

Image Analysis via Fuzzy-Reasoning Approach: Prototype Applications at NASA

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ABSTRACT

A set of imaging techniques based on Fuzzy Reasoning (FR) approach was built for NASA at Kennedy Space Center (KSC) to perform complex real-time visual-related safety prototype tasks, such as detection and tracking of moving Foreign Objects Debris (FOD) during the NASA Space Shuttle liftoff and visual anomaly detection on slidewires used in the emergency egress system for Space Shuttle at the launch pad. The system has also proved its prospective in enhancing X-ray images used to screen hard-covered items leading to a better visualization. The system capability was used as well during the imaging analysis of the Space Shuttle Columbia accident.

These FR-based imaging techniques include novel proprietary adaptive image segmentation, image edge extraction, and image enhancement. Probabilistic Neural Network (PNN) scheme available from NeuroShell(tm) Classifier and optimized via Genetic Algorithm (GA) was also used along with this set of novel FR-based imaging techniques to add powerful learning and image classification capabilities.

Prototype applications built using these techniques have received NASA Space Awards, including a Board Action Award, and were already filed for patents by NASA; they are being offered for commercialization through the Research Triangle Institute (RTI), an internationally recognized corporation in scientific research and technology development. Companies from different fields, including security, medical, text digitalization, and aerospace, are currently in the process of licensing these technologies from NASA.

BIO

Jesus A. Dominguez works for ASRC Aerospace Corporation, a NASA contractor at the Kennedy Space Center (KSC); his research activities covers multidiscipline fields in computer science and chemical engineering performed for NASA at KSC. One of the research fields involves the development of new imaging analysis techniques via soft computing applied to image information extraction from images acquired during the Space Shuttle operation. Another main research field at KSC includes the implementation and evaluation of novel sensing systems for detection and measurement of hydrogen and oxygen leaks during ground and flying Space Shuttle operation.