IMAGE ANALYSIS BASED ON SOFT COMPUTING AND APPLIED ON SPACE SHUTTLE SAFETY DURING THE LIFTOFF PROCESS

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ABSTRACT—Imaging techniques based on Soft Computing (SC) and developed at Kennedy Space Center (KSC) have been implemented on a variety of prototype applications related to the safety operation of the Space Shuttle during the liftoff process. These SC-based prototype applications include detection and tracking of moving Foreign Object Debris (FOD) during the Space Shuttle liftoff, visual anomaly detection on slidewires used in the emergency egress system for the Space Shuttle at the launch pad, and visual detection of distant birds approaching the Space Shuttle launch pad. This SC-based image analysis capability developed at KSC was also used to analyze images acquired during the accident of the Space Shuttle Columbia and estimate the trajectory and velocity of the foam that caused the accident. This paper describes the SC-based techniques and their prototype applications on the Space Shuttle safety during the liftoff process.

Key Words: Soft Computing; Fuzzy Reasoning; Edge Detection; Image Binarization; Image Enhancement; FOD Detection; Space Shuttle Safety; Debris Detection; Artificial Neural Network