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COMPARISON OF HORIZON DETECTION METHOD BY HOUGH TRANSFORM FOR DETECTION OF LANDING SITES OF AIRCRAFT

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ABSTRACT:

This developed computer aided system states efficient tool which helps pilot to find emergency landing. In this paper the method defined by comparing other method. As compare to existing methods this method gives more clarity to choose the specific correct landing sites. Earlier pilot used to manually select sites by viewing to ground at 90 degree but this method may not every time gives correct output so the developed system helps to provide 90% of clear vision by using horizon detection method. This paper compares the old methods with our developed method. The final comparison of horizon detection of proposed method carried out with the Hough transform method for detection of horizon and Greedy search methods.

KEYWORDS: K-Clustering, Horizon Detection,Hough Transform.

I. INTRODUCTION:

The main contribution of the paper is to compare the developed method with other designed methods, First of all ,we investigated the appropriate criteria to assess of landing .Two main geographic concepts:1)Elevation map,2) Landform3) Horizon detection .above geographic concepts are taken in consideration. Elevation map describes the terrain covering like water , rock, buildings, trees ,forest,sea.In summary, we evaluate the softness of a landing sites by considering roughness and dimensions assessment . We tested the developed CAD system using images taken by Google map instead of the manually captured images. The developed CAD system has good performance compare than other methods. The charts of the two experimental sets are consistent with the ground truth which explains the robustness and reliability of the proposed CAD system

DEVELOPED METHOD:

The roughness and smoothness of the landing site is mainly determined by its surface safeness and its length and width. By selecting threshold value we can detect the roughness by considering its length and width. The roughness and safeness of emergency landing is only determined by variation of the land and also depends upon the ground. Eg. Rocks, trees, vehicles, animals etc. These factors are not captured in the elevation map. so thos factors we have to consider in the dimension ..The mechanism of the developed CAD system, are described as follows. If the elevation maps are not present ,it is plausible to consider that finding smooth and rough places of the surface is equivalent to the process of edge detection in images. In this developed system the canny edge detector helps to compute sharpness of the edges.

II. BLOCK DIAGRAM:

The developed CAD tool system proposes of following modules which consists of main modules: Horizon Detection. The Horizon Detection is important module in this developed system because to detect sky and ground region is a task of the horizon Detection. K-mean method helps for clustering of the images. Following figure show the flow diagram of proposed system.

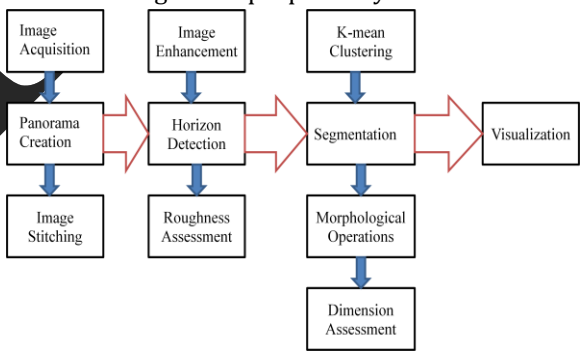

Fig1.Block diagram of Developed System

First the images are acquired by the camera which are located at the left and top right of the camera .Real time it is possible to take images but we have used images from Google because such a data is not possible for real time. So by taking the images from Google we created panorama for it .As the panorama joins the two input images so we can extract the features from it.

III. COMPARISION WITH EXISTING METHODS:

Pilots should pick all possible landing sites in the original true images. The judgment is mainly based on the smoothness of the area based on the images. By using dimension assessment module, the realistic dimension of these manually selected areas are measured. This step is very important because it is hard to predict accurate

length and width of landing sites in the captured images at different heights by looking at them. If the dimension of selected area meets with the dimension requirement then it is labeled in green as for safe-landing otherwise it is labeled in red color detected line. After selecting manually regions are arranged in the descending order according to area. The fully designed performance of the proposed CAD system is compared with the existing methods. If an area is found as a candidate landing-site by the proposed CAD system, then the detection result of this area will be considered as positive. If the result is consist with growth truth, it is called a true positive (TP), otherwise false positive (FP). If the area is not selected then it is considered as negative. If the result is true negative (TN) then consists as ground-truth.

Possible Results of the Detection of Emergency Landing-Sites

No	Categories	Ground-Truth	CAD System Results
1	TP	These area is **safe** for emergency landing	Hazards are **not found** and dimensions **equal or exceed** the requirement
2	FP	These area is **not safe** for landing	Hazards are **not found** and dimensions **equal or exceed** the requirement
3	TN	The area is **not safe** for landing.	Hazards are **found** in that area small capsor its dimensions are **below** the requirement.
4	FN	The area is **safe** for emergency landing	Hazards are **found** in that area small dimensions are **below** the requirement

The developed CAD tool uses K-mean clustering method which organizes all patterns in K-d tree structures such that one can find all patterns which are closet's to our developed results demonstrate that our scheme can improve the computational speed of the direct k-means algorithm by an order to improve the clustering size .Clustering is the process in which number of clusters are grouped in given set of patterns. The k- mean method has been used to be effective in producing good clustering results for many applications.

HORIZON DETECTION RESULT BY OTHERS METHOD:

The horizon is detected by using proposed method shows 90% of the latency. By comparing it with greedy search method and Hough Transform. The proposed method achieves 90% perfect detection and 8% good detection. Some results. The reliability and accuracy of the proposed system is validated on independent static sample Images with projection angles of 0± and 60±.

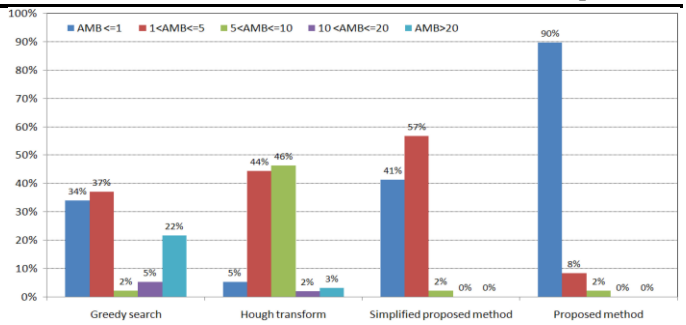

Fig2.Result of horizon detection

We tested the reliability of the proposed horizon detection algorithm on images taken by Google earth. The horizon of the sample images appears in the various angles and those images are captured at different elevations. We tested on same images with the Hough Transform method and the greedy search method .To compare the accuracy of methods below average maximum bias (AMB) has been defined as follows:

$$\mathbf{AMB}=\frac{\mathbf{1}}{\mathbf{H_m}}\sum_{\mathbf{h}}^{\mathbf{H_m}}\mathbf{M}\,\mathbf{B_h} \qquad \mathbf{(1)}$$

$$\mathbf{H_m = L_H \times 0.1} \qquad \mathbf{(2)}$$

L_H is the total number of pixels which are detected in horizon and H_m is the tenth of L_H . The reason that we are only interested in the top 10% of the maximum bias is because the horizon is often long. If we compute the average bias for the whole detected horizon, some significant bias may be hidden by other well-aligned parts of the detected horizon when the averaging operation is taken. Therefore, evaluating the most biased segment of the detected horizon can tell us the true performance of the method. In other words, if the most biased segment of the detection result can be considered satisfactory, the rest of the detected horizon can be guaranteed to be better than the most biased segment.

K-MEAN CLUSTERING METHOD:

In k-means clustering method clusters K is assumed to be fixed. Let k is a prototype of (w1….wk)N is input patterns (i1…in)
Where Wj=i1,j €{1…k}

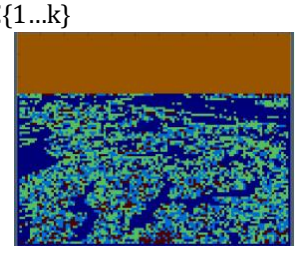

Fig.3. Clustering result

In many practical applications k- mean method is considered as very effective method in producing best results. The k-mean algorithm requires the time proportional to the number of clusters per interaction.

$$PS_V = \frac{2h_c}{N_v} \tan\left(\frac{PV}{2}\right) \quad (3)$$

For large database this is computationally very expensive. In the unite pixel the length and area are calculated by measuring its minor and major axis. in each of the center pixel.

RESULTS:

By taking images from google map we have done classification and segmentation by using k-mean clustering method. It is very helpful tool for pilot to choose safe landing because as if now there is no automatic method present in current situation for this issue. Following figure shows the detected safe landing sites which shows the total 5 sites so, pilot has to choose site according the priority.

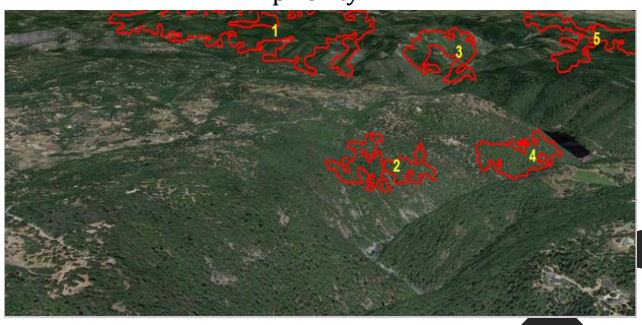

Fig.9 landing sites

Following figure shows the Comparison between manual selection and automatic detection .As the automatic detection of the sites shows 90% of the accuracy. The Visualization module is a basic view designed to help pilots to choose landing site.Depending on the threshold value which we have considered for the roughness the sites are detected as per value.CAD tool gives total number of five safe landing sites

K-mean method is efficient method.CAD system gives more accuracy in the visual system as compare to the other manual system .So the comparison gives clear difference of the two methods .Proposed method shows the total safe area for landing but manually it is not possible to select safe area so proposed method shows best results as compare to the greedy and Hough transform method.

We have done comparison of CAD system with other methods but by using k-mean clustering method it shows efficiency towards the detection. By using horizon detection tool we can easily found the line between sky and ground which is very important to differentiate .Hough transform shows the 50% of the clarity towards the landing sites but our developed method shows the 90% of the efficiency. As below figure 3 shows the comparison between the manual selection and automatic selection of landing sites. Developed computer aided system gives more efficiency as compare to the manual visual system.

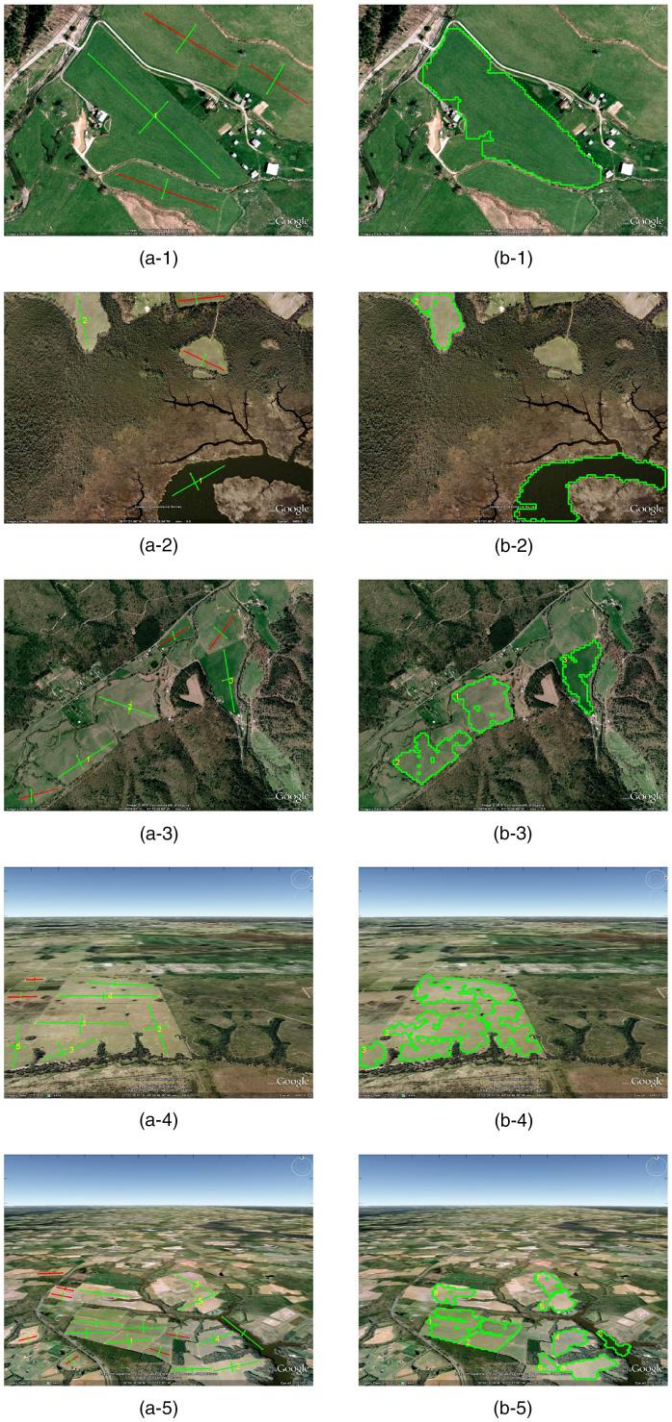

Fig.3 Comparison between manual selection and automatic detection

REFERENCES:

1) Y.F. Shen ,Z.U.Rahaman,D.Krusienski,J. Li , *"A Vision-based Automatic safe Landing site Detection System"*,Vol.49,No.1,January 2013
2) Shen,Y.F and Rahman Z, "*An automatic computer aided detection system for aircraft emergency landing Proceeding of the AIAA Infotech at aerospace conference*", St.Louis MO,vol1,2011.

3) Shen, Y-F., et al. *Automatic detection of aircraft emergency landing sites.* Proceedings of SPIE, Defense Security, and Sensing, vol. 8056,Orlando, FL, Apr. 25—29, 2011.
4) Padro, P., Sukhatme, G., Montgomery, J. *Towards vision -based safe landing for an autonomous helicopter.* Robotics and Autonomous Systems, 38, 1 (Jan. 2002)
5) Canny, J. "*A computational approach to edge detection*" IEEE Transactions on Pattern Analysis and Machine Intelligence, PAMI-8 ,Dec 2010
6) Tou, J. T., Gonzalez, P., and Rafael C. *Pattern Recognition Principles*
7) Garcia-Padro, P., Sukhatme, G., and Montgomery, J. *Towards vision-based safe landing for an autonomous helicopter.Robotics and Autonomous Systems*, **38**, 1 (Jan. 2002), 19—29.