Digital Twin Model Creation of Juja River Using Digital Image Processing Techniques

Course: ICS 2412: Digital Image Processing

Total Marks: 50

Project Overview: This project involves utilizing comprehensive digital image processing techniques to create an accurate digital twin model of the Juja River at JKUAT. Students will employ a series of steps, from image acquisition to modelling, using images of the Juja River to simulate its physical and ecological characteristics digitally.

Subsections and Marks Allocation:

1. **Image Acquisition [5 marks]**
    - Capture or collect digital images of Juja River covering various sections and environmental conditions.
2. **Pre-processing [10 marks]**
    - Apply necessary pre-processing techniques such as noise reduction, contrast enhancement, and color correction to prepare images for analysis.
3. **Feature Extraction [10 marks]**
    - Identify and extract significant features from the pre-processed images that are relevant to the river's digital twin model, such as river boundaries, water flow patterns, and vegetation cover.
4. **Model Development [15 marks]**
    - Utilize extracted features to develop a comprehensive digital twin model of Juja River. This model should reflect the physical and ecological attributes of the river, incorporating dynamics such as water flow and quality, vegetation, and surrounding topography.
5. **Analysis and Interpretation [5 marks]**
    - Analyze the digital twin model to assess the river's current state, identify potential environmental concerns, and propose sustainable management strategies.
6. **Report Writing and Presentation [5 marks]**
    - Compile a detailed project report documenting methodologies, analyses, findings, and recommendations. Include visual representations of the digital twin model and its analyses. Present the project findings in a structured presentation.

Project Deliverables:

- A comprehensive report detailing each project phase, methodologies, findings, and recommendations.
- A digital twin model of Juja River.
- A presentation summarizing the project outcomes and implications for river management and sustainability.

Submission Deadline: [March 15, 2024]