Automatic Welding Defect Detection in Radiographic Inspection Image of Space Launch Vehicle

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Launch vehicle transports satellite and spacecraft into space. Its failure causes loss of human life and large cost. So it should guarantee high level of reliability. It consists of various components such as propellant tank, combustion chamber, turbo pump, valve, pipe, etc. They experience large load and vibration during flight of launch vehicle. Welding is applied widely to their manufacturing processes. Welding defect is related closely with structural strength of the components. Radiography is used to inspect welding defect. Inspector detects welding defect in radiograph and judges pass or failure. Inspection by human has a limitation in consistency of inspection result. We studied on algorithm for automatic welding defect detection in radiographic inspection image of launch vehicle. Welding radiograph has irregular brightness distribution at normal area as well as defect area. So it is difficult to apply general image processing method which processes all image area in a batch. In order to solve this problem, we uses line tracing method which classify abnormal pixels from the image. Our algorithm calculates differential of gray value along one line perpendicular to welding direction in a digitized image. Sign variation of the differential value is utilized to detect abnormal pixel in the line. This procedure is made for all lines of the image. Cluster of abnormal pixels is determined as welding defect. Our new radiographic image processing is tested for various types of welding defects and shows good results.