Design Education & Scholarship in ECU Engineering

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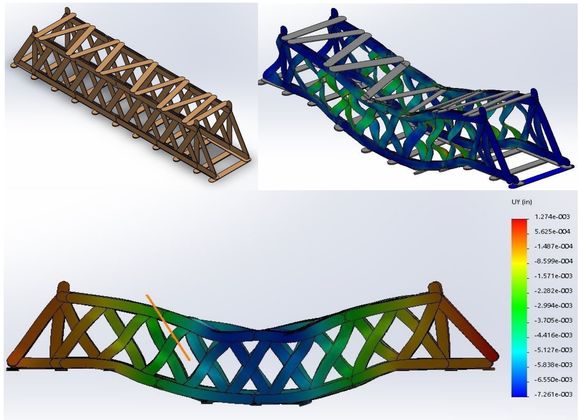
Engineering Design: A process of devising a system, component, or process to meet desired needs and specifications within constraints

Background

Design work is an important part of the engineering curriculum that gives students the opportunity to express their creativity by moving beyond standard solutions to well-constrained problems and develop innovative solutions to open-ended ones. Design also encourages teamwork since problem solutions often benefit from interdisciplinary collaboration. However, students do not always get the exposure to design that they should. My goal as a teacher and scholar has been to gain a better understanding of the theory and practice of design and to share that knowledge with my students and colleagues. In service of this goal I have worked to incorporate design research and creative activities into my courses and student mentorship. The work shown here highlights some of those projects.

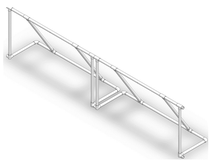
Popsicle Stick Bridge Design

- In MENG3624: Solid Mechanics, students apply what they learn about finite element analysis (FEA) to design, analyze, and test bridges made from wooden sticks.

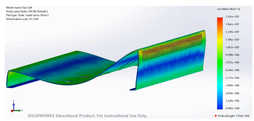


Recreational Design for Disability

- In senior capstone design students worked with experts to design recreational equipment for use in adaptive sports such as beep kickball and 5-a-side blind soccer.



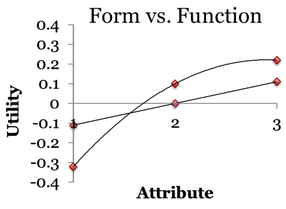
Assistive Device Design



- In this capstone design project students worked with Vidant's pediatric rehabilitation center to develop assistive devices to entertain patients.

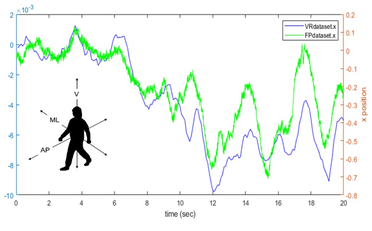
Optimizing Subjective Design Attributes

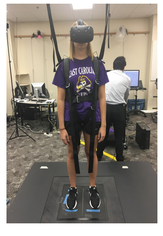
- In this project physiological data is collected to provide objective measures of consumer response to varying design attributes.



Designing Motion Tracking in Virtual Reality

- In this project the position sensors built-in to the HTC Vive VR headset are validated for use as a low-cost motion tracking alternative to expensive force plate systems.





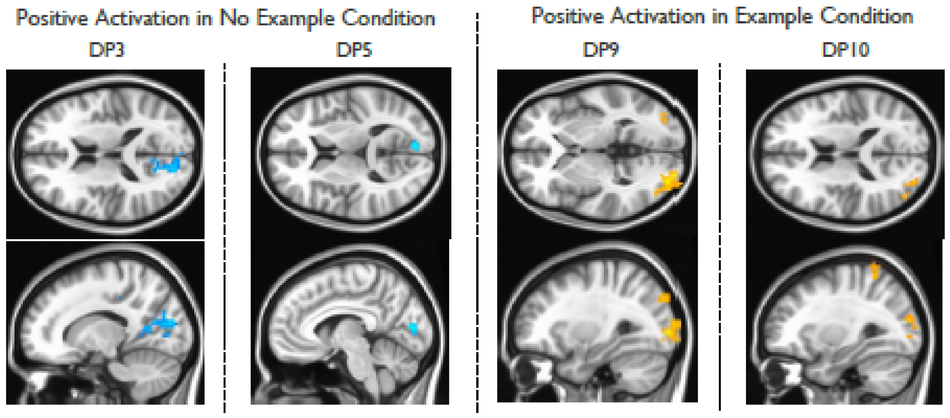
Design Fixation and its Mitigation: What Can the Brain Tell Us?

- Design fixation refers to blind adherence to a set of ideas, which can limit the output of conceptual design. Engineering designers tend to fixate on features of pre-existing solutions and consequently generate designs with similar features.

- This study leveraged functional magnetic resonance imaging (fMRI) to study the brain activity of engineering designers during conceptual design. Design solutions indicated that fixation effects were detectable at a statistically significant level.

PROBLEM SPECIFIC T-MAPS

The largest activation regions for the DP's on the right were at the cuneus and gyrus located in the occipital lobe (in the posterior region of the brain)



3D Printed Laboratory Equipment Design

- This project is the result of an increase in course-based research opportunities. Engineering students worked with the Chemistry department to develop designs for low cost, printable, lab equipment.