Alternative Tessellation and Inner Cone Design for Helmets

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The safety of bike riders going from one bikeshare system to another is absent due to insufficient use of helmets (“Bike Sharing in United States,” 2012). A collapsible helmet, in contrast to the current bulky helmet without portability, will possibly expand the use of helmets and increase the safety of the riders. The EcoHelmet (Shiffer, 2017) meets this criteria but the tessellated shape in the design is not the optimal shape, as explained in the previous year’s project: Spina Bifida Back Brace Tessellation Designs. Tessellation affects the maximum force the helmet can withstand and by changing the inner shapes to squares and hexagons, shapes that are collapsible and able to be tessellated, the maximum strength of the helmet could be improved. The double density layer and cone shaped connection of the ConeHead helmet (Conehead, 2018) was also incorporated in order to improve the distribution of crash forces. The two density layers made of paper and cardstock were initially tested independently under a stress analyzer in order to isolate the variables of changes to the tessellated shape. The material allowed preserved the eco-friendliness of the helmet, as the EcoHelmet did. With the results, the optimal designs were combined with cone design interconnections and tested with force sensors. Different lengths of the cones were also tested in order to further optimize the design. The wide coned, square design was proven to be the optimal design. Therefore, the final design was stronger and disperses force more efficiently than the EcoHelmet.

Awards Won:
Sigma Xi, The Scientific Research Honor Society: Honorable Mention Life Science Award