

An Innovative 3D Ultrasonic Actuator with Multidegree of Freedom for Machine Vision and Robot Guidance Industrial Applications Using a Single Vibration Ring Transducer

M. Shafik^{1,*}, B. Nyathi¹ and S. Fekkai²

¹School of Technology, University of Derby, Derby, UK, DE22 2UA.

²Technology Division, Pera Innovation Ltd, Melton Mowbray, UK, LE13 0PB.

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Abstract

This paper presents an innovative 3D piezoelectric ultrasonic actuator using a single flexural vibration ring transducer, for machine vision and robot guidance industrial applications. The proposed actuator is principally aiming to overcome the visual spotlight focus angle of digital visual data capture transducer, digital cameras and enhance the machine vision system ability to perceive and move in 3D. The actuator Design, structures, working principles and finite element analysis are discussed in this paper. A prototype of the actuator was fabricated. Experimental tests and measurements showed the ability of the developed prototype to provide 3D motions of Multidegree of freedom, with typical speed of movement equal to 35 revolutions per minute, a resolution of less than 5 μ m and maximum load of 3.5 Newton. These initial characteristics illustrate, the potential of the developed 3D micro actuator to gear the spotlight focus angle issue of digital visual data capture transducers and possible improvement that such technology could bring to the machine vision and robot guidance industrial applications.

Keywords: 3D ultrasonic actuator, machine vision, robot guidance, mechatronics

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* Corresponding author. E-mail address: m.shafik@derby.ac.uk

Tel.: +44 (0) 1332593170; Fax: +44 (0) 1332622739

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