

PREFACE

As a part of Bachelor of Science in Information Technology curriculum and to gain practical knowledge in the field of information technology, we were required to make a project on **“Mangroves Loss mapping using Remote Sensing and GIS of the Mumbai Region”**. The basic objective behind this project was to build up the concept of remote sensing and Geographical Information System and also to generate knowledge about software amongst us.

In this project we have used python programming language as a base. Including satellite images made our project even more interactive. Doing this project helped us to enhance our knowledge about remote sensing and QGIS software. Through this project we got to know about the importance of teamwork and role of devotion towards work.

ACKNOWLEDGEMENT

We would like to express our special thanks of gratitude to the professor **Mr. Anand Upadhyay** sir who gave us the golden opportunity to do this project on the topic “**Mangroves Loss mapping using Remote Sensing and GIS of the Mumbai Region**”. It would not have been possible without the kind support and help of many individuals. We would like to extend our sincere thanks to all of them. We are highly indebted to Mr. Anand Upadhyay sir for his guidance and constant supervision as well as for providing necessary information regarding the project and also for his support in completing the project. Our thanks and appreciations also go to my colleague in developing the project in the given time frame and people who have willingly helped us out with their abilities. We take this opportunity to highlight the valuable contribution of Bachelor of Science in Information Technology coordinator **Prof. Mr. Santosh Singh** and all my professors, my colleagues and especially my parents who have always supported and encouraged, the success of this project of large extent is also dedication to them too.

TABLE OF CONTENTS

Preface.....	I
Acknowledgement.....	II
Table of Contents.....	III
List of Figures.....	VI
List of Tables.....	VII
List of abbreviation.....	VIII
Abstract.....	IX
1. Introduction.....	1
1.1 Remote Sensing.....	1
1.2 Types of Remote Sensing.....	2
1.3 Types of sensors in IRS-P6.....	3
1.3.1 High-Resolution Linear Imaging Self-Scanner (LISS-IV).....	3
1.3.2 Medium Resolution Linear Imaging Self-Scanner (LISS-III).....	3
1.3.3 Advanced Wide Field Sensor (AWiFS).....	4
1.4 Geographical Information System	4
2. Objective.....	5
2.1 Research Problems.....	6
2.1.1 Manual Survey.....	6
2.1.2 Biasing.....	6
2.1.3 No Frequent Updation.....	6
2.1.4 Track the mangroves.....	6
2.2 Research Solution.....	7
2.2.1 Less Time Required.....	7
2.2.2 Accurate Results.....	7
2.2.3 Frequent Updation.....	7
2.2.4 Track Illegal Practices.....	7
3. Literature Review.....	8

4. Study area and Characteristics.....	9
4.1 LISS-III Sensor.....	9
4.2 LISS-III Images.....	11
5. Theoretical Background.....	12
5.1 Software Requirements.....	12
5.1.1 Python 2.7.....	12
5.1.2 QGIS 2.14 ESSEN.....	12
5.1.3 Features of QGIS.....	12
5.2 Hardware Requirements.....	13
5.3 Tools and Techniques.....	14
5.3.1 NumPy.....	14
5.3.2 Matplotlib.....	14
5.3.3 Scikit-learn.....	14
5.3.4 OpenCV.....	14
6. Algorithm Used.....	15
6.1 Decision Tree.....	15
6.1.1 Decision Tree algorithm.....	16
6.2 K-Nearest Neighbor.....	17
6.2.1 Applications of KNN.....	18
6.2.2 Algorithm.....	18
6.3 Artificial Neural Network.....	19
6.3.1 Neurons.....	19
6.3.2 Pattern Recognition.....	20
6.3.3 Clustering.....	20
6.3.4 Prediction.....	20
6.3.5 Characteristics of ANN.....	21
6.3.6 Algorithm.....	21

7. Methodology.....	22
7.1 Preprocessing.....	22
7.2 Feature Extraction.....	22
7.3 Classification.....	22
7.4 Proposed Method.....	23
8. Graphical User Interface.....	24
9. Creation of Interactive Map.....	27
10. Accuracy Assessment.....	29
10.1 Confusion Matrix.....	29
10.2 Kappa Statistics.....	31
11. Results and Observation.....	32
11.1 Accuracy and Kappa value of ANN.....	32
11.2 Accuracy and Kappa value of KNN.....	34
11.3 Accuracy and Kappa value of Decision Tree.....	36
11.4 Overall Accuracy and Kappa value.....	38
11.5 Classified and unclassified images.....	39
12. Discussion.....	41
13. Conclusion.....	42
14. Future Enhancements.....	43
15. References.....	44
15.1 Links.....	45

LIST OF FIGURES

1. Remote Sensing Process.....	2
2. LISS-III Sensor.....	3
3. LISS-III Band 2 Image.....	11
4. LISS-III Band 3 Image.....	11
5. LISS-III Band 4 Image.....	11
6. LISS-III Band 5 Image.....	11
7. QGIS 2.14 Interface.....	13
8. Decision Tree.....	15
9. Biological Neuron.....	19
10. Model of Artificial Neuron.....	20
11. Proposed method.....	23
12. GUI-1.....	24
13. GUI-2.....	25
14. GUI-3.....	25
15. GUI-4.....	26
16. GUI-5.....	26
17. Classification Accuracy Assessment of ANN.....	33
18. Classification Accuracy Assessment of KNN.....	35
19. Classification Accuracy Assessment of Decision Tree.....	37
20. Overall Classified Image.....	38
21. False color image before Classification.....	39
22. False color image after Classification.....	39
23. Map.....	40

LIST OF TABLES:

1. LISS-III Satellite Specification.....	10
2. Confusion matrix.....	29
3. Accuracy and kappa-value of ANN.....	32
4. Accuracy and kappa-value of KNN.....	34
5. Accuracy and kappa-value of Decision Tree.....	36
6. Overall Accuracy and kappa value.....	38

LIST OF ABBREVIATION:

1. ANN: Artificial Neural Network
2. KNN: K-Nearest Neighbor
3. LISS-III: Linear Imaging and Self Scanning Sensor
4. GIS: Geographic Information System
5. IRS: Indian Remote Sensing
6. QGIS: Quantum Geographic Information System
7. GPS: Global Positioning System
8. GUI: Graphical User Interface

ABSTRACT

A Mangrove is a small tree which grows only in coastal region and is basically found at the edge of water and sea. Mangroves are the home for various aquatic organisms. Mangroves help preventing soil erosion and it also protects people community from natural disasters like tsunami, storms, floods and hurricanes. In India, around 40% of these mangroves are been destroyed in the past decade. The main reason for this destruction is the land for people community. So it is mandatory for conservation of mangroves. In India, West Bengal, Odisha, Andhra Pradesh, Tamil Nadu and Andaman are the places which have the highest amount of mangroves present. Manual surveying of these mangroves takes a lot of time and is not always that we may achieve accurate results from it because there will be no frequent updating of the reports. Remote sensing is the science of making measurements of the earth using sensors on satellites. These sensors collect data in the form of images and provide specialized capabilities for manipulating, analyzing, and visualizing those images.

Remote Sensing technology has been used to detect the changes in mangroves around Mumbai region and to find where mangroves are located in Mumbai suburban. Remote sensing is technique of gathering data of an object or phenomenon without getting direct contact with the object. Nowadays remote sensing is mainly used for classification and the detection of object. Classification process is used to categorize LISS III multiband image into various land cover classes to create thematic maps. The LISS-III stands for Linear Imaging Self-Scanning Sensor-3. LISS-III data consist of images in four bands. The thematic map is used to create an interactive informative map using GIS. GIS stands for Geographical Information System The purpose of this research is to create an informative map about the changes in mangroves by collecting information from previous researches and to provide possible solutions to protect them.