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Notice for the PhD Viva Voce Examination

Mr Bijeesh T V (Registration Number: 1670076), PhD scholar at the School of Engineering and Technology, CHRIST (Deemed to be University), Bangalore will defend his PhD thesis at the public viva-voce examination on Friday, 24 March, 2023 at 10.00 am in the CDI Conference Room, Block V, Bangalore Kengeri Campus, Bengaluru 560074.

Title of the Thesis	**:**	**Design and Development of a Generic Framework for Surface Water Delineation and Monitoring Using a Hybrid Level Set Algorithm on Landsat Multi-Spectral Data**
Discipline	**:**	**Computer Science and Engineering**
External Examiner (Outside Karnataka)	**:**	**Dr J Selvin Paul Peter** Associate Professor Department of Computing Technologies SRM Institute of Science and Technology SRM Nagar, Potheri Chennai - 603203 Tamil Nadu
External Examiner (Within Karnataka)	**:**	**Dr Ramesh K B** Associate Professor Department of Electronics and Instrumentation Engineering R V College of Engineering Mysore Road Bengaluru - 560059 Karnataka
Supervisor	**:**	**Dr Narasimha Murthy K N** Professor Department of Civil Engineering School of Engineering and Technology CHRIST (Deemed to be University) Bengaluru – 560074 Karnataka

The members of the Research Advisory Committee of the scholar, faculty members of the Department and the School, interested experts and research scholars of all the branches of research are cordially invited to attend this open viva.

Registrar

Place: Bengaluru
Date: 20 March 2023

ABSTRACT

Surface water bodies are critical to the existence and sustenance of civilizations. Water bodies in urban cities across the world have undergone drastic decline in quality and quantity. This has been the result of a multitude of reasons like increase in population, urbanization and encroachment. Monitoring changes to water bodies is a necessary requirement in devising strategies to conserve them. This thesis proposes a generic framework for monitoring and forecasting changes in the surface area of lakes using a hybrid level set algorithm for water body delineation followed by a double exponential smoothing model for forecasting. The proposed hybrid level set algorithm combines the advantages of edge based and region based level sets. An edge detection term is introduced into the formulation which improves the delineation accuracy by forcing the level set evolution to stop at the boundaries of the region of interest. The performance of the algorithm was analyzed using Pearson's Correlation Co-efficient (PCC), Structural Similarity Index (SSIM) and Dice Similarity index and found to have superior performance compared to established methods in the literature.

The study uses Landsat multi-spectral data for the last 30 years to build the proposed framework for forecasting the changes in the surface area of water bodies. The experiments were conducted for nine lakes in Bangalore, a fast growing city in India, and a steady decrease in the surface area is observed for most of the lakes that were studied. The city's renovation attempts have also seen that the some of the lakes are sustaining the rapid urbanization. The proposed forecast model has yielded acceptable results with an average error of 0.22% and a correlation coefficient of 0.94 between the actual surface area and the forecasted surface area. The framework can be customized in the future to study specific water bodies by plugging in external parameters to improve the forecasting accuracy.

Keywords*: Change detection, Landsat image, Multi-spectral data, Hybrid level set, Double exponential smoothing*

Publications:

1. **Bijeesh T. V.**, and Narasimhamurthy KN. "A Hybrid Level Set Based Approach for Surface Water Delineation using Landsat-8 Multispectral Images." Engineering Letters, vol. 29, no. 2, 2021.
2. **Bijeesh, T. V**., and K. N. Narasimhamurthy. "Surface water detection and delineation using remote sensing images: a review of methods and algorithms." Sustainable Water Resources Management, vol. 6, no. 4, pp. 1-23, 2020.
3. **Bijeesh T.V.** Narasimhamurthy K.N, "Evaluation of Machine Learning Algorithms for Surface Water Delineation Using Landsat 8 Images", Journal of Advanced Research in Dynamical and Control Systems, vol. 12, no. 3, pp. 207-216, 2020.