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Online Command Are Water Resource Management System

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Abstract

Water is an important, but often ignored element in sustainable development by now it has been clear that urgent action is needed to avoid global water crisis. Water resource management is the activity of planning, developing, distributing and managing the optimum use of water resources. Successful management of water resources requires accurate knowledge of their resource distribution to meet up the competing demands and mechanisms to make good decisions using advanced recent technologies.Towards evolving comprehensive management plan in suitable conservation and utilization of water resources space technology plays a crucial role in managing country's available water resources. Systematic approaches involving judicious combination of conventional server side scripting programming and remote sensing techniques pave way for achieving optimum planning and operational of water resources projects. new methodologies and 24/7 accessible system need to be built, these by reducing the dependency on complex infrastructure an specialist domain Open source web GIS systems have proven their rich in application of server side scripting and easy to use client application tools. Present study and implementation aims to provide wizard based or easily driven tools online for command area management practices. In this large endeavour modules for handling remote sensing data, online raster processing, statistics and indices generation will be developed.

Keywords*: Water, Management system, Technology, GIS.*

1. Introduction

Command Area water resource management system implemented with the main objective of reducing the gap between irrigation water potential created and that utilized. The system aims at enhancing agricultural production and productivity in irrigated commands by judicious and equitable distribution of the available irrigation water This helps in rotational water supply in judicious manner to each field to achieve higher production prevents water logging in the crop field by which higher productivity One of the best known applications of remote sensing to water resources is the inventorying of surface water bodies, particularly streams, lakes, marshes and bogs, within a given region. The area covered by open water is readily delineated by various remote sensing techniques because of the particular radiation characteristics of water. A major factor in increasing agricultural production is development of irrigation practices, which in turn is essential for economic development of the country. In most of the Command Areas (CA) in India, the present Scenario demands a more efficient water management program. The Command Areas in India suffer from problems of inadequate and unreliable water supply, wide gap between created and utilized irrigation potential, temporal imbalances of water demand and supply, excessive seepage loss and rise of groundwater leading to water logging and salinity problems. Periodic satellite monitoring of Irrigation Command Areas has helped in evaluating increase in irrigation utilization and improvement in agricultural productivity over a period of time. Remote Sensing methods have been successfully applied in delineating saline and alkaline soils and detecting areas having ineffective water management practices leading to decrease in crop yield. Remote Sensing techniques

have been successfully applied for performance evaluation of particular command area. During this study, IRS-1C Linear Imaging and Self Scanning-III (LISS-III) and Wide Field Sensor (WiFS) data were used for calculation of Normalized Difference Water Index (NDWI), Water Use Efficiency (WUE) for characterization of the Irrigation Command Area.

1.1 Generation of Normalized Difference Water Index Algorithm

step1: Take the input as satellite data
step2: Input is in the form of shape files
step3: Take the B, G, R, NIR, SWIR bands
step4: Apply the formula for calculating the NDWI values
step5: NDWI=NIR-SWIR/NIR+SWIR
step6: values of NDWI is in the range of -1 to +1
step7: If the NDWI value is >0 are assume to represent water surface
step8: The NDWI value is <0 (or) equal to zero assumed as non water surface
step9: After calculating the NDWI values we find the crop health n water supply sufficient to that area or not.
step10: Prepare the statistics based on index values
step11: Clip the NDWI'S from command area
step12: Time series data analysis for preparing index for NDWI
step13: Using time series data identify the potential area

1.2 Normalized Difference Water Index

Remote sensing techniques provide important capabilities to map surface water features and monitor the dynamics of surface water. Water body information is very important for urban planning and environment improving. NDWI is useful in many remote sensing applications like Crop health monitoring, land/water boarding mapping, inland water discrimination from open sea water bodies. The NDWI is a new method that has been developed primarily to delineate open water features and to enhance their presence in remotely sensed digital imagery while simultaneously eliminating soil and terrestrial vegetation features. Rapid and efficient estimation of open water surface area in such digital imagery can then be made using image processing software. Additionally, the NDWI may prove to be a useful tool in the study of water quality issues, particularly with regard to turbidity estimations.

NDWI (Normalized Difference Water Index) is developed by Gao (1996) to enhance the water related features of the landscapes. This index uses the near infrared (NIR) and the short wave infra red (SWIR) bands, where SWIR is the shorter wavelength region (1.2 to 1.8 mm), NDWI, an acronym Normalized Difference Water Index is an indicators of the near-infrared (NIR) and Shortwave Infrared (SWIR) spectral reflectance band.

2. Mathematical Model

NDWI (Normalized Difference Water Index) is developed by Gao (1996) to enhance the water related features of the landscapes. Calculating the NDWI is the one of the step in the Generation of Normalized Difference Water Index Algorithm. NDWI computed using the near-Infrared (NIR) and short wave infrared (SWIR), NDWI value ranges from -1 to 1. Mathematical formula for computing NDWI values

$$\mathbf{NDWI} = \frac{\mathbf{NIR-SWIR}}{\mathbf{NIR+SWIR}}$$

Where

NDWI =Normalized Difference Water Index

NIR = Near Infrared, SWIR =Short wave infrared

3. System Architecture

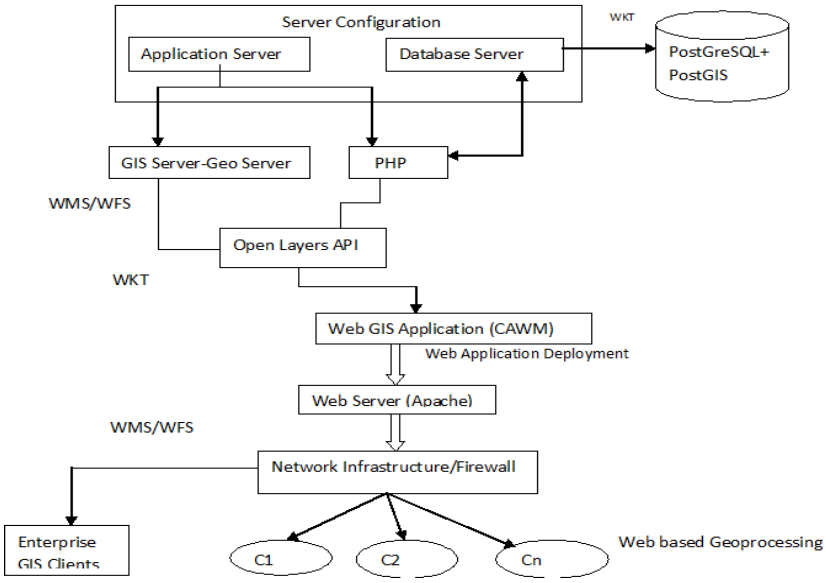

Figure 1: System Architecture Of The Command Are Water Resource Management System

4. Results and Discussion

Water resource can be identified using online water resource management system as a web application, IRS-P6, Land sat data is used as it is providing special bands for retrieving the water bodies. The major problem of providing real time analysis of water resource availability is to track the data about availability of water bodies, soil moisture and Runoff. A webbased application for Online Command area water resource management system was developed which is useful for water availability and how much of water is required for crop area. It is useful for increasing agriculture rate for that we can developed a 24/7 accessible decision support system.

5. Conclusion

Water as a resource is essential to support human existence. The availability of fresh water for human use has been declining over the years, due to some human activity and the demand of growing population is increasing. In this situation, there is an urgent need to monitor and obtain a better

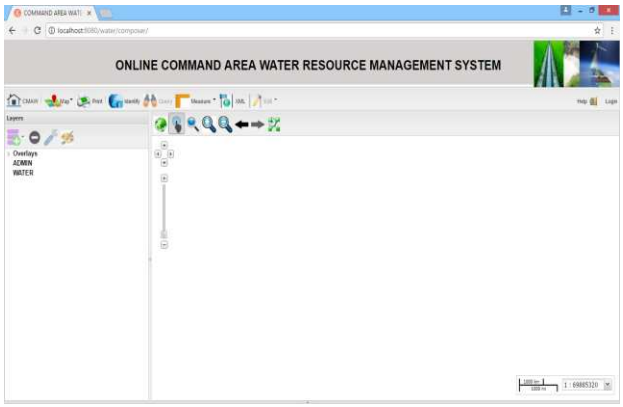

Figure 2 : Front GUI of Online Command Area Water Resource Management System

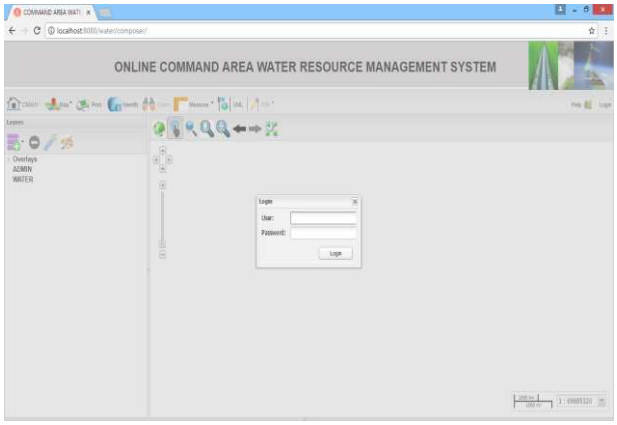

Figure 3 : Login Page of Online Command Area Water Resource Management System

Understanding of its use, which will provide information that can assist towards the development of effective water management strategies and infrastructures. This can be of crucial importance, particularly to regions on which the amount of water available is limited. The spatial water availability maps can be generated. Decisions can be made regarding the sustainable management of water resources in the identified regions. With the rising pressure on natural resources due to the increasing human population, remote sensing and GIS can be used to manage these precious limited resources in an effective and efficient manner. Geospatial information are quite useful in the identification and analysis of factors that affect the utilization of these resources. Hence, with the detailed understanding of these factors, sound decisions can be arrived at that will ensure the sustainable use of natural resources to meet the needs of the current as well as future generations.

The development of a 24/7 accessible Geospatial Web Portal is proposed as the best solution to Water resource Information and Management. The Web Portal built around a hydrological data model synthesizes data from diverse sources describing the water resource, provides visualization tools and link to externally modeled results. This Geospatial Web Portal would provide a robust platform for the planning, execution and monitoring of status of water resources. The present study demonstrates usage of remote sensing data in detecting the water resources and monitoring the water levels in particular regions using time series data. In future, it is necessary to carry forward such study to identify the role of water resource management in planning, developing, distributing and managing the optimum use of water resources.

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