

A delta-robot-based test bench for validation of smart products

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Abstract: With the development of new technologies, such as smart components, additive manufacturing or multi-materials, product performance tests play a decisive role in supporting effective design and product reliability. However, test machines are mostly designed to attend norms and perform standard tests, which requires a need for the development of new machines when dealing with new cutting-edge technologies or reliability of a specific product. Therefore, these test benches must be designed to be flexible and robust, in order to attend the highest number of possibilities for a certain kind of test and a range of different components. With this intent, an innovative test bench for high loads was here designed and constructed based on a delta-robot configuration. This configuration, which is commonly applied for high-speed kinematic systems, was adapted to apply high transverse loads in three axes while keeping a considerably large range of movement. Thereunto, dynamic simulations were conducted considering a hydraulic actuation and the robust control approach of Sliding Mode Control (SMC), which delivered satisfactory results. Finally, after mechanical design, construction and calibration, first tests were performed for a self-sensing suspension arm, where the load prediction ability of the component was analyzed and the ability of the developed system to test complicated components under multi-axial load was evaluated.

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