聯網切削模擬技術與應用

Networked Cutting Simulation Technology and Application

高永洲
國立中正大學
前瞻製造系統頂尖研究中心 研究員
機械工程學系 教授

關鍵詞(Keywords)

- 切削模擬 Cutting Simulation
- 工具機 Machine Tools
- 聯網 Networked

摘要(Abstract)

電腦數值控制(CNC)工具機使用的數值控制(numerical control, NC)程式通常是藉由使用CAD/CAM軟體或由技術熟練人員產生，而該NC程式之正確性驗證則是安全切削的重要一環。就目前之技術現況而言，大多數CAD/CAM軟體均能具備驗證其刀具路徑以及衍生之NC程式之切削正確性，然而，當NC程式上傳到CNC工具機之控制器之後，若因故更改了NC程式，使用CAD/CAM軟體或商用NC程式驗證軟體(例如Vericut)驗證變動過之NC程式的正確性，其流程將變得不順暢，因此，直接驗證即將被使用於實際加工之CNC控制器裡面的NC程式，變成逐漸被重視的實務需求。

隨著資通訊(information and communication technology, ICT)技術環境以及CNC控制器之聯網功能的普及，直接與CNC控制器透過網路連通不再是遙不可及。例如FANUC控制器可以透過FOCAS 2聯網、海得漢控制器可以透過其RemoTools SDK聯網、三菱控制器可以透過其CNC Communication聯網而研華寶元控制器可以透過其ReconLib聯網，因此，本文聚焦於探討整合聯網技術以及切削模擬技術之可行性，並實作聯網NC程式切削模擬技術，期能進一步瞭解此整合技術應用之實務可行性。

The Numerical Control (NC) program used in a Computer Numerical Control Machine Tools is generally generated by off-the-shelf CAD/CAM software or created by a CNC operator manually. The correctness check of the NC code is a guarantee of machining accuracy. Most CAD/CAM software has been facilitated with the capability to check the correctness of its own generated NC code. However, if changes need to be conducted after the NC code has been uploaded to the CNC controller, verification of the revised NC code by the original CAD/CAM software is not convenient. Therefore, verification of the NC code in the CNC controller has been paid more attention practically.

The rise of Information and Communication Technology (ICT) makes the CNC controller no longer out of reach. For example, FANUC CNC can be networked through FOCAS 2 SDK, Heidenhain Programming Station can be connected based on RemoTools SDK, Mitsubishi CNC can communicate through CNC Communication Application Programming Interface, and A-LNC CNC is connected by ReconLib. In order to better understand the practicality of this technology, this article discusses the feasibility of cutting simulation and network implementation of cutting NC programs.

1. Introduction

With more and more focus on enhancing machine tools towards Industry 4.0 and/or intelligent machinery, precision and worry free machining has become one of the major issues in industrial machining application practices. This has resulted in the increasing demands on tackling workpiece complexity and toolpath verification via value-adding applications and high-level machine tool capabilities. Furthermore, with the facts that Taiwan has been one of the major Machine Tool exporters consecutively in these years, how to keep pace with the world machine tool advanced application and maintain a world-wide prosperous CNC machine tool industry is very important. However, traditional CNC machine tool has long learning curve and toolpath verification with 3D solid cutting simulation functions are not necessarily supported by either the machine tool builder (MTB) or its computer numerical control (CNC) controller maker partners. This has resulted in long demands of a toolpath verification system such as the Vericut^{TM} software system [1]. For example, VericutTM has been welcomed and adopted successfully by the CNC machine tool users for verifying toolpath in the format of either cutter location file or NC code program. The reasons were aiming for “Right the first time” and/or “Quick first part” based on “CNC Simulation”. The popularity of toolpath verification software has therefore greatly encouraged toolpath simulation and verification system research and development resulted from its expensive cost and the pursuit of increasing global

更完整的內容

請參考【機械工業雜誌】404 期・105 年 11 月號

每期 220 元・一年 12 期 2200 元

劃撥帳號：07188562 工業技術研究院機械所

訂書專線：03-591-9342

傳真訂購：03-582-2011

機械工業雜誌官方網站：www.automan.tw

機械工業雜誌信箱：jmi@itri.org.tw