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Geospatial data sharing, online spatial analysis and processing of Indian Biodiversity data in Internet GIS domain − A case study for raster based online geo-processing

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Abstract. National Biodiversity Characterization at Landscape Level, a project jointly sponsored by Department of Biotechnology and Department of Space, was implemented to identify and map the potential biodiversity rich areas in India. This project has generated spatial information at three levels viz. Satellite based primary information (Vegetation Type map, spatial locations of road & village, Fire occurrence); geospatially derived or modelled information (Disturbance Index, Fragmentation, Biological Richness) and geospatially referenced field samples plots. The study provides information of high disturbance and high biological richness areas suggesting future management strategies and formulating action plans. The study has generated for the first time baseline database in India which will be a valuable input towards climate change study in the Indian Subcontinent.

The spatial data generated during the study is organized as central data repository in Geo-RDBMS environment using PostgreSQL and POSTGIS. The raster and vector data is published as OGC WMS and WFS standard for development of web base geoinformation system using Service Oriented Architecture (SOA). The WMS and WFS based system allows geo-visualization, online query and map outputs generation based on user request and response. This is a typical mashup architecture based geo-information system which allows access to remote web services like ISRO Bhuvan, Openstreet map, Google map etc., with overlay on Biodiversity data for effective study on Bio-resources.

The spatial queries and analysis with vector data is achieved through SQL queries on POSTGIS and WFS-T operations. But the most important challenge is to develop a system for online raster based geo-spatial analysis and processing based on user defined Area of Interest (AOI) for large raster data sets. The map data of this study contains approximately 20 GB of size for each data layer which are five in number. An attempt has been to develop system using python, PostGIS and PHP for raster data analysis over the web for Biodiversity conservation and prioritization. The developed system takes inputs from users as WKT, Openlayer based Polygon geometry and Shape file upload as AOI to perform raster based operation using Python and GDAL/OGR. The intermediate products are stored in temporary files

and tables which generate XML outputs for web representation. The raster operations like clip-zip-ship, class wise area statistics, single to multi-layer operations, diagrammatic representation and other geo-statistical analysis are performed. This is indigenous geospatial data processing engine developed using Open system architecture for spatial analysis of Biodiversity data sets in Internet GIS environment. The performance of this applications in multi-user environment like Internet domain is another challenging task which is addressed by fine tuning the source code, server hardening, spatial indexing and running the process in load balance mode. The developed system is hosted in Internet domain (http://bis.iirs.gov.in) for user access.

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