Research project and supervisory team

Supervisory Team	Principle supervisor: Bingjian Liu (Bingjian Liu - University of Nottingham Ningbo China) Co-supervisor: Yoke-Chin Lai (Yoke Chin Lai - University of Nottingham Ningbo China) Co-supervisor: Guang Li (Guang Li - University of Nottingham Ningbo China)
Short introduction & description of research project	**Enhancing Passenger Safety and Comfort through Multimodal Seat Design in Autonomous Vehicles** **Summary** The emergence of autonomous vehicles (AVs) is transforming transportation by shifting focus from driving to passenger experience. While current AV research emphasizes external systems like navigation and traffic management, the interaction between passengers and the vehicle interior remains underexplored. This study proposes to investigate multimodal seat design in AVs, integrating sound, light, and tactile feedback to improve passenger safety, comfort, and trust in driverless mobility. The need for this research stems from the rise of fully autonomous vehicles, which eliminate the role of the driver and convert all occupants into passengers. This raises important questions about how passengers interact with the vehicle, especially regarding trust, comfort, and engagement. Vehicle seats, as a central part of the cabin, present an opportunity to incorporate multimodal technologies that can alleviate issues like motion sickness, discomfort, and lack of situational awareness. Recent studies emphasize the role of multimodal interaction in AV seat design, highlighting how attention, duration, and sensory integration affect passenger comfort. Deep learning and AI-driven systems are also being explored to enhance passenger security and in-vehicle experiences. This project will adopt a mixed-methods approach, combining prototype development, simulated environment testing, and user evaluations to assess how passengers respond to multimodal seating. Expected outcomes include a clearer understanding of passenger needs in AVs, innovative seat concepts that promote trust and safety, and practical design guidelines for automakers and mobility service providers. The study aims to advance human-centered design in autonomous mobility, ensuring passenger well-being remains central to the development of driverless vehicles.
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Short introduction & description of research project	CoNiCrAlY coatings are widely used to protect high temperature components in gas turbine engines due to their excellent oxidation resistance. Currently, single-layer CoNiCrAlY coating is facing challenges in meeting the continuous demands of increasing turbine inlet temperatures, due to its limited composition range. Development of novel multi-layer and compositional-graded CoNiCrAlY coating system with promising microstructure, oxidation performance and mechanical characteristics is necessary to tackle these challenges. Meanwhile, conventional CoNiCrAlY coatings that are prepared by thermal spraying usually exhibit high porosity with limited bonding, which significantly degrades the mechanical performance of the CoNiCrAlY coating system. Laser powder bed fusion (LPBF) appears of great potential to manufacture compositional-graded and defect-free CoNiCrAlY coatings, which allows enhanced oxidation lifetime and mechanical performance to be achieved. Therefore, this proposed research aims to design and develop novel multi-layer and compositional-graded CoNiCrAlY coatings with desirable phase distribution, oxidation resistance and mechanical performance. The composition and phase equilibria of CoNiCrAlYs will be evaluated by thermodynamic modelling to design compositional-graded CoNiCrAlY coatings. Subsequently, the microstructure and high temperature oxidation behaviour of LPBF-fabricated CoNiCrAlY/IN718 system is examined to elucidate the element interdiffusion mechanism of compositional-graded CoNiCrAlY coatings. Lastly, the mechanical performance will be studied to reveal the effects of phase boundaries and interfacial bonding on the crack propagation mechanism of the multi-layered CoNiCrAlY/IN718 system. This project aims to design, fabricate and characterise the microstructure, oxidation behaviour and mechanical characteristics of the LPBF-fabricated multi-layer and compositional-graded CoNiCrAlY/IN718 system, in an attempt to provide an enhanced lifetime for gas turbine components.
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