



Dongxu WU

Technology centre: Irish Manufacturing Research (IMR)

Academic Mentor: Prof. Fengzhou Fang, University College Dublin

Commercial Partner: DePuy Ireland Unlimited Company

Commercial Mentor: Paul Evans, Szymon Baron

Dr Dongxu Wu has more than 8 years of engineering and research experience in precision/ultra-precision manufacturing technology. Dongxu Wu received his bachelor degree (Mechanical Design, Manufacture and Automation) in 2009 from Yanshan University and obtained his master degree (Mechanical and Electronic Engineering) in 2011 and PhD degree (Mechanical Manufacture and Automation) in 2016, both from Harbin Institute of Technology. His area of interest includes diamond turning of optical molds, ultra-precision machining of freeform surfaces and microstructured surfaces, bio-medical implants manufacturing, on-line measurement and monitoring of surface topography and tool wear. He is currently a post-doctoral research fellow at the Centre of Micro/Nano Manufacturing Technology (MNMT-Dublin), University College Dublin. He has published 8 technical papers, filed 2 patents, delivered 2 oral presentations at international conferences. He also co-supervised 2 master students and acted as an International Journal's reviewer.

Prof. Fengzhou Fang

Prof. Fengzhou Fang has over 30 years' experience in manufacturing science and technology. He has set up the Centre of Micro/nano Manufacturing Technology (MNMT) at Tianjin University in 2005, which has been recognised as a leading manufacturing research organization in the world. Prof. Fang was appointed as the SFI chair professor in precision manufacturing of UCD in 2016. As a world-renowned expert in manufacturing research and innovation, Prof. Fang has a remarkable track record in both academic research outcomes and industrial collaborations. He is a Recipient of SME Albert M. Sargent Progress Award, the Founding President of ISNM, and the editor-in-chief of Nanomanufacturing and Metrology. He served as a Council Member of CIRP, the Chairman of the CIRP Manufacturing Curriculum Committee, and the Vice Chairman of IMCC Steering Committee. Prof. Fang is Fellow of ISNM, SME, and CIRP.

Paul Evans / Szymon Baron

Paul Evans has over 20 years' experience in high volume manufacturing, holding leadership roles in both Engineering and Operations. The last 14 years have been spent in the highly regulated medical device sector. Paul currently leads the Machining team within Operations Technology Development at DePuy Ireland UC with responsibilities for global standardisations and technology & system innovations in the machining space. Paul has a B.E.(Hons) in Mechanical Engineering, a MEngSc and a MBA.

Szymon Baron is the technical day-to-day contact point for the Fellow. Szymon joined DePuy Ireland UC as a project engineer in the Machining team having completed a PhD co-funded by Enterprise Ireland and DePuy Ireland UC at University College Dublin. Szymon leads a portfolio of new technology projects across the 28 sites and serves as an industry mentor to PhD and Post-Doctoral researchers in existing and new academic collaborations.

Irish Manufacturing Research (IMR)

IMR is a leading manufacturing Research and Technology Organisation with labs and industrial pilot lines in Dublin and Mullingar, Ireland. IMR works with leading global and indigenous brands to de-risk and de-mystify new and emerging technologies and to deliver high impact collaborative research to enable global leadership in advanced manufacturing. IMR has over 60 researchers with 100's years of combined Industry Expertise working in areas such as Design for Manufacturing, Digitisation, Automation and Control, Sustainable Manufacturing and IIoT. IMR activities span national and European research collaborations, prototyping services, training and Industry networks.

DePuy Ireland Unlimited Company

The DePuy Synthes Companies are part of the Johnson & Johnson Family of Companies. Today, DePuy Synthes, parent company of DePuy (Ireland) Unlimited, employs approximately 18,000 people across 60 countries. DePuy Synthes offer the world's most comprehensive portfolio of orthopaedic and neuro products and services for joint reconstruction, trauma, spine, sports medicine, neuro, cranio-maxillofacial, power tools and biomaterials. These products are distributed and implanted across the world served by a global manufacturing network which spans North America, Europe (UK, Ireland, Switzerland & Germany) and Asia.

DePuy Synthes established a manufacturing facility in Ringaskiddy, Cork in 1997 that is focused on joint reconstruction. Today, the Cork facility is the largest manufacturing plant in the company and also houses an Innovation Centre and Global Supply Chain Centre.

Dongxu's project

“Development of on-line surface micro-topography measurement and tool wear monitoring system in precision/ultra-precision machining of freeform components”

Freeform surfaces can be defined as surfaces with no axis of rotational invariance and may appear to have an arbitrary shape, and regular or irregular surface structures. Ultra-precision freeform surface possesses sub-micrometric form accuracy and nanometric surface finish.

As freeform components can offer the advantages of higher optical quality, more comfortable visual experience, smaller optical systems, lower cost of imaging and display instruments, freeform components have played an increasingly significant role in the fields of new energy, illumination, aerospace, and biomedical engineering. However, due to the geometry complexity and high-precision requirement, there are still many challenges for the manufacturing and measurement of freeform components.

This proposed research is focused on the development of on-line surface micro-topography measurement and tool wear monitoring system in precision/ultra-precision machining of freeform components. The optical properties of the machined surface will be investigated and the mapping relationship between the surface topography and interference characteristics under different tool-wear conditions will be established.
