Fei Shen

Personal Information

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Date of Birth: Nov. 10, 1986
Native Place: Hubei Province, China
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Education and Work Experience

- **Research Fellow** 3/2016 ~ present
  Nanyang Technological University (NTU), Singapore
- **Ph.D.** in **Solid Mechanics** 9/2009 ~ 01/2016
  School of Aeronautic Science and Engineering, Beihang University, Beijing, China
  Thesis: Continuum damage mechanics approach on fretting fatigue of metallic components
  Supervisor：Prof. Meng Qingchun
- **B.E.** in **Aerospace Engineering** 9/2005 ~ 7/2009
  School of Astronautics, Beihang University, Beijing, China
  Top 9/93 Postgraduate recommendation

Research Interests

- **3D printing**
  - selective laser sintering
  - 3D printed auxetic structures
- **Fatigue and wear**
  - Fretting fatigue and wear
  - Rolling contact fatigue
  - Fatigue crack initiation and propagation behavior
  - Fatigue lifetime prediction
- **Continuum damage mechanics**
  - Damage evolution model
  - Cyclic constitutive models of metallic and polymeric materials

Research Experience

- **Industrial additive manufacturing: work package 5 (Selective laser sintering)** 3/2016 ~ present
  Research Fellow at NTU, Singapore
  - Modeling of selective laser sintering process
  - Optimization of selective laser sintering process parameters
  - Experimental and numerical investigation on the energy absorption of 3D printed auxetic structures

under quasi-static compression and impact

- **Fretting fatigue crack initiation behavior using damage mechanics approach** 6/2012 ~ 10/2015

  Sponsor: National Natural Science Foundation of China (Grant number: 11002010)

  - Finite element analysis of contact and subsurface stresses in fretting contact
  - Evaluation of the effect of wear on stresses and fretting fatigue life
  - Development of the wear-coupled elasto-plastic damage model for fretting fatigue through the combination of the damage-coupled elasto-plastic constitutive model, the damage evolution model and the wear model
  - Finite element implementation of the model for fretting fatigue life prediction using user subroutines in ABAQUS
  - Investigation of the effects of the wear coefficient, slip amplitude, stress gradient on fretting fatigue life

- **Fatigue life prediction of notched specimens** 8/2013 ~ 12/2014
  - Stress-strain response at the notch tip using damage-coupled elasto-plastic constitutive model
  - Fatigue damage accumulation by adopting two kinds of damage evolution models
  - Fatigue life prediction of notched specimens
- **Fatigue life prediction of riveted lap joints in aircraft structures** 8/2011 ~ 6/2012
  - Finite element analysis of contact stresses in joints
  - Development of fatigue damage evolution model and parameter determination
  - Fatigue life prediction using APDL in ANSYS

Academic qualification

- Process modeling and parameter optimization of selective laser sintering
- Strong background on solid mechanics, damage mechanics, fatigue theory, fretting fatigue and wear
- Expertise in finite element analysis and finite element software packages ABAQUS, ANSYS
- Excel at the constitutive models of cyclic plasticity and the finite element implementation in ABAQUS
- Excel at C/C++, Fortran, MATLAB and Python programming

Publications

Journal Papers

1. **Fei Shen**, Weiping Hu, Qingchun Meng. A damage mechanics approach to fretting fatigue life prediction with consideration of elastic–plastic damage model and wear, *Tribology International*, 82, 176-190, 2015.
2. **Fei Shen**, Weiping Hu, George Z. Voyiadjis, Qingchun Meng. Effects of fatigue damage and wear on fretting fatigue under partial slip condition. *Wear*, 338-339, 394-405, 2015.
3. **Fei Shen**, George Z. Voyiadjis, Weiping Hu, Qingchun Meng. Analysis on the fatigue damage evolution of notched specimens with consideration of cyclic plasticity. *Fatigue & Fracture of Engineering Materials & Structures*, 38, 1194-1208, 2015.
4. **Fei Shen**, Weiping Hu, Qingchun Meng. New approach based on continuum damage mechanics with simple parameters identification to fretting fatigue life prediction. *Applied Mathematics and Mechanics*, 36(12), 1539-1554, 2015.
5. **Fei Shen**, Weiping Hu, Qingchun Meng, Miao Zhang. A new damage mechanics based approach to

fatigue life prediction and its engineering application. *Acta Mechanica Solida Sinica*, 28(5), 510-520, 2015.

6. **Fei Shen**, Weiping Hu, Qingchun Meng. A non-local approach based on the hypothesis of damage dissipation potential equivalence to the effect of stress gradient in fretting fatigue. *International Journal of Fatigue*, 90, 125-138, 2016.
7. **Fei Shen**, Shangqin Yuan, Yanchunni Guo, Bo Zhao, Jiaming Bai, Mahan Qwamizadeh, Chee Kai Chua, Jun Wei, Kun Zhou. Energy Absorption of Thermoplastic Polyurethane Lattice Structures via 3D Printing: Modeling and Prediction. *International Journal of Applied Mechanics*, 8(7), 164006-1, 2016.
8. **Fei Shen**, Bo Zhao, Lin Li, Chee Kai Chua, Kun Zhou. Fatigue damage evolution and lifetime prediction of welded joints with the consideration of residual stresses and porosity. *International Journal of Fatigue*, 103, 272-279, 2017.
9. **Fei Shen**, Shangqin Yuan, Chee Kai Chua, Kun Zhou. Development of process efficiency maps for selective laser sintering of polymeric composite powders: Modeling and experimental testing. *Journal of Materials Processing Technology*, 254, 52-59, 2018.
10. **Fei Shen**, Kun Zhou. Modeling of thermal response in fretting sliding with the consideration of plastic dissipation, surface roughness and wear. *Tribology International*. (Under review)
11. Pamela Lin, **Fei Shen**, Alfred Yeo, Bo Liu, Ming Xue, Huan Xu, Kun Zhou. Characterization of interfacial delamination in multi-layered integrated circuit packaging. *Surface and Coatings Technology*, 320, 349-356, 2017.
12. Shangqin Yuan, **Fei Shen**, Jiaming Bai, Chee Kai Chua, Jun Wei, Kun Zhou. 3D soft auxetic lattice structures fabricated by selective laser sintering: TPU powder evaluation and process optimization. *Materials & Design*, 120, 317-327, 2017.
13. Bo Zhao, **Fei Shen**, Yi Cui, Kun Zhou. Damage analysis for an elastic-plastic body in cylindrical contact with a rigid plane. *Tribology International*, 115, 18-27, 2017.
14. Ying Sun, Weiping Hu, **Fei Shen**, Qingchun Meng, Yuanming Xu. Numerical simulations of the fatigue damage evolution at a fastener hole treated by cold expansion or with interference fit pin. *International Journal of Mechanical Sciences*, 107, 188-200, 2016.
15. Zhixin Zhan, Weiping Hu, **Fei Shen**, Qingchun Meng, Jing Pu, Zhidong Guan. Fatigue life calculation for a specimen with an impact pit considering impact damage, residual stress relaxation and elastic-plastic fatigue damage. *International Journal of Fatigue*, 96, 208-223, 2017.
16. Ying Sun, George Z. Voyiadjis, Weiping Hu, **Fei Shen**, Qingchun Meng. Fatigue and fretting fatigue life prediction of double-lap bolted joints using continuum damage mechanics-based approach. *International Journal of Damage Mechanics*, 26(1), 162-168, 2016.
17. Jiaming Bai, Shangqin Yuan, **Fei Shen**, Baicheng Zhang, Chee Kai Chua , Kun Zhou, Jun Wei. Toughening of polyamide 11 with carbon nanotubes for additive manufacturing. *Virtual and Physical Prototyping*, 12(3), 235-240, 2017.
18. Ping Hu, Qingchun Meng, Weiping Hu, **Fei Shen**, Zhixin Zhan, Linlin Sun. A continuum damage mechanics approach coupled with an improved pit evolution model for the corrosion fatigue of aluminum alloy. *Corrosion Science*, 113, 78-90, 2016.
19. Zhixin Zhan, Qingchun Meng, Weiping Hu, Ying Sun, **Fei Shen**, Yanjun Zhang. Continuum damage mechanics based approach to study the effects of the scarf angle, surface friction and clamping force over the fatigue life of scarf bolted joints. *International Journal of Fatigue*, 102, 59-78, 2017.
20. Fukai Li, Weiping Hu, Qingchun Meng, Zhixin Zhan, **Fei Shen**. A new damage-mechanics-based model

for rolling contact fatigue analysis of cylindrical roller bearing. *Tribology International*, 120, 105-114, 2018.

21. Jiawei Huang, Qingchun Meng, Zhixin Zhan, Weiping Hu, **Fei Shen**. Damage-mechanics based approach to studying effects of overload on fatigue life of notched specimens. *International Journal of Damage Mechanics*. (Accepted)
22. Shangqin Yuan, **Fei Shen**, Chee Kai Chua, Kun Zhou. Polymeric composites for powder-based additive manufacturing: materials and applications. *Progress in Polymer Science*. (Under review)

Conference Papers

1. **Fei Shen**, Miao Zhang, Weiping Hu, Qingchun Meng. Finite element analysis of large span suspension bridge. *The Fourth International Conference on Modelling and Simulation*, Phuket, Thailand, April 25-27, 2011.
2. Shangqin Yuan, **Fei Shen**, Jiaming Bai, Chee Kai Chua, Kun Zhou, Jun Wei, 3D soft metamaterials fabricated by selective laser sintering of polyurethane. *Annual International Solid Freeform Fabrication Symposium*, Austin, Texas, USA, August 7-10, 2016.

Journal Paper Review

Scientific Reports

Fatigue & Fracture of Engineering Materials & Structures

International Journal of Damage Mechanics

Additive Manufacturing

Mechanics Research Communications

Virtual and Physical Prototyping

Journal of Micromechanics and Molecular Physics