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Conceptualization and design of a compliant universal joint by kinematic analysis of universal joint

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A universal joint is basically a flexible pivot point that transmits power through rotational motion between two shafts having misaligned intersecting axes. Purpose of this research is to propose and design a compliant mechanism, by analyzing the universal joint. The common design consists of two yokes, having a single bend angle, arranged with a pinion at right angles. Compliant version enables the joint with two bend angles, in two different planes. So as to achieve the compliance over the universal joint, kinematic analysis of common universal joint has been done and the results are generalized. For a common U- joint, pinion- yoke revolute have angular motion specifically for every bend angles. An important aspect of these revolutes is that, while in action they never go through complete cycles. In other words, each of these revolutes revolves only few degrees around its axis before returning to its original position. This angular motion is well studied for different bend angle combination up to 30 degree in two different planes. Based on the results, revolutes' angular motions are generalized, and compliance over the common universal joint is achieved. This compliant mechanism can find its application as a tool holder that can create complex profiles along with rotational motion in the field of manufacturing, robotics, surgical instruments etc.

Biography

Jibin Jacob is an Assistant Professor of Machine Design, Department of Mechanical Engineering at the Mar Baselios College of Engineering and Technology, Trivandrum, India. His main research areas are computer aided design and analysis, elastocaloric cooling effect using shape memory alloys, mechanical system designing, advanced manufacturing techniques etc. Currently, his area of interest is specifically focused on elastocaloric cooling and design of compliant mechanisms.

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