CHAPTER 7

PERFORMANCE EVALUATION

7.1 Performance Evaluation in Terms of detection Accuracy

The objective of this chapter is to evaluate the performance among the proposed works discussed in the various stages of this research work. In order to find out the best accurate detection, segmentation and classification method this chapter compares all the results and discussed here. All the three stages of the research works are programmed in MATLAB software and experimented. The obtained experimental results are given here stage wise. The dataset is taken from internet sources and they are benchmark dataset experimented and proved. The entire dataset is available at [86].

In the first stage, the oil spill detection accuracy. The accuracy of the oil spill detected from the input image is different for various images. According to the differences in the images, the detection accuracy is also changed. Over all accuracy calculated for 100 images is 98.98%. From the obtained results and the detection accuracies, it is very clear and noticed that the proposed approach is efficient for oil spill detection using SAR images under different constraints. The maximum accuracy detection obtained by the proposed approach is 98.98%.

In the second stage of the research work, the proposed Automatic CAD System is experimented over 100 images and the detection accuracy is calculated. From the experiment ACADS obtained 98% of detection accuracy and it is given in Table 7.1. From the below Table7.1, it is very clear that the number of normal images available in the database, correctly classified by multi-class SVM and wrongly classified by multi-class SVM.

Table 7.1 Existing Images versus Classified Images

Images	Normal Images	Oil Spilled Images	Correctly Classified	Wrongly Classified
Database	100	100	98	2

In the third stage, the proposed approach (DT-SVM) is implemented and results are verified in MATLAB software. The performance of the proposed approach is evaluated by comparing the results with the existing approach in term of Sensitivity, Specificity and Accuracy based on oil spill detection and classification.

Table 7.2 Performance Evaluation

Techniques	**Accuracy**	**Sensitivity**	**Specificity**
Support Vector Machine [1]	90.54	84	91
Critical Phase function [2]	96.23	89	98
Artificial Neural Network [2]	98.45	89	99
Dual Threshold-Multi Class Support Vector Machine	99.03	90	99.02

From the performance evaluation, it is proved that the proposed Dual-threshold method with MSVM provide the best results. In order to evaluate the performance of the proposed approach, sensitivity, specificity and accuracy are calculated and it is given in Table 7.2. From the Table 7.2, it is clear that the proposed DT-MSVM method is suitable for SAR image processing and oil spill detection.

In the Final stage, the comparative analysis between the existing and proposed classification techniques based on the type of dark object, such as VOS(IMP), VOS(WSM), L-A(IMP) and L-A(WSM) are used to the Oil percentage given in Table 7.3 and shown in Figure 7.1 and Look-Alike

percentage given in Table 7.4 and shown in Figure 7.2 by Automatic Slick Detection Unit (Existing) and Adaptive Edge and Texture clustering (Proposed) methods.

Table 7.3 Classification techniques for object as Oil

Type of Dark Object	Object Classified as Oil Percentage	
	Automatic Slick Detection Unit (Existing)	Adaptive Edge and Texture clustering (Proposed)
Verified Oil Slicks (Image Mode Precision)	82.9	85.3
Verified Oil Slicks (Wide Swath Mode)	80	82.8
Look-Alikes (Image Mode Precision)	76.2	79.1
Look-Alikes (Wide Swath Mode)	50	65.7

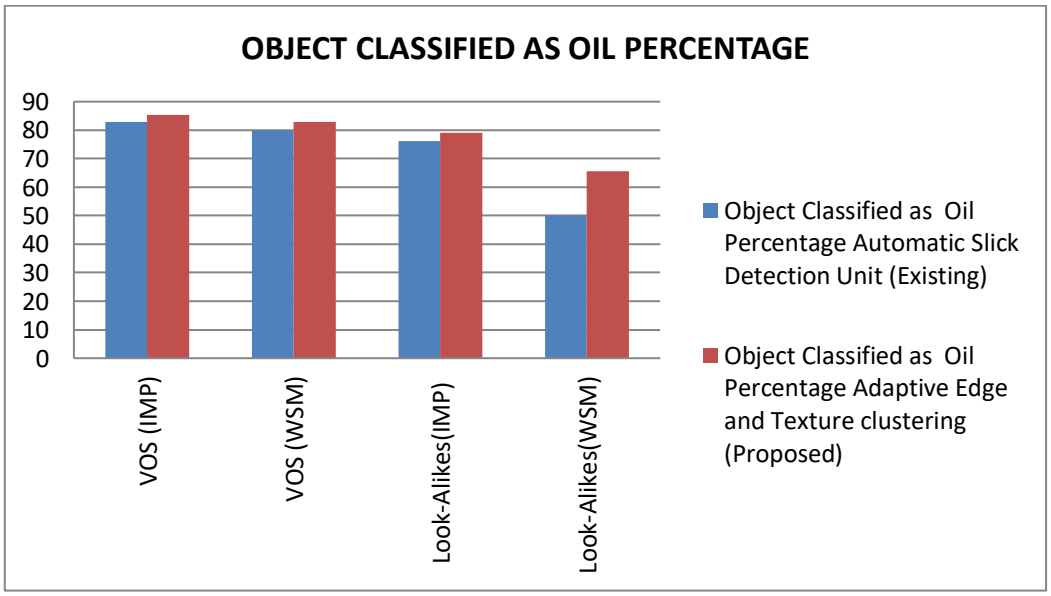

Figure 7.1 Comparative analysis between the existing and proposed techniques based on the type of dark object Oil Percentage

Table 7.4 Classification techniques for object as Look-Alike

Type of Dark Object	Object Classified as Look-Alike Percentage	
	Automatic Slick Detection Unit (Existing)	Adaptive Edge and Texture clustering (Proposed)
Verified Oil Slicks (Image Mode Precision)	17.1	14.7
Verified Oil Slicks (Wide Swath Mode)	20	17.2
Look-Alikes (Image Mode Precision)	23.8	20.9
Look-Alikes (Wide Swath Mode)	50	34.3

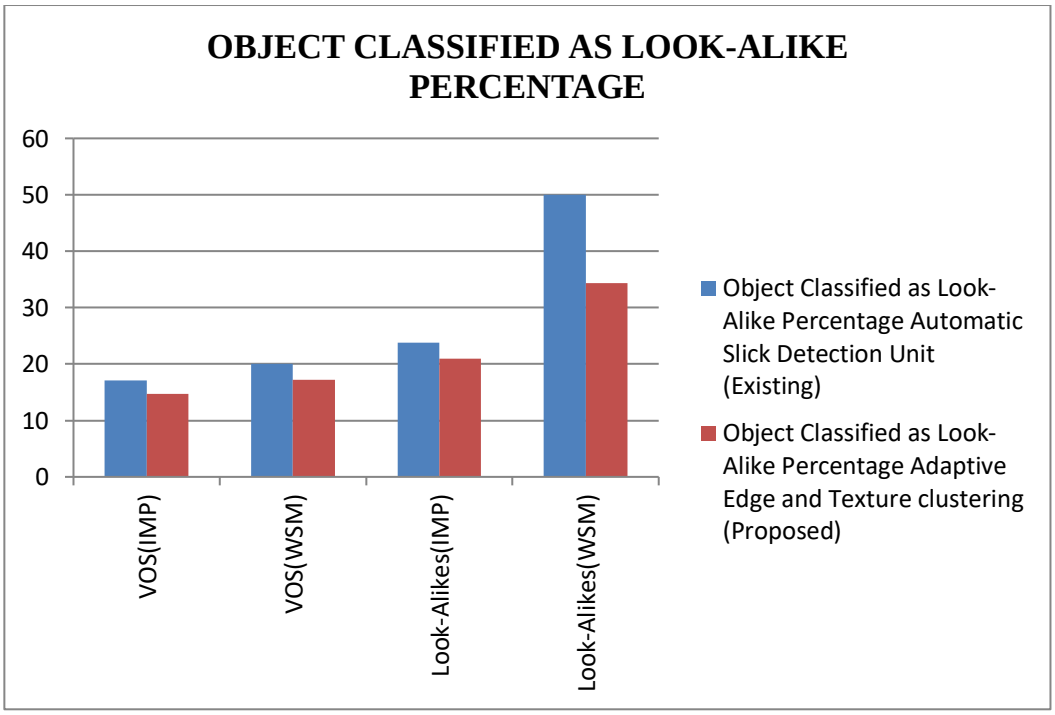

Figure 7.2 Comparative analysis between the existing and proposed techniques based on the type of dark object Look -ALike

The Existing ANN and proposed CHV-RVM techniques are compared in terms of accuracy, sensitivity and specificity, technique as given in Table 7.5.

Table 7.5 Comparison based on Accuracy, sensitivity and specificity values for both existing and proposed techniques

Techniques Used for Classification	Accuracy Percentage	Sensitivity Percentage	Specificity Percentage
Back scatter-Gradient-ANN	93.54	84	95
Convoluted Horizontal Vertical-Relevance Vector Machine	98.23	89	99

To evaluate the performance comparing with the previous stages of this research works. In the earlier stages provides a classification result generally, over the oil spill detection. In order to improve the accuracy in classification, a dual threshold method based classification is applied where it can detect and classify all kind of oil spills on the SAR images.

7.2 Summary

From the above discussion it is identified and clear that, all the three different stages of this research work is efficient in terms of oil spill detection and classification. Even though the final stage of the research work (DT-SVM) method gives better accuracy in detection as well as in classification of oil spills on the SAR images. It has better performance than the other existing techniques like ANN, SVM and CPF and obtained 99.03% of accuracy. In the final analysis it is observed that the level of accuracy is increased to 98.23%, sensitivity is increased to 89% and the specificity is increased to 99% by using the RVM classification. Hence this research work is suitable and efficient for oil spill detection in SAR images and is proved.