Mechanical Engineering Master's Defense

Conformable Skin Electronics Based on Spiral Pattern

School for Engineering of Matter, Transport and Energy

Yiling Fan

Advisor: Hanqing Jiang

abstract

Skin electronics is one of the most promising applications of stretchable electronics. The versatility of skin electronics can only be guaranteed when it has conformal contact with human skin. While both analytical and numerical solutions for contact between serpentine interconnects and soft substrate remain unreported, the motivation of this thesis is to render a novel method to numerically study the conformability of the serpentine interconnects. This thesis explained thoroughly how to conduct finite element analysis for the conformability of skin electronics, including modeling, meshing method and step setup etc.. User-defined elements were implemented to the finite element commercial package ABAQUS for the analysis of conformability. With thorough investigation into the conformability of Fermat's spiral, it has been found that the kirigami based pattern exhibits high conformability. Since thickness is a key factor to design skin electronics, the thesis also talked about how the change of thickness of the skin electronics impacts on the conformability.

April 15, 2015; 1:30 PM; ERC 593