Nida Phunpeng 2009: Development of an Image Processing System for a Visually-Guided Landing of a Small-Scaled Autonomous Helicopter. Master of Engineering (Aerospace Engineering), Major Field: Aerospace Engineering, Department of Aerospace Engineering. Thesis Advisor: Squadron Leader Sukon Puntunan, Ph.D. 86 pages.

The objective of this work is to develop an image processing system for a visually-guided landing of a small-scaled autonomous helicopter. The CCD camera is mounted underneath an autonomous helicopter and directed downwards to the landing target (Helipad). The axis of camera is paralleled to the z-axis of an autonomous helicopter. The image from the camera is analyzed to determine the position and orientation of an autonomous helicopter with respect to the landing target. The purpose of this work is to develop a secondary positioning system which provided more accuracy compare to traditional GPS.

In this work, an image processing method and the interface between the automatic flight control and the image processing system are studied. Then, an image processing algorithm is developed to determine the position and orientation of an autonomous helicopter with respect to the landing target. Firstly, the image from the camera is filtered by using low-passed-filter. Secondly, the filtered image is sent to the process of image segmentation to extract the object image from background image. Thirdly, the object image is analyzed to determine the position and orientation of an autonomous helicopter with respect to the landing target. Finally, the x-distance, y-distance and orientation are sent to the automatic flight control system. The image processing system could accurately determine the position and orientation of an autonomous helicopter with respect to landing target. The calculated position is compared with the position obtained from the DGPS system. The calculated orientation is compared with the orientation obtained from the Gyro sensor. The RMSEs in x-axis, y-axis and orientation are 0.0534 meter, 0.0485 meter and 4.3569 degrees, respectively, at an altitude of 3 meters.

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