AIRPORT RUNWAYS IN FLIR USING ROI METHOD

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ABSTRACT

Recognition of Airports are very important factor to avoid the accidents. In future we could develop intelligent weapon system by using airport runway recognition. A method of recognizing airport runways is described using region of interest(ROI) method in forward looking infrared (FLIR) images. First of all, read image after doing preprocessing, edge detection can be done, then use some Morphological operation for gradient generation. Line segments images are extracted by line segment detector (LSD).By using line segment linking method, to link the broken line segments. Then find out normalized cross correlation values and compare them with threshold value and detect the air strip. So the method used here is robust and has good real time performance.by using different airport runway images ,we find out or locate exact runway.

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INTRODUCTION

Runway is rectangular area on land prepared for the landing and takeoff of aircraft. Runway may be manmade surface or natural surface. Runway can normally use in both directions. It always get attention during the war of air supremacy. Here ,we used Region of interest (ROI) method to detect the accurate air strip. so we used forward looking infrared images(FLIR). FLIR cameras, typically used in military and civilian aircraft, use a thermo graphic camera that senses infrared images. This sensors installed in FLIR

Our algorithm consists of ROI extraction. Line segment detector (LSD) method [10]is applied for extraction of line segment images. Then we get results are in broken lines, to join these broken lines used line segment linking method. After linking lines , find out normalized cross correlation value and to generate the cross correlogram. Finally compare them with threshold value and detect the airport runway.

Procedure

First of all we read the airport images. here we store some different runway images. which will be used in final output. then we can done here pre-processing. Pre-processing in an improvement of the image data that suppresses unwanted distortions or enhance some image features which important for the further process. The pre-processing is also called filtration and resolution enhancement. The collected Runway images first pre-processed and then segmented. After pre-processing edge detection is very important.[16].

Edge detection is a fundamental tool for image segmentation. Edge detection methods transform original images into edge images benefits from the changes of grey tones in the image. The use of edge detection technique is reducing unnecessary information in image while preserving the structure of image. It extracts the important features of image like corners, lines, curves etc. So many edge detection techniques are available.

Techniques are Roberts edge detection, Sobel Edge Detection, Prewitt edge detection, Kirsh edge detection, Robinson edge detection, Marr-Hildreth edge detection, LoG edge detection and Canny Edge Detection. In our method, We used canny edge detection method. Advantages for canny edge detection methods are Canny edge detection method uses probability for finding error rate, localization and response, improving signal to noise ratio, better detection specially in noise conditions. Edge detection is used for image segmentation and data extraction.

Fig.1. Flow Diagram of Method.

Here we used morphological operators for the gradient generations. Morphology is the set of process images based on the shapes. Morphological operators apply structuring elements to input image and then to create output image in same size. [16]The most basic morphological operations are dilation and erosion. Function of dilation to add pixels to the boundaries of object in an image and the function of erosion is removes the pixels on object. Opening and closing are also important morphological operations. It is derived from fundamental operations that are dilation and erosion. It is usually applied for binary images but grey value images are also possible.Opening and Closing are dual operations. Opening is similar to erosion, that spot and noise removal and less destructive. Closing is similar to dilation, that removal of holes and tends to enlarge the regions. In our methods used opening and closing morphological operations to generation of gradient.

ROI (Region of interest) extraction method based on straight line segments. It consist of Line segment detection. Line segments are detected by LSD are usually fragmented it means line segments runway are not continuous so our purpose is to link these fragmented line segments together to present runway. Least square algorithm [13]is plays important role to fit new line segment in these linking line process but process is repeated until all lines segments are checked.

After line segment linking method, find out normalized cross correlation value [14] for each pixel position. Normalized correlation is one of the methods used for template matching.

After applying all above procedure, At last we detect the perfect runway.

RESULTS

1.Case 1(Airport Runway image)

A.First of all,save different airport runways images in folder.

Fig 2 Different airport images

I. B. Open the MATLAB software.

Fig..3 MATLAB Software

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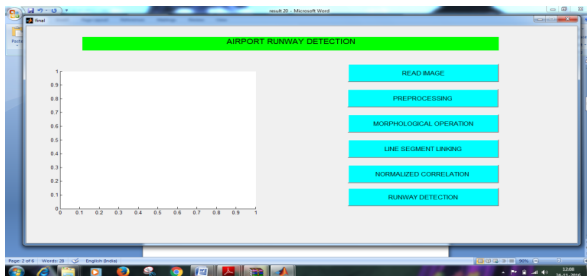C. Then click on RUN button,fig .shows the main page of the AIRPORT RUNWAY DETECTION.

Fig.4 Main page of airport runway detection

D. Now click on READ IMAGE Button,folder will be open where all airport imges are saved.
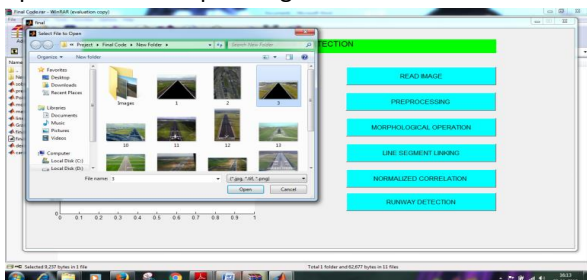

Fig.5 Airport runway detection

E. Pick one Airport runway image,click on open button.

Fig.6 runway image.

F. Next click on preprocessing button,all preprocessing action done here also make canny edge detection and output of after canny edge detection displayed here.

Fig.7 Image after canny edge detection method.

G. Now,click on MORPHOLOGICAL OPERATION button, here we used some morphological operators.we get here dilation result,erosion result,object detection , runway image as shown in next fig.8.
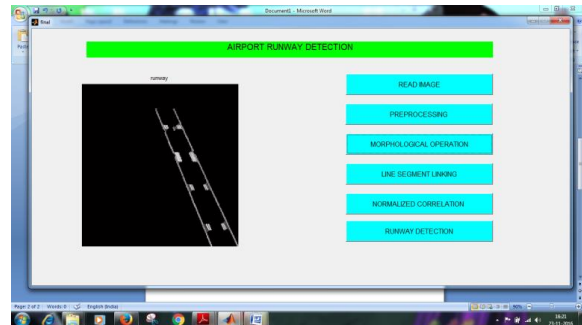
Fig.8 Reuslt after morphological operators.

H. Then click on LINE SEGMENT LINKING button, here we find out angles,distance map,gradient generation on X axis and Y axis,also directional gradient on Y axis and X axis.result shown in fig. 9.
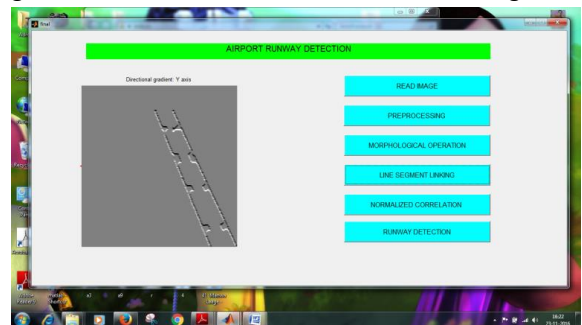
Fig.9 Output of gradient generation and directional generation.

I. Then click on next button that is NORMALIZED CROSS CORRELATION. Here we find out normalized cross correlation value for each pixel position.
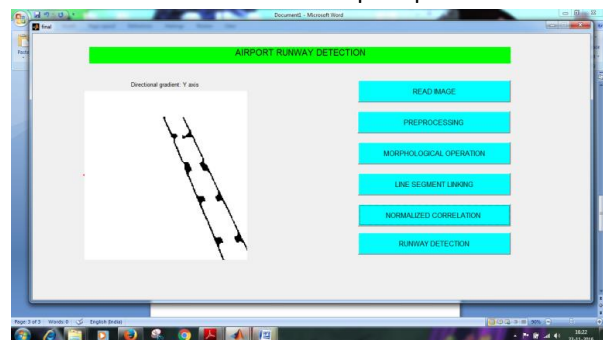
Fig 10. Output after applying normalised cross correlation.

J. And last click on RUNWAY DETECTION button, calculating all NC values, Compare with threshold Є and detect the Air Strip, and we get the result as shown in fig.11, which is in red lines.

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Fig 11. Output of runway detection (red lines).

2.Case 2(Another runway image):

A. First of all,save different airport runways images in folder.
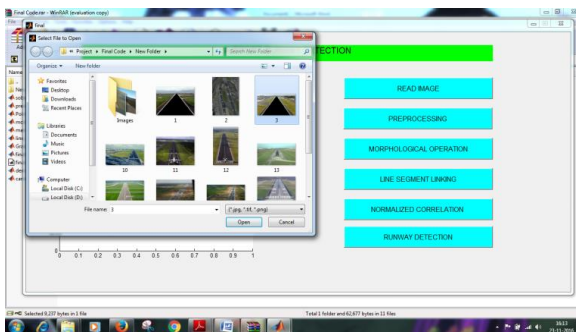

Fig 12. Different airport images
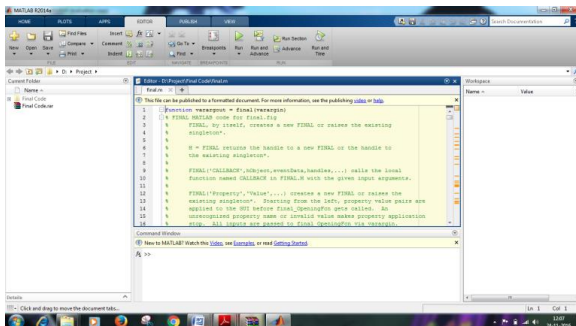
II.   B. Open the MATLAB software.

Fig. 13 MATLAB Software

C. Then click on RUN button,fig .shows the main page of the AIRPORT RUNWAY DETECTION.
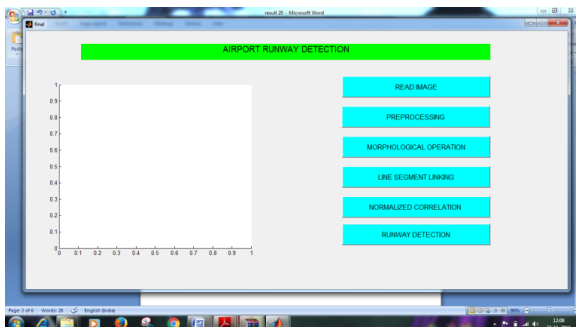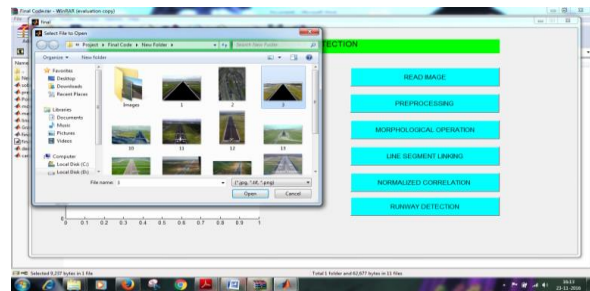

Fig.14 Main page of airport runway detection

D. Now click on READ IMAGE Button,folder will be open where all airport imges are saved.

Fig.15 Airport runway detection

E. Pick one Airportrunway image,click on open button.

Fig. 16 Runway image

F.   Next click on preprocessing button,all preprocessing action done here.also make canny edge detection.and output of after canny edge detection displayed here.
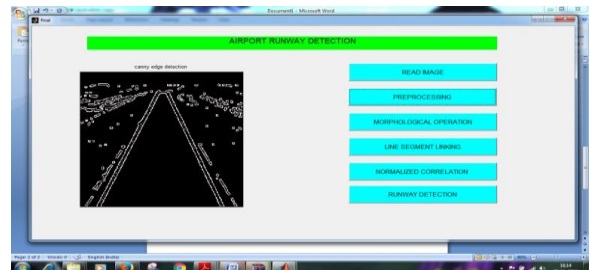
Fig.17 Image after canny edge detection method.

G.   Now,click on MORPHOLOGICAL OPERATION button, here we used some morphological operators.we get here dilation result,erosion result,object detection , runway image as shown in next fig.
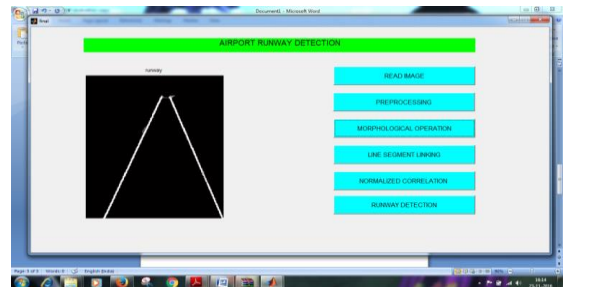

Fig. 18 Result after morphological operators.

H. Then click on LINE SEGMENT LINKING button, here we find out angles, distance map, gradient

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generation on X axis and Y axis, also directional gradient on Y axis and X axis. result shown in fig. 19.
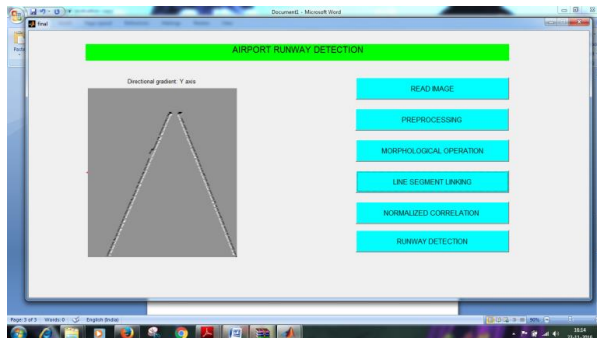

Fig.19 Output of gradient generation and directional generation.

I. Then click on next button that is NORMALIZED CROSS CORRELATION. here we find out normalized cross correlation value for each pixel position.
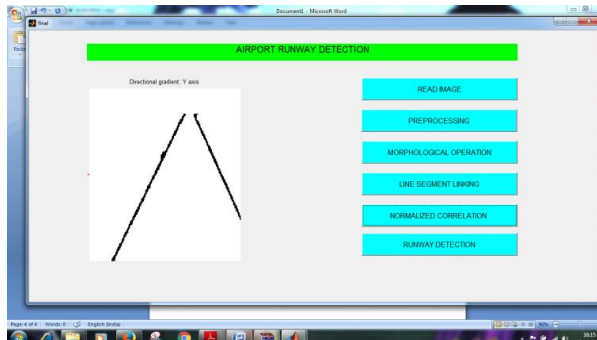

Fig.20 Output after applying normalised cross corelation.

J.And last click on RUNWAY DETECTION button, calculating all NC values, Compare with threshold Є and detect the Air Strip.and we get the result as shown in fig.21, which is in red lines.

Fig. 21 Output of runway detection (red lines).

Discussion of Results

For getting the perfect runway detection ,we used here preprocessing, then canny edge detection method, morphological oprators like erosion and dilation, after that for joining the broken line segments we used here line segment linking

method, then find out normalised cross correlation value, comparing it with threshold value and detect the airstrip. The output result as shown in fig.11 and fig.21(case 1,case2) airport runway detected very accurately which is shown in red lines.Using these methodology we can avoid the accidents. In rainy season or in fog environment , pilot can easily detect the runway using this methodology.

Conclusions

This method is robust to different imaging conditions and has good real-time performance. The new technique integrating line segment detector (LSD) and line segment linking method has ability of extracting line segments of runway, even in low SNR. Integrating LSD and line segment linking has a prominent capacity of extracting line segments of runway edges, even in the presence of low SNR and unpredictable clutter. ROIs are effectively extracted by introducing constraints of direction consistency and gradient relativity.

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