ASSIGNMENT

COURSE INFORMATION

Course Code: CSE427
Course Title: Digital Image Processing
Topic: Paddy Detection using Image Processing in Bangladesh

SUBMITTED TO

Teacher's Name: Dr. Naznin Sultana
Designation: Associate Professor
Department: Computer Science and Engineering

Daffodil International University

SUBMITTED BY

Student Name: ID: Sujoy Saha
212-15-4234
Section: 59_A
Department: Computer Science and Engineering

Daffodil International University

Date of submission: April 16, 2025

1. Introduction

Agriculture is a critical sector in Bangladesh, significantly contributing to GDP and employment. Among various crops, paddy is the most important due to its status as the staple food for the majority of the population. Despite its importance, monitoring paddy fields remains a manual process, which is inefficient and susceptible to human error. This project explores the use of image processing techniques to automate paddy field detection, thereby aiding farmers, researchers, and policymakers.

2. Problem Statement and Objective

The main challenge in paddy field management is the absence of an automated system capable of identifying and analyzing fields on a large scale. The objective of this project is to develop a system that utilizes image processing techniques to detect paddy fields from satellite and drone imagery. This solution aims to improve decision-making in agriculture.

3. Data Collection

Images were sourced from high-resolution satellite imagery and drone footage. These sources were chosen for their accessibility and ability to capture large areas. Smartphones can also serve as viable image sources, but the focus here was on satellite and drone data.

4. Image Processing Techniques

The process began with preprocessing techniques like noise reduction and contrast enhancement. Segmentation was then applied to isolate paddy fields based on color and texture. Feature extraction focused on:

- Greenness using NDVI (Normalized Difference Vegetation Index)
- Texture using GLCM (Gray Level Co-occurrence Matrix)

5. Algorithms and Tools

Machine learning and deep learning models were employed for detection.
These included:
- Support Vector Machine (SVM)
- Random Forest
- Convolutional Neural Networks (CNNs)

Software and tools used in the project:
- Python
- OpenCV
- TensorFlow
- GIS software for mapping

6. Workflow Overview

The workflow involved:
1. Collecting satellite and drone images
2. Preprocessing and enhancing image quality
3. Segmenting and extracting features
4. Applying detection algorithms
5. Analyzing results

7. Result Analysis

The accuracy of various models was recorded as follows:

Model	Accuracy
MobileNet	98.72%
VGG16	98.74%
DenseNet121	86.16%
NASANetMobile	67.92%
Xception	98.74%

8. Challenges

Key challenges encountered included:

- Cloud cover during the monsoon season, affecting image clarity
- Difficulty distinguishing paddy from visually similar crops like wheat and jute
- Limited availability of labeled training data specific to Bangladeshi agriculture

9. Applications and Future Scope

This system can have broad applications, including:

- Real-time crop monitoring
- Yield estimation
- Damage assessment from floods or droughts
- Support for government food planning

Future goals include developing a web application to provide farmers with real-time updates and expanding the model to detect multiple crop types.

10. Conclusion

Automating paddy detection through image processing offers significant benefits for agriculture in Bangladesh. With high accuracy from deep learning models and future plans for expansion, this project lays the foundation for smart agricultural solutions in the region.