Safe Landing - Area Detection System for Aero plane

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Abstract— Now a day, an automatic safe landing-site detection system is invented for aircraft emergency landing based on visible related data acquired by aircraft-mounted cameras. In this system, the top-five leading factors of random or unplanned landing, which is also called emergency landing, are engine failure, running out of fuel, extremely bad weather, medical emergency, and aircraft hijack. We concentrate on the detection mechanism of the proposed system and assume that image improvement for increased visibility and image stitching for a bigger field-of-view (FOV) have already been performed on the terrain images acquired by aircraft-mounted cameras(Here we used goggle map images). We focus on the detection mechanism of the proposed system and assume that image stitching for a larger field-of-view(FOV) &image enhancement for increased visibility have been performed on the terrain images acquired by aircraft-mounted cameras (Here we used goggle @Earth Images). Specifically, we propose a horizon detection to identify the ground in the image. Then, Segmentation is used to find out various clusters based on Color, performed by K-Mean Method. Principle component analysis is used for feature extraction & Classification of various clusters done by Cross correlation Classifier. Dimensions are measured by using blob Analysis. Then, sorting (descending order) of detected landing sites are performed, based on size of area. If the dimensions of a candidate region exceed the minimum requirement for safe landing, the potential landing-site is considered a safe candidate and is highlighted on the human machine interface. At the end the pilot makes the final decision by confirming one of the candidates and also by considering other factors such as wind speed and wind direction.

Key words: Safe Landing, Area Detection System

I. INTRODUCTION

An automatic safe landing-site detection system is proposed for aircraft emergency landing based on visible information acquired by aircraft-mounted cameras. Emergency landing is an unplanned event in response to emergency situations. The top-five leading factors of unplanned landing, which is also called emergency landing, are engine failure, running out of fuel, extremely bad weather, medical emergency, and aircraft hijack. Once these happen a forced landing process has to be immediately carried out. So, finding a safe landing-site is critical to the survival of passengers and crew. Conventionally, the pilot chooses the landing-site visually by looking at the terrain through the cockpit. This is a required, fundamental skill acquired in the flight training program. However, many external environmental factors, i.e., fog, rain, illumination, etc., can significantly affect human vision. so that the decision of choosing the optimal landing-site greatly depends on the pilot's flight experience. In addition the visual angle that the human eyes can simultaneously cover is limited. When the pilot looks to the left, what is on the right is missed and vice versa. Since time is of supreme importance in the scenario we are considering, the inability to simultaneously scan on both sides of the cockpit is a distinct disadvantage. Imaging sensors can alleviate this problem by creating panorama images that encompass the entire field-of-view (FOV) in front of the aircraft. In order to compensate for the natural inadequacies of human vision and also to alleviate the negative effects of both external and internal factors, a robust, reliable, and efficient process for safe landing-site detection is greatly desirable. Therefore, we present a vision-based, automatic safe landing-site detection system.

II. PREVIOUS WORK

Lots of the achievements of autonomous landing have been accomplished [2-6] by utilizing vision-based approaches to support unmanned aerial vehicles (UAVs) or helicopters to known landing-sites in the system. Landing marks, which often appear in high-contrasting the image so that can be easily detected, play a vital role in these approaches by giving relative position information for state estimation. Then, for a landing strategy to be match in unknown environments which is usually the case for emergency landings of airplane, the dependence on known landing marks is limiting, therefore, annexable means of finding safe landing-sites is desired. In [7] Garcia-Pardo, et al. designed a two-step autonomous safe landing-site detection strategy. First, they applied a local contrast descriptor which is derived by normalizing the neighborhood of the to-be-tested pixel and then by manipulating and calculating the mean and the standard deviation of its neighborhood, to assess the roughness of the ground under the assumption that the limitations of hazards appear as high-contrast edges in the image, reacted by small values. A contrast threshold required to be selected to separate smooth areas and boundaries, and the middle contrast threshold is found to have a linear relationship with the ratio of mean and standard deviation of the whole image in the system. Then the round landing-sites with a convenient size are search in the smooth areas. The main system was tested in an offline fashion on 10 image main sequences, which are captured by real fights over a synthesized environment that means keeping white boxes on grassy ground. The detection results are implemented by a failure rate defined as the percentage of images in which the system fails to search any safe landing-site[8].The previous some authors are used the Spacecraft Landing Footprint for Safe Planetary Landing, in this system they used footprints for landing sites, but this system is not recognizing accurate space or area, one more author used UAV forced landings using machine vision system for landing , but they also shows approximate chances of exact area of space, so to overcome this drawbacks, we are using this new advanced system called as Safe Landing-Area Detection System For Aero plane

III. PROBLEM STATEMENT

This system has addressed the forced landing problem for aero plane/UAV. Forced landings are required; when an aircraft is unable to continue on its mission .This can occur for example, if an engine failure occurs. This system proposes an automatic CAD system that provides a robust, reliable, and efficient image analysis algorithm to detect smooth areas, avoid hazards, and measure dimensions of areas.

IV. PROPOSED METHODOLOGY

A. Initially, Terrain images accessed by aircraft-mounted cameras.(We used Google@Earth Images)
B. Image joining is used for a creating bigger field-of-view
C. Image improvement used for improved visibility of image.
D. Then, Horizon detection algorithm to identify the ground & sky in the image.
E. Then, the terrain image is segmented based on color which is used to find out various clusters. Principle component analysis is used for feature extraction & Classification of various clusters done by Cross correlation Classifier
F. Whose Dimensions are measured by using blob Analysis

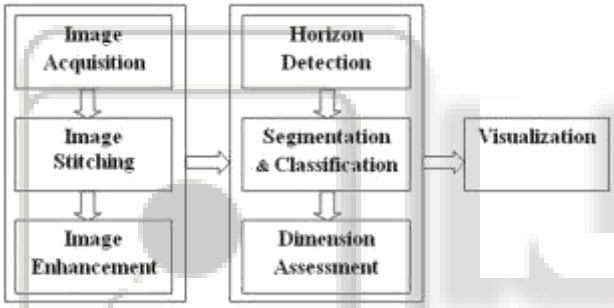

Fig. 1: Flow diagram of safe landing detection system

G. If, the measurement of a candidate region beyond the minimum need for safe landing, the potential landing-site is considered a safe candidate Region in the system.
H.Finally, the pilot makes the final decision by deciding one of the candidates and also by considering many factors such as wind speed and wind direction, etc.Ideally,

when the aircraft is flying in the upper air, it can be guided to an approximatelysmooth area according to the gradient information extracted from the elevation map.Then, the proposed computer-aided-detection system leads the aircraft to a safe landing-site. In practical most aircraft's do not have either a database of elevationmaps or a LIDAR sensor system.The imagery captured by aircraft-mounted cameras is the only available information source, so the proposed CAD system plays a crucial role in this scenario. The proposed safe landing-site detection system consists of main modules as follows:

1. Images Captured (by aircraft-mounted cameras)
2. Image Stitching - SIFT Algorithm
3. Image-Enhancement- Retinex Algo.
4. Horizon detection algorithm- K Mean
5. Segmentation & Classification
a) K-mean clustering method
b) Principle component analysis &Cross correlation Classifier
6. Dimension Assessment:Blob Analysis
7. Visualization

V. RESULTS

In this system, the visualization module is designed and constructed to highlight largest safe landing-site candidates on the human-machine interface for the pilot's final decision, though the system may detect safe landing-sites in the system. If the system provides the pilot with all the possible choices in the system, he may get confused when seeing so many recommended areas on the screen, and the time cost of making a decision is very complicated under the emergency situation in the system. The landing-sites are sorted in a descending order based on their approximate areas .therefore the pilot can efficiently evaluate the recommended candidates in a rational order in the system. The pilot will make his final decision by choosing one landing-site from the recommended candidates and by taking into account other factors as well in the system.

VI. CONCLUSION

In this proposed methodology mainly concentrate on safe landing-site detection system for robust type, reliable view, and efficient emergency landing of Aeroplane This proposed system makes up for the limitations of human eyes which works mainly, assists the pilot to find safe landing-sites in this system, and more important, it saves time under emergency conditions at the time of work. In the further step the proposed system will be further extended to better meet practical demands and applications in the system.

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