters all over India is deployed. Haversine formula [10] as described in the box, is used for calculating distances between user's current location and nearest forecast location.

Figure 2: Main menu of application

Figure 3: Weather Info using Google Maps

Implementation

MOSDAC weather App which is the Android application provides 3 hourly current weather conditions and detailed 24, 48 and 72 hour forecast for parameters such as temperature, humidity, rain, wind speed and sky conditions. Topographical information (land, mixed, and ocean) is provided at the user's point of interest. This application also provides several weather alerts for cyclone and heavy rain (fog, smoke, fire are in pipeline). The prerequisites and the features of our application are described in the following:

Prerequisites

- The application is first implemented on ADT in 4.4 (Kitkat) version environments. This application will also run on higher versions of android.
- Internet connection is required to load the MOSDAC Weather App.
- GPS or Network must be available in handset. It enables to determine current location of user.

Features of the application

Whenever the application is

launched, user will see three options which is illustrated in Fig 2. There is an option named 'Google Map' that enables user to take a look at his current location. The current location of the user is viewed in the Fig 3. If user wants to get the forecast details from location on the Google map then this activity is called. This activity gets the latitude and longitude value for the particular location from the Google maps and redirects the latitude and longitude to the next activity. The Location activity is responsible for connecting to the web service to allow the user to query the database and obtain the results. If the main thread which controls elements of the UI is blocked by waiting

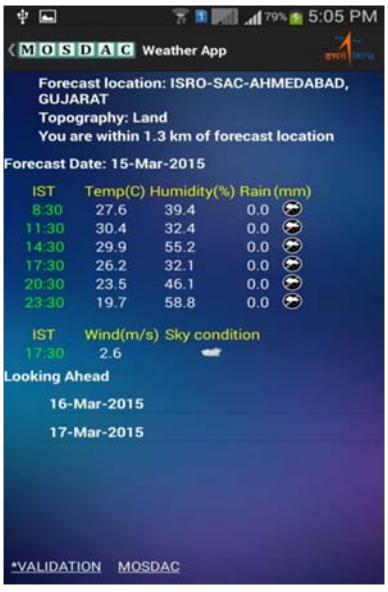

Figure 4: Weather information for requested station

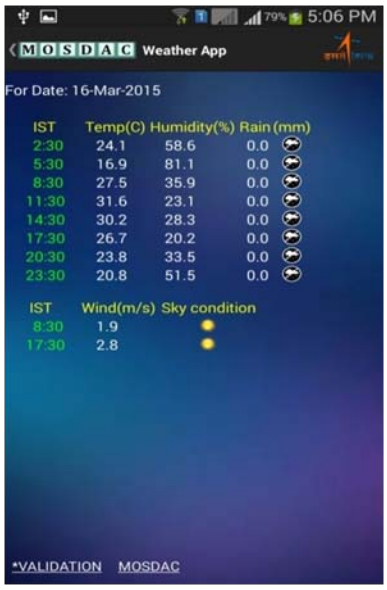

Figure 5: Weather information for next day

for incoming connections, the interface will appear to freeze, and if blocked for long enough will cause an error message dialog to be displayed to the user allowing him/her to force close the application. This is not the experience expected and so an additional thread is created to handle connections. Android provides a class called AsyncTask to make it easier for the developer to handle threading. It makes it possible to publish updates from the background thread to the UI thread, but also contains methods for onPreExecute () and onPostExecute () which are first invoked on the UI thread before and after the thread works on background tasks. This makes it possible to add a loading dialog to show onPreExecute (), and to dismiss when onPostExecute () is called. By handling the workload and waiting for connections in this way it is possible to show a user friendly dialog and avoid possible freezing problems. An inner class for each section which requires a HTTP connection has been created inside the Location activity which is responsible for communicating with the web service and parsing the JSON response. Parameters such as latitude and longitude are sent to the servlet using HTTP POST. The weather information is shown in Fig 4. Weather Information for the next day is shown in Fig. 5.

For disseminating the information related to heavy rainfall, one activity is created named

Figure 6: Heavy rain

Figure 7: Details of Heavy rain

Figure 8: Details of Cloud Burst

heavy_rain. The heavy_rain activity is responsible for connecting to the web service to allow the user to access the text file and obtain the results. But here the problem is that size of heavyrain.txt file is approximately 6 MB in rainy days. There are 3, 63,272 points or rainfall locations are there in the file. So, it is not possible to parse the huge JSON response by using RESTful web service and show it on Google map. Therefore, we have applied the topographic algorithm on each and every location of the file to check whether the point is on land, ocean or mixed. If the location is in the ocean then that particular point is removed from the file. After applying the algorithm, the file size is only 5 KB. By using this algorithm, we have solved the issues we have mentioned in the earlier section such as minimize the response time and memory problem. The reduced file is then convert that file into JSON response and sent to the Android client. The heavy rainfall information is shown in Fig. 6.

Table 1: Battery consumption for different weather applications

Application Name	When GPS is activated	When Notifications are activated	When GPS and Notifications are not active
Accuweather	75.6 J	157.5 J	1.5 J
Weather Channel	81.4 J	40.5 J	11.7 J
Weather	37.2 J	106.6 J	3.2 J
1Weather	33.9 J	18.0 J	4820 mJ
MOSDAC Weather App	32.8 J	18.7 J	816.0 mJ

For disseminating the Nowcast information, two activities are created named UK_HIM and UK_HIM_cloudburst. UK_HIM activity is responsible for connecting to the web service to allow user to query the database and obtain the results. Here, PostgreSQL database is used for querying the results. This activity is showing information related to heavy rainfall and cloudburst over Uttarakhand and Himachal Pradesh. The Nowcast information related to heavy rain and cloudburst is shown in Fig. 7 and Fig. 8.

Dissemination of smoke/fire and fog alerts has been tested over test-setup. This test-setup includes local GIS database and Android emulator. This development can easily be operationalised with same tuning and server related configurations after complete chain is ready.

Table 2: Response Time of Application

Activity	Response Time Test 1 (ms)	Response Time Test 2 (ms)	Response Time Test 3 (ms)
Location Activity	23627	23300	22582
Forecast Activity	12828	12752	12471
Nowcast Heavy Rain	997	995	1047
Nowcast Cloud Burst	1034	985	970
Heavy Rain	987	965	957

Results

Battery consumption

Substitution technique has been adopted for minimizing battery consumption. Substitution incorporates use of other low energy location-sensing mechanisms as compared to GPS. Low energy location-sensing mechanisms are WiFi and cell-id positioning. PowerTutor [11] is used to determine the battery consumption in MOSDAC Weather App and other weather applications. PowerTutor allows user to monitor the real-time power consumption of the phone or monitor the power consumption of applications. Table 1 shows battery consumption when GPS is on, battery consumption when notifications are activated and battery consumption when notification and GPS is not activated in the applications.

Response time

The core components of the MOSDAC weather application have been described in the previous section. Attempts at verifying the performance of the above components experimentally were tested in this section. In these experiments performance of the components are tested using the response time of the application for different activities to provide a good reference framework. Response time of application is shown in Table 2.

Discussion of results

Comparison of MOSDAC weather app with other applications, indicate that proposed application uses less battery than other applications in different scenarios. In the 1st experiment scenario, GPS is enabled for all the applications. MOSDAC Weather App consumed lesser battery than any other applications. Higher battery consumption in other applications could be due to use of heavy widgets in order to make the application attractive but they can drastically reduce battery life. Other applications automatically detect user's location at a fixed interval. But it is better not to detect user's location automatically through GPS. Detect user's location only when user is requesting for weather details.

In the 2nd experiment scenario, Alerts for the notifications are enabled for all the applications. Most of the Android applications use Google Cloud Messaging (GCM) for pushing the notifications to the users. The application server has to register with GCM for enabling the notifications. Therefore, at the fixed interval user's request will be processed by GCM and application server. Every time an application gives notifications, it connects to your network, 3G, Edge or Wifi to get the required notifications. The

more often that happens, the more strain it will put on your battery life. In MOSDAC Weather App, we have not used GCM for notification alerts. We have created Notification service for pushing the notifications. There are no network operations for connecting to GCM in our application. Therefore, Battery consumption is less in our application. In the 3rd experiment scenario, all the applications use lesser battery compared to previous scenarios. Weather Channel and Accuweather consume more battery because these applications uses live wallpapers and heavy widgets.

Response time for location activity is higher than any other activity in this application. The reasons for the same are:

- Getting coordinates for the location in this activity
- Connection with the database, implementation of Haversine formula in the query and fetching the nearest location for the weather details.
- Topographic algorithm is implemented for this activity
- Getting the forecast dates from the database by using query.

Conclusions

MOSDAC weather app is an Android app providing location based weather forecast. It uses a database at central server comprising information about weather stations across India. Our application provides Current weather conditions and detailed 24, 48 and 72 hour forecast, information for heavy rain at each half an hour and Nowcast (Half hourly forecast valid for 6 hours) Information related to heavy rain and cloudburst over Western Himalayan Region. This application will be very helpful to have weather information during any emergency situations. In the development perspective, weather web service is not readily available too. So, developers of the application write code to develop weather web service. MOSDAC Weather App has been compared with other applications with respect to battery consumption. Future services will include fog, smoke and fire alerts. Furthermore, attempts will be made to minimize battery consumption by using mobile usage patterns and machine learning algorithms. This application has been given to Disaster Management Support Programme (DMS) of ISRO and has been made operational on http://www.mosdac.gov.in.●

Notes

[1] Meteorological and Oceanographic Satellite Data Archival Centre(MOSDAC) Web portal and http://mosdac.gov.in/login.jsp

[2] Bhagyasri G. Patel, Vipul K. Dabhi, Utkarsh Tyagi, Pushpalata B. Shah, “A Survey on Location Based Application Development on Android platform.” presented at IEEE International Conference on Advances in Computer Engineering & Applications (ICACEA’15) at Ghaziabad.

[3] http://www.openweathermap.com/forecast

[4] http://weather.weatherbug. com/mobile.html

[5] Android, http://en.wikiped ia.org / wiki/Android_(operating _system)

[6] B. Rajitha, “Performance of Web Services on Smart Phone Platforms.” IOSR Journal of Computer Engineering (IOSR-JCE), 14(5).

[7] R. Aher, N.Gupta, A. Khairnar, K. Thanki, A. Gaidhani, "Bluetooth Based Notification System for Blind People Using JSON Technology." International Conference of Advance Research and Innovation, 2014.

[8] R. Anacleto, N. Luz, and L. Figueiredo. "Personalized sightseeing tours support using mobile devices." Human-computer interaction. Springer Berlin Heidelberg, 2010.

[9] A. Patel, "An efficient location information management system (LIMS) for smartphone applications." 2012.

[10] Haversine Formula http://andrew.hedges.name/experiments/haversine.

[11] http://ziyang.eecs.umich.edu/projects/powertutor/

Heatwave condition monitoring from the Satellite Derived Land Surface Temperature Products

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During the period of April to June, spells of very hot weather occur over certain regions of India. Such spells termed as heatwaves associated with hot sustained temperatures have severe impacts on human mortality, energy supply, ecosystems and economics. Future global warming scenario may result in further increases of such temperature anomalies and heat waves (Meelh & Tebaldi, 2004).

- India Meteorological Department (IMD) has defined heatwave under two categories (Chaudhury et al., 2000). The first category includes places where the normal maximum temperature is more than 40˚C. In such regions if the day temperature exceeds by 3 to 4˚C above the normal for a spell of 3 or more days, it is said to be affected by a heat wave. Similarly when the day temperature is 5˚C or more than the normal for a spell of 3 or more days, severe heat wave condition persists. The second category considers the regions where the normal maximum temperature is 40˚C or less. In these areas, if the day temperature is 5 to 6˚C above the normal for a spell of 3 or more days, then the place is said to be affected by the heatwave. A severe heatwave condition exists when the day temperature exceeds the normal temperature over the place by 6˚C or more.

- Recently during the period of April-May 2015 various parts of India suffered a severe heatwave. Thousands of people died due to this harsh meteorological phenomenon in various states of India. The catastrophic effect of the heatwave persisted for a long time and over a large geographical area across India. Satellite observations can provide a means of detecting the heatwave affected regions.

- Satellite observations have been used to detect the heatwave conditions prevailing over India in recent time corresponding to sec-

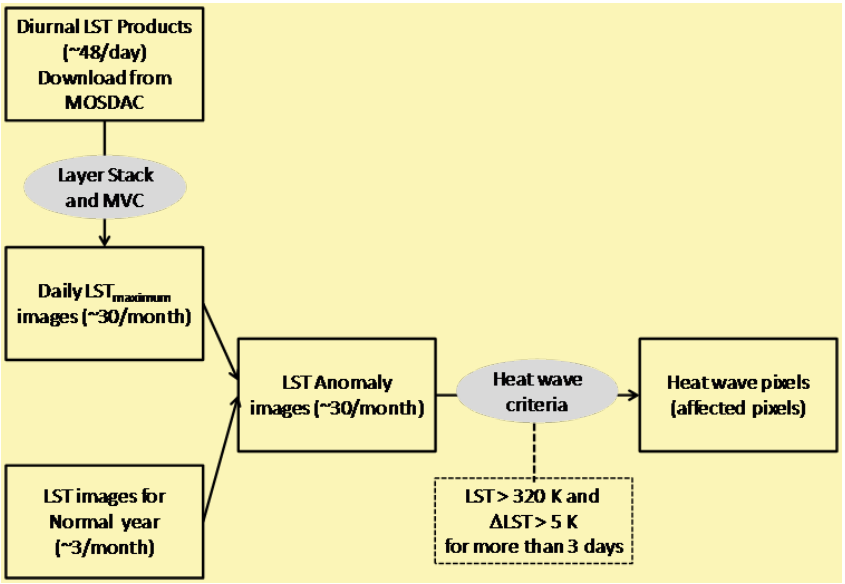

Figure 1: Flowchart showing steps followed to derive heatwave affected pixels from the Kalpana-1 VHRR derived LST images

ond and third week of May of the present year 2015. A new technique has been developed, which uses Kalpana-1 VHRR derived land surface temperature (LST) products (Pandya et al., 2014) available on MOSDAC to detect the heatwave regions over India. Daily maximum LST images were used to generate

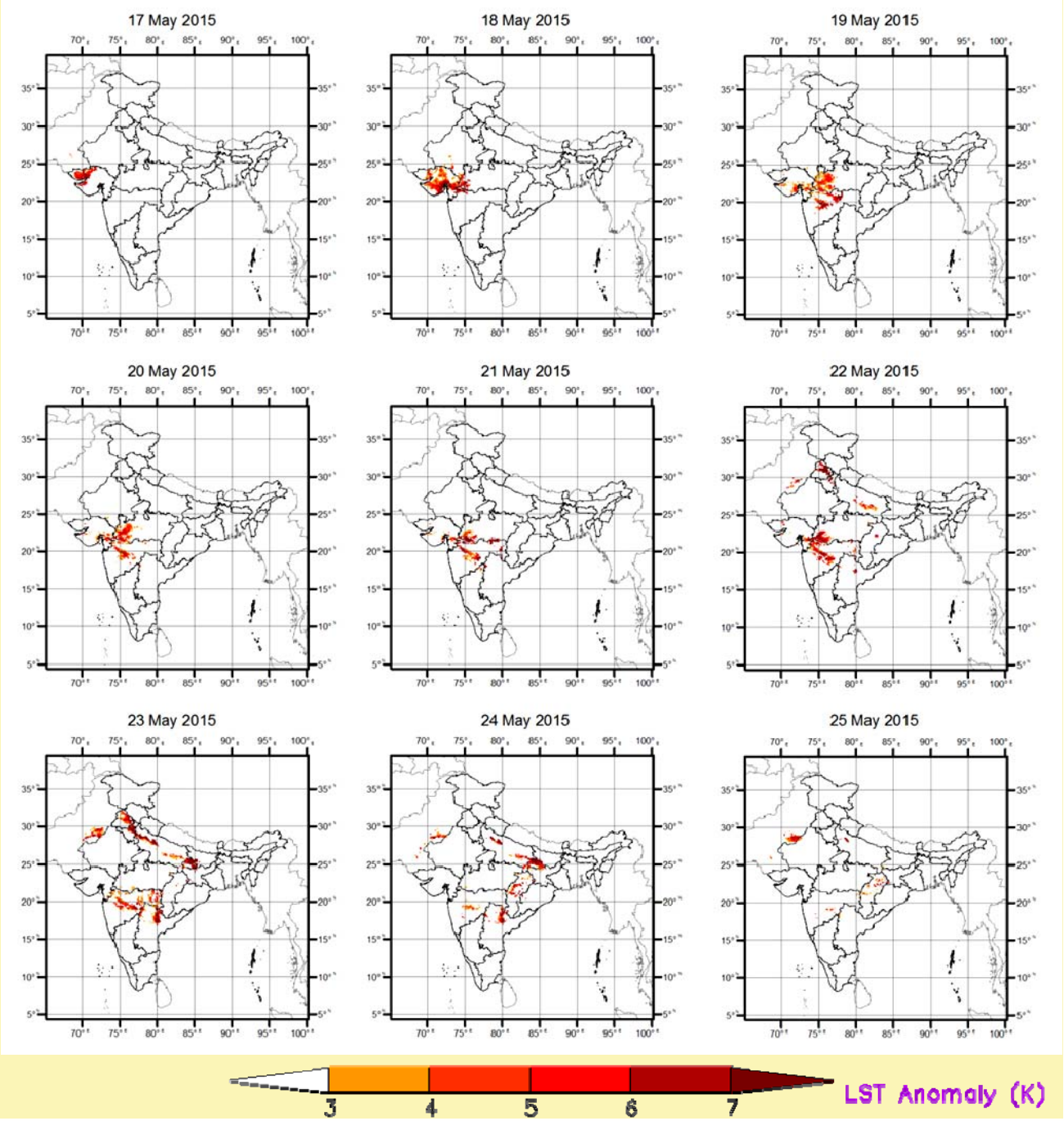

Figure 2: Heatwave affected regions detected through the use of Kalpana-1 derived LST images shown for a period of May 17 to May 25, 2015.

daily LST anomaly (departure of daily maximum LST from the normal maximum LST condition for a particular day) and then heatwave affected locations representing heatwave conditions (pixels that are in heatwave conditions for three consecutive days) are identified as a heatwave product. Figure 1 shows the steps followed in detecting the heatwave from the Kalpana-1 LST products.

- It is to be noted that after deriving the LST anomaly on daily basis, two main criteria were applied to detect the heatwave pixels, (a) the LST value should be greater than 320 K and (b) pixel should have the LST anomaly more than 5 K for 3 consecutive days.
- Figure 2 provides images showing the pixels under heatwave conditions and LST anomaly products for duration of 16 May to 25 May 2015. It can be clearly seen that during the study period various parts of India were under heatwave conditions.
- This technique has successfully captured the heatwave conditions prevailing over India in recent time corresponding to second, third and fourth week of May of 2015. Operational heatwave products using the new technique were generated on daily basis and were posted on MOSDAC. (www.mosdac.gov.in).●

References:

Chaudhury S. K., Gore J. M. and Ray K. C. S. (2000). Impact of heat waves over India. Current Science. 79(2): 153-155.

Meelh G. A., and Tebaldi C. (2004), More intense, more frequent, and longer lasting heat waves in the 21st century, Science, 305, 5686, pp. 994-997.

Pandya M. R., Shah D. B., Trivedi H. J., Darji N. P., Ramakrishnan R., Panigrahy S., Parihar J. S. and Kirankumar A. S. (2014). Retrieval of land surface temperature from the Kalpana-1 VHRR data using a single-channel algorithm and its validation over the Thar desert. ISPRS Journal of Photo Engineering & Remote Sensing. Vol. 94: 160-168.

Corrigenda: ISG Newsletter, Vol. 21, Issue 1-2, pp 18-22.

Article on 'Solar-cum-Geo-Genic Driven Climate Change' by Prof V K Verma (ISG Newsletter. Vol. 21, Issue 1-2, pp 18-22).

Author has pointed out following inadvertent citation / typing errors in the article as follows:

1. Figure 1A & B credits:
   (1) http://en.wikipedia.org/wiki/Indian Plate.
   (2) http://news.softpedia.com/news/A-Chunk-of-India-and-Asia Found -under-Tibet -46626.shtml
2. Figure 2 modified after http://www.earth-policy-org/indicators/C51/temperature_2006;
3. Page 20: corrections in text
   (a) first column line 3rd read '4.0C' instead '40c'
   (b) Third column line 2nd read '1.0' instead of '10'

Editor regrets the omissions/errors.

Geoinformatics Education & Career

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Environment Impact Assessment is generally offered as core subject in Geoinformatics course and Environment Auditing and Environment-Health-Safety which are basically core subjects for Environment Engineering are offered as electives by many institutions conducting Geoinformatics course. EIA, EA and EHS tasks offer great professional challenges and job opportunities for Geoinformatics professionals. Chemical and allied industries mainly located in Gujarat and Maharashtra are contributing ~ 15 % in GDP and considered major point source for air, water and soil pollution in the country. Medium and large industries have their own effluent treatment facilities and SSIs are using services of common effluent treatment plants. Regulatory authority has made it compulsory to carry out regularly

Institutions offering EHS & Pollution Control Program (Partial List)

Institute / University	Geo-informatics Course
Shri Jayachamarajendra College of Engineering, Mysore – Karnataka	M. Tech. (Health, Safety and Environment Engineering)
Institute of Science & Technology for Advanced Studies & Research (ISTAR), V. V. Nagar , Gujarat	Master of Industrial Hygiene and Safety (In collaboration with Cincinnati Uni., USA)
Indian Institute of Environment, Health & Safety Management, Sector-20, Dwarka, New Delhi	P G Diploma in Environment, Health & Safety Management
Centre for Science & Environment, New Delhi	Short Term Certificate Course in EIA
Directorate of Distance Education , Sikkim Manipal University	Diploma in Industrial Pollution Control
Indian Institute of Ecology & Environment, New Delhi	M. Sc. (Pollution Control)
Institute of Management and Technical Studies, Noida, U.P.	M. B. A. (Pollution Control Management)
SVIIT, Patiala – Punjab	M. B. A. (Pollution Control Management)
C M J University, Shillong , Meghalaya	M. Sc. (Pollution Control)
The Global Open University , Nagaland	M. B. A. (Pollution Control Management)
SICART (Established by DST), V. V. Nagar	Short Term course in Environment Monitoring & Analytical Instrumentation Methods
Central Board of Higher Education, Delhi	Diploma in Pollution Control (Vocational)

environment audit and EIA by third party. This calls for preparing large pool of professionals to accomplish huge task of Environment Auditing, Environment Impact Assessment and EHS monitoring. Very few institutions of the country have required lab facilities and skilled human resource for teaching EA, EIA and EHS course. Indian rank in pollution control is very low and Geoinformatics professional with expertise in EIA, EA and EHS can contribute significantly by implementing required compliance measures. Hazardous waste disposal industry alone is worth more than $ 200 million.

Many Institutions / universities are offering Environment courses in India and information about Institutions / universities offering Geoinformatics courses has been provided in previous issues of ISG News Letter. ●

Recent EA, EIA and EHS Job Posting (May-June 2015)

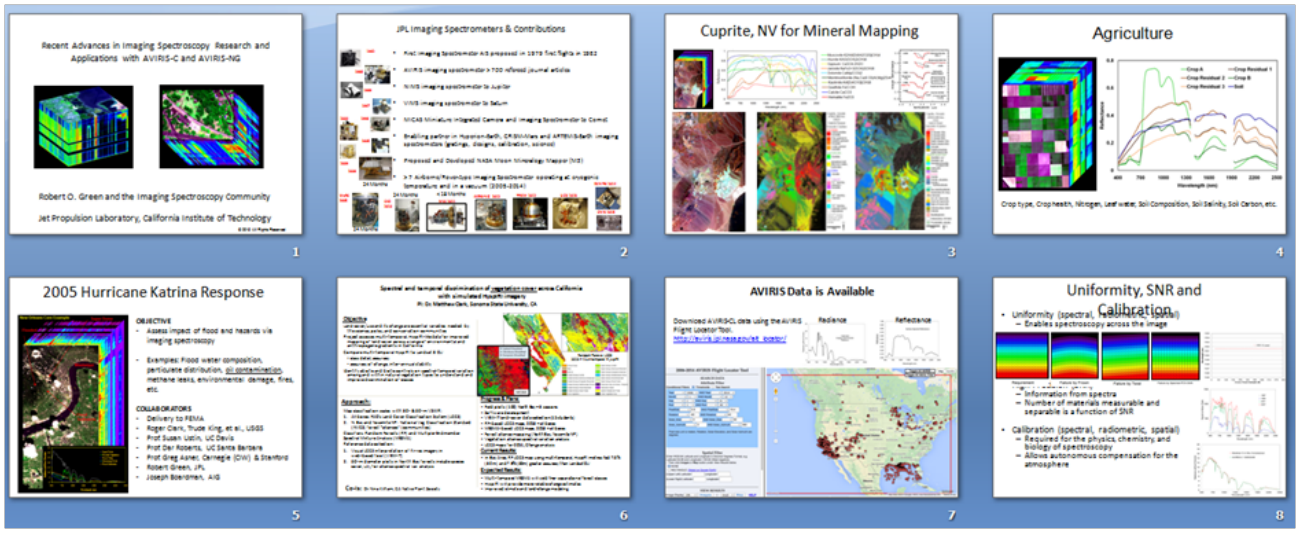
Organization	Designation & Job Requirements
Green India Consulting Pvt. Limited, NCR - Delhi	Senior Manager – Environment EIA Study and Report Writing
AECOM India Pvt. Limited , Gurgaon	Project Consultant Safety Management & Risk Assessment
Harsco India Pvt. Limited , Bellary	Associate Manager – EHS EHS and Safety Systems
Ashkom India Pvt. Limited , Bhopal	Environment Expert EA, EIA and Environment Policy
B2N Management Consulting (P) ltd. Palakkad / Palghat	Deputy Manager – EHS EHS, EA and EIA
MVG HR Solutions Pvt. Limited Gurgaon	ECO Analyst Trainee Water, Soil, Air and Noise Monitoring
Liva Pharmaceuticals, Zydus Cadilla Group, Vadodara	Executive – EHS Safety Program and GPCB Compliance
Envisafe Environment Consultant, Ahmedabad	Environment Scientist
T.E.P.L. - Navi Mumbai	Environment Manager
Ministry of Environment Forest and Climate Change - Delhi	Scientist Experience in EIA of Hazardous Substances.
URS Corporation - Guwahati , Assam	Environmental Specialist
Sahara India Pariwar Ltd., Mumbai	Head – EIA
Green & Clean Solutions Pvt. Ltd. - Bangalore	EIA Consultant

Recent Advances in Imaging Spectroscopy Research and Applications with AVIRIS-C and AVIRIS-NG

Robert O. Green, Jet Propulsion Laboratory, California Institute of Technology, USA

Dr Robert O. Green of Jet Propulsion Laboratory, California Institute of Technology, USA made a very informative and comprehensive presentation on "Recent Advances in Imaging Spectroscopy Research and Applications with AVIRIS-C and AVIRIS-NG" in Vikram Hall at SAC during April 24, 2015.

The event was organized by ISG Ahmedabad chapter. Dr. Green covered historical perspective, instrumentation aspects, Science and Applications Research Examples and gave glimpses of HyspIRI Preparatory Airborne Campaign. The presentation was attended by a full house of members of ISG and colleagues from Space Applications Centre. ●



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News from Chapters

Ahmedabad Chapter

Following activities were undertaken by Ahmedabad Chapter during April-June 2015:

- Talk on "Geomatics for Earth Awareness and Sustainable Development" as a part of Éarth Day'' celebration at AG Teachers High School, Ahmedabad was held on April 22, 2015;
- The chapter organized a popular lecture ''Recent Advances in Imaging Spectroscopy Research and Applications with AVIRIS-C and AVIRIS-NG" by Robert O Green, NASA on May 11, 2015.
- A one-day workshop on "Remote Sensing and GIS" together with eiTRA and IEEE-GRSS was conducted at Umiya Campus, Ahmedabad on May 28, 2015.●

NATIONAL SYMPOSIUM ON

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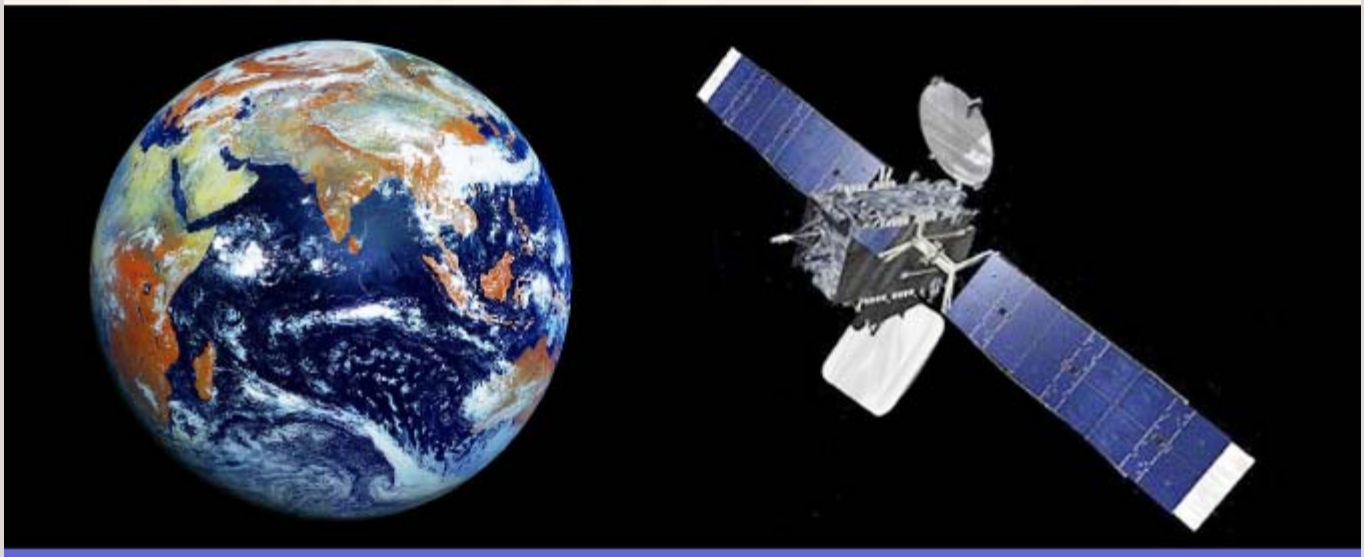
& ANNUAL CONVENTIONS

of

Indian Society of Geomatics & Indian Society of Remote Sensing

December 16-18, 2015, Jaipur, Rajasthan



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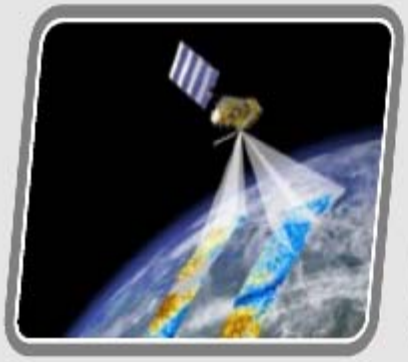
- Smt. Aparna Arora, Chairperson, Rajasthan Pollution Control Board, Jaipur
- Shri Harbans Singh, Director General, GSI, Kolkata
- Prof. V.C. Jha, Director, NATMO, Kolkata
- Dr. P.S. Acharya, CEO, NSDI, New Delhi
- Shri Rajesh Mathur, CEO, ESRI India, New Delhi
- Dr. Satheesh C. Shenoi, Director, INCOIS, Hyderabad
- Dr. A. Senthil Kumar, Director, IIRS, Dehradun
- Dr. Anmol Kumar, Director, FSI, Dehradun
- Shri A. K. Jain, Managing Director, Rajasthan Electronics & Instruments Ltd., Jaipur
- Dr. Alexander P Hansen, Director, German Research Foundation, New Delhi
- Dr. P.K. Pal, Dy. Director, EPSA, SAC, Ahmedabad
- Shri K.S. Parikh, Dy. Director, SNAA, SAC, Ahmedabad
- Dr. Ajai, Chief Editor, JOG & ISRO Prof. SAC, Ahmedabad
- Dr. P.G. Diwakar, Vice-President, ISRS and Dy. Director, NRSC, Hyderabad
- Dr. J.R. Sharma, Chief General Manager, RRSC, NRSC, Hyderabad
- Dr. S.S. Ray, Vice-President, ISRS & Director, MNCFC, New Delhi

Background

Digital India is an initiative of Government of India to integrate the government departments and the people of India by utilising Information Technology. It aims at ensuring that the government services are made available to citizens electronically by reducing paperwork. It is an umbrella programme co-ordinated by the Department of Electronics & Information Technology and implemented by all Government Departments. The Programme is centred on three key areas i.e. Digital Infrastructure as a utility to every citizen, Governance & Services on demand, and Digital Empowerment of citizens. Geomatics plays a key role in providing technology for planning and GIS based decision making and is an integral part of Digital India programme. Space based communication, navigation and earth observation technology developed by the Indian Space Programme, coupled with developments in GIS and information and communication technology plays a major role in achieving the targets of Digital India Programme. The symposium shall focus on various themes related to applications of geomatics in various key areas defined under the Digital India Programme.

The Indian Society of Geomatics (ISG) and the Indian Society of Remote Sensing (ISRS), the two premier professional societies dedicated to promotion and dissemination of GIS & RS in India, conduct annual conventions and joint national symposiums in tandem providing excellent opportunities to the scientists, teachers and students for presenting their research findings, updating their knowledge base and interacting with experts and peers. Continuing this rich tradition, a national symposium on "Geomatics for Digital India", is being organized by ISG and ISRS in the beautiful pink city of Jaipur (Rajasthan) during 16-18 December, 2015 (Wednesday to Friday). This mega event is jointly hosted by J.K. Lakshmipat University Jaipur and Indian Society of Geomatics, Jaipur Chapter.



Symposium Theme & Sub-Themes

The major theme for national Symposium and ISG & ISRS annual conventions is Geomatics for Digital India. The original unpublished research papers covering one or more sub-themes for presentation during symposium from India and abroad are invited:

- Making Digital India: Issues and Challenges
- G - Governance for Village Level Planning
- Spatial Data Infrastructure and Decision Support Systems
- Web and Location based Services (Tele-Geomatics, Mobile GIS)
- Geomatics for Skill Development & Livelihood
- Geomatics for Smart Cities Planning
- Geomatics in e - Commerce
- Advanced Imaging and Processing Technologies (UAV, Sensor Technology, LIDAR, SAR)
- Advances in Photogrammetry and 3-D Mapping
- Navigation and Positioning System
- Infrastructure Development and Planning
- Geospatial Technology for Renewable Energy Resources
- Land Degradation, Desertification and Soil Health
- Sustainable Land Management
- Rejuvenating and Interlinking of Rivers
- Disaster Management & Weather Forecasting
- Coastal and Marine Environment
- Natural Resource Management (Water, Soil, Forest, Agriculture, Horticulture)

It is to be noted that operating language of the conference and tutorials shall be English. Selected papers presented in the national symposium shall be published in a special issue of Journal of Geomatics (ISSN 0976-1330) after the peer-review process.

Abstract Submission

Authors intending to present their original research in national symposium and later get it published in peer-reviewed Journal of Geomatics, they may submit abstracts within 300 words online through the symposium website www.isgjaipur.org. In case you are unable to do the online submission, a paper abstract may be sent per e-mail to isg2015@jklu.edu.in Authors are requested to strictly adhere to the guidelines for abstract preparation available at (www.isgjaipur.org). The last date for submission of on-line abstract is 15th September 2015.

Manuscript of the full length papers as per the prescribed format of the Journal of Geomatics will be included in the soft copy proceedings. Selected good quality papers after the peer-review process shall be published in a special issue of Journal of Geomatics (www.isgindia.org). The last date for submission of full length paper is 15th November 2015.

MODEL MAKING COMPETITION

A special model making competition relevant to "Geomatics for Digital India", for higher secondary school (10+2) students as side event has been scheduled to expose young minds on scientific temperament. There are special prizes/ awards under model making competition category which carry a certificate and cash prize.

Best Paper Awards

The best paper awards in student category as well as in general category will be given to the selected papers presented (Oral/Poster) during the symposium.

Special Awards Lectures & Tutorials

Apart from paper presentations, a number of professionally significant events such as: two popular lectures on the symposium theme, Millennium Lecture of ISG and Vikram Sarabhai Memorial Lecture of ISRS are highlights of the Symposium. Selected lead talks on major themes, plenary presentation by invited experts, and address by annual awardees of ISG & ISRS too are scheduled. Besides professional presentations Annual General Body meetings of both societies ISG & ISRS, Pre-symposium tutorials and several interesting programs such as poster presentation and model making competitions will make the national symposium an enriching and memorable experience to all the attendances.

Pre-Symposium Tutorials

There will be five pre-symposium tutorials during 14-15 December 2015 (Monday & Tuesday) training young professionals and students on the following themes.

Theme 1	Applications of IRNSS system and GPS in Navigation & Mapping	Dr. Ashish Kumar Shukla, SAC/ISRO Ahmedabad
Theme 2	Geoinformatics Skill Development for NGOs & CSR Sectors	Dr. Alok Chaudhary, MPCOST, Bhopal
Theme 3	RISAT Data Processing & Applications	Ms. Arundhati Misra, SAC / ISRO Ahmedabad
Theme 4	Applications of open source GIS	Prof. Anupam K. Singh, JKLU Jaipur
Theme 5	Cloud computing and big data analytics	Dr. M.P. Punia, BIT Mesra and Dr. D. Punia, JKLU, Jaipur

Interested participants may submit their applications online at the symposium website (www.isgjaipur.org) along with CV OR submit by email to the Organising Secretary (isg2015@jklu.edu.in) on or before 15th October 2015. The admission to the tutorials will be based on merit as only 30 candidates will be taken in each tutorials, hence early registration is recommended to the participants. The venue for all above tutorials will be JK Lakshmipat University, Jaipur. Outstation participants are advised to reach tutorial venue in advance so as to avoid last minute hassle. More details on the JK Lakshmipat University and location may be found on the website (www.jklu.edu.in).

Registration Fee

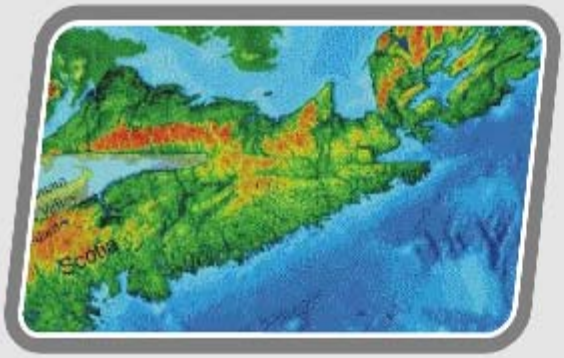
Registration fee for participation in symposium under various categories is as:

Sr. No.	Participant Category	Payment of Registration Fees	
		Upto 31st October 2015	After 31st October 2015
01.	ISG/ISRS members	Rs. 3000	Rs. 3500
02.	Non-members	Rs. 4000	Rs. 4500
03.	Foreign participants	US $150	US $200
04.	Students & Senior Citizens* (Members)	Rs 1500	Rs 2000
05.	Students & Senior Citizens* (Non-Members)	Rs 2000	Rs 2500
06.	Accompanying persons	Rs 1000	Rs 1500
07.	Pre-symposium Tutorials	Rs 2000	Rs 2500

Participations interested to register for pre-symposium tutorial (during 14-15 December) and symposium are entitled for Rs. 500/- discount on the gross registration fees if paid for both the events together. Bonafide students making oral/poster presentation in the Symposium shall be refunded registration fee and to-and-fro fare equivalent to rail sleeper class by shortest route.

The registration fees may be remitted online through direct bank transfer to Account number 612-7239-8415 of State Bank of Bikaner and Jaipur (SBBJ), PWD Complex branch (IFSC: SBBJ0010820; MICR: 302003051). Please send a copy of the bank receipt by email isg2015@jklu.edu.in along with full details of remitter to the Organizing Secretary.

In absence of online remittance option, registration fees may also be sent by Registered Post/ Speed Post (no courier) through bank draft drawn in favour of ISG Jaipur Chapter payable at Jaipur. It is to be noted that registration fees covers symposium kit including symposium souvenir/ proceedings and working lunches. Accommodation shall be arranged in Hotels, JKLU Hostel and available Guest houses on payment basis as indicated on the website (www.isgjaipur.org).



Industry Participation

A special session for industries, NGOs and entrepreneurs to showcase their products, new technologies and services is planned. Industries and institutions willing to make use of this opportunity need to register by paying Rs 20,000/- for a 15-minutes presentation. Industry participation includes one complimentary registration.

Industrial Exhibition

An exhibition of industrial products/services from various manufacturers will be held at conference venue. The exhibition is envisaged to provide a forum for interaction between the participants and service organizations. Manufacturers of hardware, software and service provider for space technology, defence manufacturer, remote sensing, photogrammetry, GIS, GPS, LBS, satellite communication and navigation are invited to participate in the exhibition.

Interested exhibitors may book a stall (measuring 3m x 3m) or multiple units of exhibitions space @ Rs 40,000/- per single unit. There will be two complimentary registrations per unit booked. Interested industrial manufacturers/ companies may contact the organizing secretary for queries.

Important Dates to Remember

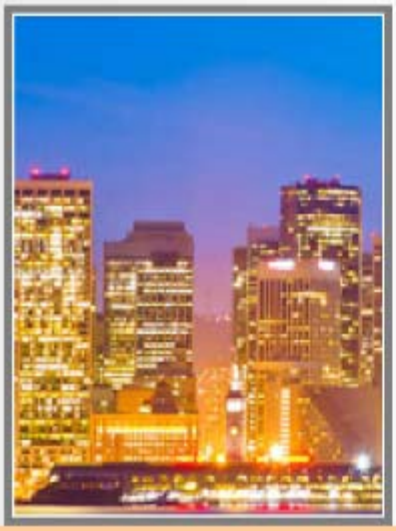
Participants are requested to remember following dates:

Release of First Circular	June 15, 2015
Last Date for Abstract Submission	September 15, 2015
Intimation of Acceptance of Abstracts	September 30, 2015
Last Date for Submission of Tutorial Applications	October 15, 2015
Intimation of Admission into Tutorials	October 31, 2015
Registration for Commercial Presentations	October 31, 2015
Registration for Industrial Exhibition	October 31, 2015
Last Date for Registration for Tutorials	November 15, 2015
Submission of Full Paper	November 15, 2015
Last Date for Guest House/Hostel booking	November 30, 2015
Pre-Symposium Tutorials	December 14-15, 2015
National Symposium	December 16-18, 2015

Payment

All payments towards the registration fee / exhibition charges / company presentation shall be remitted through online bank transfer or demand draft in favour of ISG Jaipur Chapter payable at Jaipur, along with the duly filled registration form.

The registration fees may be remitted online through direct bank transfer to Account number 612-7239-8415 of State Bank of Bikaner and Jaipur (SBBJ), PWD Complex branch (IFSC: SBBJ0010820; MICR: 302003051). Please send a copy of the bank receipt by e - mail to isg2015@jklu.edu.in along with full details of remitter to the Organizing Secretary.



About the Symposium Organizers

Indian Society of Geomatics

Indian Society of Geomatics (ISG), established in 1993, has been promoting interactions among professionals for advancement of remote sensing & GIS technologies and applications through symposia and workshops that it frequently conducts, besides publishing the Journal of Geomatics and ISG Newsletters at regular intervals. With more than 1700 members and 20 Regional Chapters, ISG is growing from strength to strength. The ISG-Jaipur Chapter started in 2014 with 20 life members and many student members is the 19th of such Chapters and latest addition to the ISG family actively conducting awareness and expert programmes in the field of Geomatics in the region. Every year, ISG confers several awards during the Society's annual conventions through nomination. Further details are available at ISG website (www.isgindia.org).

Indian Society of Remote Sensing

Indian Society of Remote Sensing (ISRS) established in 1969 as Indian Society of Photo-interpretation is the pioneering professional society dedicated to popularization and dissemination of RS technology and applications through seminars/symposia and a number of publications such as bulletins, proceedings and the internationally reputed Journal of Indian Society of Remote Sensing. With more than 4500 members and 24 regional chapters, ISRS is now a valued member of the International Society of Photogrammetry and Remote Sensing (ISPRS) and Asian Association of Remote Sensing (AARS). ISRS confers a number of awards during the Society's annual conventions, the details of which are available at www.isrsindia.in

JK Lakshmipat University

JK Lakshmipat University Jaipur has been established under Rajasthan private university act and covered under section 2(f) of University Grant Commission Act 1956. Research and innovation has been in the forefront of JKLU and offers programs in Engineering & Technology and Management. University is established by Padma Bhushan Hari Shankar Singhania former President-FICCI, President JK Organization, and promoted by one of the most respected Indian corporate house JK Organisation viz. JK Tyre and Industries Ltd, JK Paper Ltd, JK Lakshmi Cement Ltd, JK Fenner Ltd, Umang Dairy Ltd, JK Soft Ltd and Pushpavati Singhania Research Institute & Hospital. University is growing under the able leadership of Dr Devi Singh former Director IIM Lucknow, Director MDI Gurgaon as Vice Chancellor.

About Pink City Jaipur

Pink city Jaipur was one of the strong holds of a clan of rulers whose three hill forts and series of palaces are important attractions. Pink city is one of the country's most popular tourism spots, a confluence of a rich heritage and vibrant present. The travelers have always taken a keen interest in the culture of Jaipur. Against the backdrop of breath taking monuments of legendary Rajput royalty, today towering edifices of the new-age multiplexes, modern residential and commercial complexes, special economic zone and MNC offices are the hallmark of Jaipur city.

One of the most significant transformations of the city has been the development of a modern hub of higher learning, with a host of universities and institutions coming up fast. This gives today's Jaipur a youthful character, with an atmosphere buzzing with learning and new age knowledge streams.

Being an important tourist destination, Jaipur is well connected through road, rail and air. Jaipur is situated 260-km from Delhi and 240-km from Agra through road and forms an important part of golden triangle tour (Delhi-Jaipur-Agra).

Weather during December at Jaipur is pleasant with clear sky in general and maximum and minimum temperatures range from 21 – 26 degree celsius and 10-13 degree celsius respectively. Accordingly, woolen clothes are recommended.

Post-Symposium Tour (Pink City Jaipur)

A post-symposium one-day excursion tour to Pink city Jaipur is planned to be organized if sufficient number of interested delegates register for the tour. Visit to a number of forts and palaces such as Hawa Mahal, City Palace museum, Jantar Mantar, Amber Fort and Chokhi Dhani is tentatively planned. Details are available on the Symposium website.

Organizing Committee

Chairman: Prof. Devi Singh, Vice Chancellor, JKLU, Jaipur

Organizing Secretary: Prof. (Dr. - Ing) Anupam Kumar Singh, Chairman, ISG-JC & Director-IET,, JKLU Jaipur

Joint Organizing Secretary: Mr. Kamal K Mishra, Secretary, ISG - JC & State Nodal Officer (GIS & IT) , PWD, Govt. of Rajasthan, Jaipur

Treasurer: Prof Vinod Vishwakarma, Treasurer, ISG-JC, JKLU, Jaipur

Members:

- Dr. A. S. Rajawat, Vice - President, ISG & Head, GSD, SAC, Ahmedabad
- Shri N.S. Mehta, Secretary, ISG, Ahmedabad
- Dr. R. Nagaraja, Jt. Secretary, ISG and GD, NDC, NRSC, Hyderabad
- Dr. Sarvesh Palria, Member, ISG-EC, MDS University, Ajmer
- Dr. Rohit Goyal, Professor, MNIT, Jaipur
- Dr. Rakesh C Vaishya MNNIT, Allahabad
- Dr. S K Katiyar, MANIT Bhopal
- Dr Devendra K Punia, Professor, JKLU, Jaipur
- Dr. Pushpendra Singh, Assoc. Professor, JKLU, Jaipur
- Prof. Amit Kumar, Asst Professor, JKLU, Jaipur
- Shri Pankaj Dhemla, Poornima Group, Jaipur
- Ms. Richa Singh, University of Rajasthan, Jaipur
- Shri R.P. Dubey, Editor ISG - Newsletter
- Dr. S.P. Aggrawal, Secretary, ISRS, IIRS, Dehradun
- Shri K.P. Bharucha, Treasurer, ISG, SAC, Ahmedabad
- Shri K.L.N. Sastry, Member, ISG-EC, SAC, Ahmedabad
- Dr. M. P. Punia, Professor, BIT Mesra, Jaipur
- Dr. Sandeep S. Sengar, Assoc. Professor, JKLU, Jaipur
- Dr Ravi Kumar Ganti, Asst Professor, JKLU, Jaipur
- Shri Manu Sharma, NIRD Centre, Jaipur
- Mr. Rajesh S Chauhan, Lecturer, Balaji College, Jaipur
- Ms Kritika Sharma, GIS Analyst, Govt. of Rajasthan, Jaipur

JK LAKSHMIPAT UNIVERSITY

ज्ञानम् अमृतम्

Education for Life

ADDRESS FOR CORRESPONDENCE:

Prof. Dr. - Ing. Anupam Kumar Singh

Organizing Secretary ISG2015 & Chairman ISG Jaipur Chapter
Institute of Engineering & Technology, JK Lakshmipat University

JK LAKSHMIPAT UNIVERSITY

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