a place of mind
THE UNIVERSITY OF BRITISH COLUMBIA

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MECH 493 project: Fatigue analysis of 3D printed materials

Background and research goal

Additive manufacturing (AM) is a novel technique to manufacture components in arbitrary shapes that is revolutionizing the field of manufacturing. In AM, multiple microscopic layers of materials are deposited to generate the desired shape of the component. However, with the deposition each layer, many imperfections appear and can critically compromise the structural stability and safety of components. Therefore, to further understand and improve AM, more advanced models and simulation techniques need to be developed. In particular, due to the heterogeneous characteristic of AM components, most of the models to predict crack propagation and fatigue need to be revisited to be applied in AM. Therefore, in this project, we seek to develop a model to simulate crack propagation and fatigue limit in AM components. The project involves the modelling and simulation of heterogeneous additive manufactured materials, and validation with experimental measures. The students will be required perform different simulations, analyse and compare the results with experimental data carried out by other researchers and it is expected that the resulting model will be published in a peer review journal article.

Tasks to be performed by the student

1- Develop a Finite Element protocol to model and simulate fatigue and fracture propagation in AM materials.
2- Compute fatigue life for different printing patterns.
3- Optimize printing strategy to maximize fatigue life.
4- Perform fatigue testing of AM components.
5- Write technical report.

Facilities and team:

The Modeling and simulation lab is placed in ICICS and it is an interdisciplinary team of researchers. The student will work under the supervision of M. Ponga.