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Evolutionary Design for Intelligent Design and Manufacture
- A Computer-Automated Design (CAutoD) in the Digital Age

Yi Chen[1], Yun Li[2], Hongnian Yu[3], Erfu Yang[4], Housheng Hu[5]

[1]School of Computer Science and Network Security, Dongguan University of Technology, Dongguan 523808, China. Email: leo.chen@ieee.org
[2]School of Engineering, University of Glasgow, Oakfield Avenue, Glasgow G12 8LT, UK Email: Yun.Li@glasgow.ac.uk
[3]Faculty of Sciences & Technology, Bournemouth University, Talbot Campus, Poole BH12 5BB, UK. Email: yuh@bournemouth.ac.uk
[4]University of Strathclyde, Department of Design, Manufacture and Engineering Management, Glasgow G1 1XJ, UK. Email: erfu.yang@strath.ac.uk
[5]School of Computer Science and Electronic Engineering,University of Essex, Colchester CO4 3SQ, UK. Email: hhu@essex.ac.uk

Design and manufacture are essential to the UK economy and reflect one of the most innovative and creative activities of UK business. A rising demand of design has been seen in the requirement of increased efficiency, reduced costs, and manufacturing flexibility. The design and manufacture are driven by technological innovation and intellectual ingenuity. For this, Computer-Automated Design (CAutoD) promises many benefits, including higher flexibility, improved efficiency (in design, manufacture and energy use), and improved design quality. However, there are many challenges to be overcome before concepts and creativity can become commercial designs for manufacture.

An increasing requirement of improving design efficiency, shortening the product's time to market, enhancing design and manufacture flexibility and cost-cutting has been witnessed. To address this issue, derived from the CAutoD, this project uses a computational intelligence assisted design and manufactur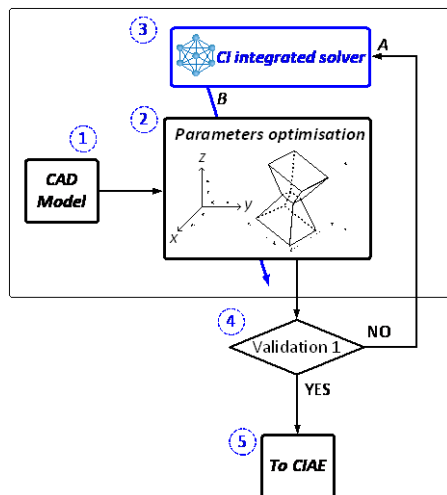e (CIAD) framework[1] to develop a 'push button' solution to design automation suitable for future smart manufacture. As a result, such a smart design process will shorten the design-manufacture cycle to: mining demand data > cyber-physical push button solution > end-user, and will hence elevate industrial competitiveness by an order of magnitude. With CIAD, smart designs can then seamlessly integrate mass-networked computational elements to control physical entities for smart manufacturing, transferring potential products from state-of-art to state-of-practice and assisting the next generation of design and manufacture.

Computational intelligence(CI) is a set of nature-inspired approaches which offers a wealth of capability for complex problem solving. Compared to the traditional optimisation methods, CI does not need to reformulate the problem in order to search a non-linear or non-differentiable space. This feature is particularly appealing if an explicit objective function is difficult to obtain, specially in the real-world applications.

Figure 1: CIAD framework[1]

References

[1] Yi Chen, Yun Li, (2017), Computational Intelligence Assisted Design (In the Era of Industry 4.0), CRC Press (ISBN 978-1-4987-6066-9)