ABSTRACT

Golf Club Prototyping and Design for Spin Rate Tuning

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The aim of this project was to design a golf wedge capable of increasing backspin for the amateur golfer. This was accomplished by embedding a metal lattice structure behind the clubface to allow the face to elastically deform slightly upon impact. This would increase contact time between the club and ball. The mechanism of spin generation was discussed and the relationship between contact time and spin rate was established. The design was enabled by using additive manufacturing, which allowed for the generation of a metal lattice structure. An appropriate control and prototype were designed to minimize run time and material usage due to limited machine capacity.

Various lattice topologies were generated and analyzed with finite element analysis. Design validation build in plastic revealed that these were not feasible due to support material generation, so X topology was used instead. After printing, player testing was conducted. The prototype design underwent plastic deformation during testing, and resulted in a significantly lower spin rate than the control. The design outlined in the report is not recommended unless changes to prevent plastic deformation are made and more testing is performed. Economic justification for the production of additive manufacturing golf club designs is made in case future designs prove viable. Future work involves earlier consideration of design for manufacturability given the constraints of the selective laser melting (SLM) machine and better testing using an automated process such as a golf swing robot.