Quality Assurance of Additive Manufacturing Parts

PROJECT DESCRIPTION

"This project is related to Additive Manufacturing. Additive Manufacturing (AM) is a manufacturing process that creates solid physical parts by joining materials in successive layers, from a 3-dimensional Computer Aided Design (CAD) model. This form of manufacturing technology encompasses several processes which include Stereolithography (SLA), Selective Laser Sintering/Melting (SLS/M), 3-Dimensional Polyjet Printing (3DP) and Fused Deposition Modelling (FDM). All the processes mentioned differ in materials used and processing techniques. AM technology allows manufacture of complex structures without the need of any conventional or intermediate tooling in a short time with low material wastage.

Fused Deposition Modelling (FDM) is an AM process in which a three dimensional, layered component is built through bonding and solidifying the extruded layer with the previous layer. The process produces geometries and structures hitherto impossible to produce due to incremental, precise, and tool independent material addition . This, however, introduces a strong coupling between process and product, resulting in quality variation and unpredictability in dimensional accuracy and strength of component even for the professional grade printers. There are significant barriers to functional utilization and quality assurance of the technology. These barriers include but are not limited to: lack of appropriate design processes, process reliability, repeatability (material properties, dimensional accuracy , and quality. CAD system capabilities must be developed that enable designers to synthesize a part, its material composition, and its manufacturing methods to meet specifications.

This project will investigate and develop predictive methods for mechanical behavior conformance of components manufactured through AM considering the variations for increased process reliability and repeatability as per the relevant standard ISO17296-3 specifications. The AM parts are printed by converting the STL file into tool path file through printer specific software, usually done through G-code. Due to slicing, and depending upon the degree of infill and toolpath offset, this introduces voids along the tool path as well as within the internal structure. The project will develop an integrated Meta model for modeling of quality and behavior of the sliced CAD file, simulating and predicting mechanical strengths and geometry of the part while considering a comprehensive list of process parameters for FDM processes.

Essential Requirements:

The ideal candidate will have a background in mechanical/mechatronics engineering with a strong grasp on 3D solid modeling in Autodesk Inventor or Solidworks. The candidate should also have a very strong background in a programming software such as C++/VB/C#. The student should be a motivated self starting individual willing to learn new tools and methods and interested in cutting edge research.

Contact: Brendan Cavanagh, Internship Coordinator (Inbound)
University of Alberta International
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Desired Requirements:

Having prior knowlegde of Inventor or Solidwords API would be highly advantagous. Additionally, candidates with experience in additive manufacturing/3D printing will be preferred. Knowledge of CNC control /G-Code/FEA would be an added asset.

Working within the research group, the student will carry out the tasks assigned to him. The taskw will be allocated by the PI and and the student will regularly meet the supervisor to update the tasks. The general role of the student will be to independently work on the tasks related to modeling and simulation of 3D printed parts for quality assurance. This would require the student to write custom data compatible code for enabling the modeling of CAD models within different environments such CAD/CAM/FEA Software

FACULTY-DEPARTMENT

Engineering - Mechanical

DESIRED FIELD OF (STUDENT) STUDY

Mechanical, Mechatronics, or Industrial Engineering

INTERNSHIP LOCATION

University of Alberta Main Campus - Edmonton

NUMBER OF INTERNSHIP POSITIONS

2

INTERNSHIP START DATE

July 4, 2018

INTERNSHIP END DATE

3 months from start date

ARE THE DATES FLEXIBLE?

Yes, I am flexible regarding the internship dates. Selected students can contact me to request a date change.

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