



11th International Conference Interdisciplinarity in Engineering, INTER-ENG 2017, 5-6 October 2017, Tirgu-Mures, Romania

Experimental methods for determining compliant mechanisms microdisplacements

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Abstract

The present work approaches the experimental validation of a compliant mechanism movements. It had studied the movements using four methods: photo capture method, video capture method, optical sensor method and palpation method. The presentation of the four methods, the experimental results and their interpretation are found in this study.

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Peer-review under responsibility of the scientific committee of the 11th International Conference Interdisciplinarity in Engineering.

Keywords: measurements; methods of measures; tactile; sensor; video; images; compliant mechanism.

1. Introduction

In all branches of the technique, determining measurement plays an important role because designing, analyzing, manufacturing and then finally using any product cannot be considered without reference to this concept. Measurement is a comparison process. Because the measurements are so important, there is a wide range of instruments designed to accurately indicate the length and movement of an object. In order to determine the movement or a surface displacement, this work will be using the tools from measurement laboratories. Instruments used for measurement can be divided into two categories: contact and noncontact [16, 17]. The contact ones are by palpation, using a palpator device to reach the measured surface. In this category are the coordinate measuring machines called CMM [13, 14]. The noncontact ones are of optical nature, such as the microscope, camera, video

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camera. The image quality and then the software used to process the data are very important aspects of these methods. Also, in the noncontact category, laser sensors that are grouped in a certain order can give us data we can process and ultimately obtain the displacement of the object, the surface [4, 11]. In the actual study, the movement of a compliant mechanism will be analyzed. The compliant mechanism is a two-degree mobility pentalater shown in figure 1. It will be also studied the movement of the final effector $P(x, y)$, formed by a circle situated on a semicircle of the compliant mechanism [6, 7, 8, 9, 10].

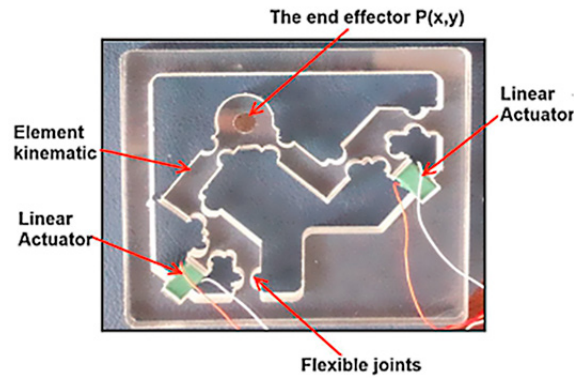


Fig. 1. The compliant mechanism.

2. Methods of determining the movements used in the study

The present work points out four methods of displacement measurements applied to the compliant mechanism, such as: photo acquisition method, video acquisition method, optical sensors method and palpation method. It will give then details about the methods and the stands made for the experimental measurement determination [1, 2, 3].

2.1. The snapshot method

This method determines the mechanism movement by capturing a photo image [2]. Using a microscope that has a camera on the eyepiece, it can zoom in on the area of interest, namely the final effector, and capture images while the mechanism is in motion. Figure 2 shows the experimental stand used to determine movement in the mechanism.

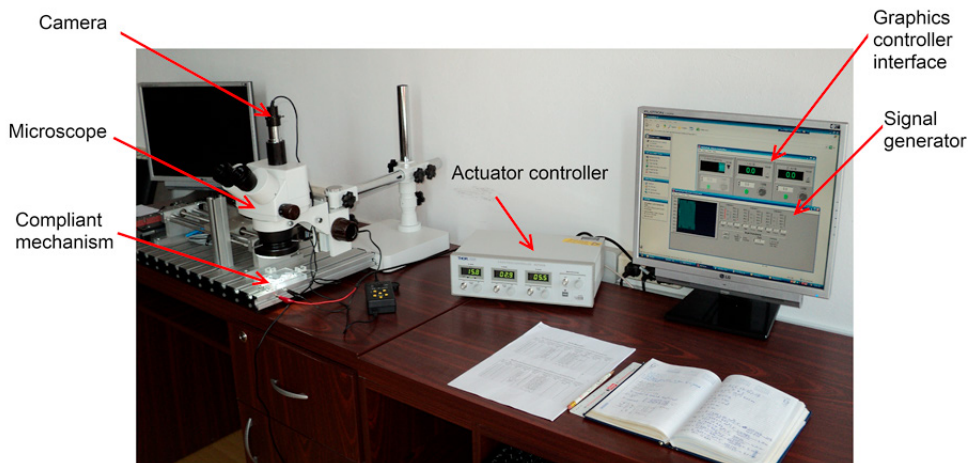


Fig. 2. The experimental stand.

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