

## Machining Process & Information Modeling Based on MBD Procedure Machining Cell

Linlin Liu<sup>1,2</sup>, Rong Mo<sup>1</sup>, Neng Wan<sup>1</sup>

<sup>1</sup>The key laboratory of Contemporary Design and Integrated Manufacturing Technology, Northwestern Polytechnical University, Xi'an, 710072, Shannxi, China. E-mail: liulinlin1978@gmail.com, morong@nepu.edu.cn, wan-neng@nepu.edu.cn

<sup>2</sup>Institute of Printing and Packing Engineering, Xi'an University of Technology, Xi'an, 710048, Shannxi, China. E-mail: liulinlin1978@gmail.com

To describe the machining process and information of mechanical parts in petroleum engineering, the paper defines MBD machining process model from the perspective of process parts; analyzes evolutionary law of geometric features information in the course of part machining process and creates the concept of procedure machining cell; makes clear description about machining process based on procedure machining cell sequence to achieve the expression of machining process information; analyzes geometric features of procedure machining cell, proposes extended AAG based on AAG by combing with examples and links with attribute information table to complete the modeling of geometric and non-geometric features information about procedure machining cell. The research made in this paper provides a basic framework for integration of process information in 3D CAPP system.

**Keywords:** MBD, Machining process, Procedure machining cell, Information modeling

### Acknowledgement

*The author gratefully acknowledges the support of the National Natural Science Foundation of China (Grant No.51375395), China Postdoctoral Science Foundation (2014M552484), Natural Science Foundation of Shaanxi Province (2014JM8334), Science Foundation of Shaanxi Educational Department (Natural Science 2013jk0996), and Science Foundation of Xi'an University of Technology (104-211106).*

### References

- [1] IJOMAH, W. A. (2002). *Model-based definition of the generic remanufacturing business process*.
- [2] LU, H., HAN, S., FAN, Y. (2008). Model Based Digital Definition Technology. In: *Aeronautical Manufacturing Technology*, No.3, pp.78-81. BAMTRI. Beijing.
- [3] KUNDRAK, J., RACZKOVI, L., GYANI, K., DESZPOTH I. (2014). A Method for Planning the Cutting Ability of CBN Tools. In: *Manufacturing Technology*, Vol.14, No.2, pp.206-213. J. E. Purkyne University. Usti nad Labem.
- [4] LIU, L., MO, R., WAN, N. (2013). A MBD procedure model based on machining process knowledge. In: *International Journal of Applied Mathematics and Statistics*, Vol. 51, No.23, pp. 317-324. CESER Publications, Roorkee.
- [5] WAN, N., LIU, L. (2012). A New Method of 3D Machining Procedure Model Creation Based on Process Knowledge. In: *Information-An International Interdisciplinary Journal*, Vol.15, No.11, pp.4627-4632, International Information Institute, Tokyo.
- [6] FENG, G., LIANG, Y., YU, Y. (2011). Data Organization and System Implementation of Model Based Definition. In: *Aeronautical Manufacturing Technology*, No. 9, pp.62-66. BAMTRI. Beijing.
- [7] QUINTANA, V., RIVEST, L., PELLERIN, R. (2010). Will Model-based Definition replace engineering drawings throughout the product lifecycle? A global perspective from aerospace industry. In: *Computers in Industry*, Vol.61, No.5, pp. 497-508. ELSEVIER. Amsterdam.
- [8] ALEMANNI, M., DESTEFANIS, F., VEZZETTI, E. (2011). Model-based definition design in the product lifecycle management scenario. In: *The International Journal of Advanced Manufacturing Technology*, Vol.52, No.1, pp.1-14. Springer. London.
- [9] WAN, N., CHANG, Z., MO, R. (2011). Three-dimensional new mode of machining process planning. In: *Computer Integrated Manufacturing System*, Vol.17, No.9, pp.1873-1879. CIMS. Beijing.
- [10] TIAN, F., TIAN, X., GENG, J. (2012). Model-based definition process information modeling and application. In: *Computer Integrated Manufacturing System*, Vol.18, No.5, pp.913-919. CIMS. Beijing.
- [11] LUO, W., TONG, B. (2010). Model Based Technology of Aircraft Process Planning, Verification and Execution. In: *Aeronautical Manufacturing Technology*, No.18, pp.10-16. BAMTRI. Beijing.

- [12] LIU, J. (2013). The significant changes of product development mode promoted by the three-dimensional digital design and manufacturing technology. In: *Sciencepaper Online*, 201305-146. <http://www.paper.edu.cn/releasepaper/content/>
- [13] DOU, G., MO, R., WAN, N. (2012). Expression and Integration Technology of Three-Dimensional CAPP Process Information. In: *Aeronautical Manufacturing Technology*, No.7, pp. 20-21. BAMTRI. Beijing.
- [14] FENG, T., WANG, Z., MENG, J. (2012). Application and Development of MBD in Digital Collaborate Manufacturing. In: *Journal of Nanjing University of Aeronautics & Astronautics*, Vol.44, No.B04, pp.132-137.NJU.Nanjing.
- [15] CUNNINGHAM, J., DIXON, R. (1988). Designing with features: the origin of features. In: *Proceedings of the 1988 ASME International Computers in Engineering Conference and Exhibition*, No.1, pp.237-243.ASME.New York.
- [16] VASILKO, K. (2015). The Influence of Shift on Machined Surface Microgeometry and Its Use. In: *Manufacturing Technology*, Vol.15, No.1, pp.109-116. J. E. Purkyne University. Usti nad Labem.
- [17] LIU, Z., WANG, L. (2007). Sequencing of interacting prismatic machining features for process planning In: *Computers in Industry*, Vol.58, No.4, pp.295-303. ELSEVIER. Amsterdam.
- [18] LIU, W., GU, L., CHANG, W., (2001). An AAG-Based Method of Machining Feature Recognition. In: *Computer Integrated Manufacturing System*, Vol.7, No.2, pp.53-58.CIMS. Beijing.
- [19] BÍLEK, O., ROKYTA, L., ŠIMONÍK, J. (2012). CAM in the Production of Casting Patterns. In: *Manufacturing Technology*, Vol.12, No.12, pp.7-12. J. E. Purkyne University. Usti nad Labem.
- [20] LU, Y., LI, Y. (2009). A feature recognition technology of complex structural parts based on re-extended attributed adjacency graph. In: *Machinery Design & Manufacture*, No.5, pp.236-238.JSYZ. Shenyang.
- [21] YIN, R., TAO, Y., XIE, R. (2001). *Data structure (using object-oriented method and described in C++)*, pp.262-263.Tsinghua University Press, Beijing.
- [22] LATTNER, M., HOLESOVSKY, F. (2014). Effect of Machining the Load Capacity Notched Components. In: *Manufacturing Technology*, Vol.14, No.1, pp.47-50. J. E. Purkyne University. Usti nad Labem.

---

**Paper number: M201530**

Copyright © 2015. Published by Manufacturing Technology. All rights reserved.