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A Development of Human Machine Interface in a Miniature 3-Axis Milling Machine Prototyping

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Keywords: human machine interface, 3-axis milling machine, virtual and physical prototype

Abstract. This paper presents a development of human machine interface (HMI) which was applied to a miniature 3-axis milling machine prototyping. The development began with the study and design of a milling machine. Then, virtual prototyping, this stage is the integration of aided design, programming design, and simulation design to demonstration the functionality of the virtual machine in a computer environment. After that, the virtual prototype which was verified and optimized to be used a physical prototyping. Finally, links the virtual and physical together. The experimental results show that a performance of proposed HMI in a machine prototyping was satisfactory.

Introduction

Milling is the machining process of using rotary cutters to remove material from a work piece advancing in a direction at an angle with the axis of tool. It is one of the most commonly used processes in industry and machine shops today for machining parts to precise sizes and shapes [1]. With the dramatic increase of the growing demand of miniature product, therefore, current industry practice tends to downsize the milling machine used to produce small volume objects, small machine for small products. However, the study of past research, which involved a miniature milling machine [2-5] that most often designed without simulation functionality to visualize and customize before creating the real machine. Moreover, such research is often used comercial motion controller which makes the lack of flexibility and the high cost in the design and development.

To enhance performance and efficiency in machine prototyping, therefore, this research aims to develop a HMI which was applied to a miniature 3-axis milling machine prototyping. For this project will be focus on the combination of SolidWorks with LabVIEW and the NI SoftMotion module that used for virtual and physical prototyping. The process of a 3-axis milling machine developing and the link between virtual and physical prototype to HMI is presented in Fig. 1. The development process consists of four main steps: design of machinary, configuration control, design and simulation of systems, make machine and test work. The whole process will work in harmony together which details are discussed in the following order.

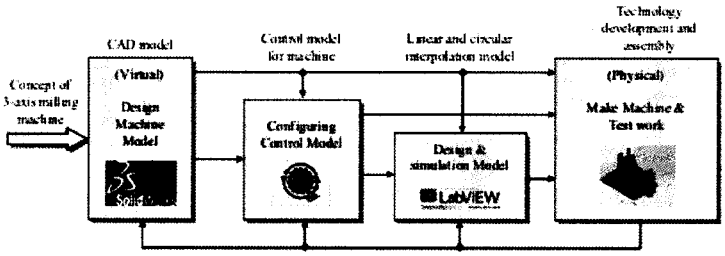

Fig. 1 The process of development of HMI in machine prototyping.

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