

## **INFORMATION OF DOCTORAL DESSERTATION**

Title of thesis: **Research an error compensation solution for the bridge coordinate measuring machine**

Sector: **Manufacturing engineering**

Major code: **62520401**

PhD candidate name: **Pham Hong Thanh**

Scientific supervisor: **Assoc-Prof. Ph.D Thai Thi Thu Ha**

Education Organization: **University of Technology, Vietnam National University Ho Chi Minh City**

### **1. DESSERTATION SUMMARY**

Trends finishing machinery and equipment is to improve productivity and quality, coordinate measuring machine isn't out of this rule. To improve productivity traverse speed of the machine should be increased as close as possible speed limit. When measuring at high speed (high acceleration), inertial forces appear and bring about CMM's components, such as links, joints (especially joints) to be impacted. Joints are prismatic formed from air bearings that mounted between the carriage and the slide-way. Because of the air bearing's property, joints are deformed under inertial forces. The deceleration measurements contradict trend productivity growth of coordinate measuring machines so must accept the fact that the acceleration caused by high travelling speed. Based on analyses of the design, manufacture and use of materials, control, error compensation of the researches were published, an error compensation solution was chosen to improve the accuracy of CMMs. The thesis consists of 4 chapters, they are:

- Chapter 1 Overview of coordinate measuring machines
- Chapter 2 Study and investiga about displacements of joints on the coordinate measuring machine while inertia forces affect
- Chapter 3 Build up a mathematical model to compensate errors of the bridge coordinate measuring machine
- Chapter 4 Experimental study evaluated the accuracy of the measurement results

after error compensating for the coordinate measuring machine

Concludes and further research of the dissertation

## **2. CONTRIBUTIONS OF DESSERTATION**

+ The thesis has contributed to the theory of error compensations for coordinate measuring machines.

+ A analysis method combined with using sensors in experiments has been used to offline compensate for coordinate measuring machines.

+ Displacements of prismatic joints (random errors) have been studied with the applied regression analysis.

+ A new mathematical model has been found out to compensate coordinate measuring machines' errors caused by displacements of prismatic joints and a procedure to calip coordinate measuring machine has been built too.

## **3. APPLIED AND THEORETICAL IMPLICATIONS**

Based on the mathematical model is built, a software used to compensate and calibrate for coordinate measuring machines has been written and is used to calibrate the accuracy of the bridge coordinate measuring machine manufactured in Viet Nam.

## **4. FURTHER RESEARCH OF DESSERTATION**

The error compensation solution for coordinate measuring machines built can be considered applicable to other forms of coordinate measuring machines or devices that have air bearings.

To facilitate the performance and implementation of error compensation, the relationship between joint displacements when inertial forces affect can be studied in order to be able to perform all of the joint displacements in the same function.

**Supervisor**

Thai Thi Thu Ha

*Assoc-Prof. Ph.D*

**Ph.D. candidate**

Pham Hong Thanh