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Author: Mr. Achindev J
Vikram Sarabhai Space Centre (VSSC), India

Mr. Kumar K
Vikram Sarabhai Space Centre (VSSC), India
Mr. Harikrishnan R
Vikram Sarabhai Space Centre (VSSC), India
Mrs. Asha GS
Vikram Sarabhai Space Centre (VSSC), India
Ms. YADDULA VENKATA SWARNALATHA
Vikram Sarabhai Space Centre, ISRO, Thiruvananthapuram, India

DEFECT DETECTION IN MECHANICAL HARDWARE USING AI AND VISION TECHNOLOGY

Abstract

A chassis is the mechanical structure that houses the electronics of an avionics package. Printed circuit boards, connectors electronics etc. are mounted on the chassis using various fasteners. The chassis provides the required stiffness, protection, means of interface and thermal conduction to the package. Helical insert assembly is a critical operation in chassis fabrication and early detection of defective helical insert assemblies is very important. Finding and replacing a defective helical insert at the fabrication stage is easy, but replacing a defective helical insert after electronics assembly is difficult. Rework of defective helical inserts may not be possible after the assembly of electronics and hence may lead to rejection of the chassis with electronics. Some of the defects in the helical assembly include defective helical inserts causing damages to the screws while assembling and stuck in the hole. Tang may break while assembling the screw and fall inside the package which will result in electrical damages. Also tang may prevent the full engagement of screw.

Presently helical insert inspection is a manual process and 100 percent inspection is required. At present the inspection is carried out by assembling the helical inserts with screws and visual inspection is carried out under magnification. This purely depends on the skill of the opreator and is a labour intense and time consuming process. Hence, a fast and reliable method for the inspection of helical insert assemblies is proposed by using AI capability and vision technology.

By using AI and vision technology, the inside threaded area of the helical inserts will be inspected using a needle probe with camera head. The recorded images will be fed into a software having AI capability. This software will analyze the input images and will detect the defect. An initial database will be created and the defect detection capability of the system will be gradually improved based on the input images and its disposition made. This method not only improves the inspection speed, but also improves the quality of inspection with a huge database of defects for comparison and conitual improvement using AI.