Finite Element Analyses on Dynamic Responses of a Portable Instrument Subjected to Drop/Impact

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Abstract

Portable electronic products such as portable instruments are susceptible to drop impacts. Therefore the effects of impact and shock on the integrity of the instrument body as a whole and the internal components including the printed circuit board (PCB) are important reliability issues and hence need to be addressed. The impact orientation is one of the major factors that influence the dynamic responses of the instrument structure. This paper presents a study, using ANSYS/LS-DYNA, of drop/Impact responses of the body structure of commercially available portable measurement instruments. The instrument is set to free fall drop with three impact angles 0°, 45°, and 90°. The responses including the variations of stress and strain are evaluated on the housing cases and internal PCBs of the instrument. The results show that the subsequent impacts that follow the first impact also contribute noticeable influences to the structure of the instrument. The results of this study can be the bases for the design of drop concerns of general portable measurement instrument.

Keywords: Finite element analysis, Dynamic, Portable, Drop, Impact.

On Climbing Stairs for an Autonomous Vision-Guided Wheelchair Robot

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Abstract

In this paper a vision-guided technology is applied to our newly developed wheelchair robot for autonomous stair-climbing. In order to climb a flight of stairs automatically, a CCD system combining with a line laser mounted on this wheelchair robot is used to detect stairs. After performing the detection on the edges of steps and imagine processing, the captured image coordinates can be transformed into the real-world coordinates, and the required dimensions of steps are deduced. The corresponding rotational angles for the associated arms of the wheelchair robot are then calculated from the kinematics and one-step-ahead motion planning algorithm such that the autonomous vision-guided stair-climbing can be implemented reliably. Finally, the experiments validate that the wheelchair robot can climb stairs autonomously using the vision-guided technology.

Keywords: Wheelchair robot, Stair, Autonomous, Vision-guided.