



CUTC New Initiative Project : Human-Robot Interactions in Transportation

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Motivation – Haptic Paddles

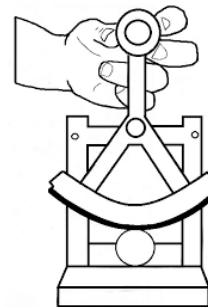
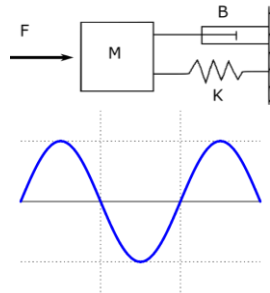
- Hands-on, experiential learning
- 25 years of development [1]
- Beneficial to a range of curricula [2] – K-12
- Goal
 - connect fundamentals of science/engineering to future of transportation



Stanford 1997



Rice 2017



[1] A. M. Okamura et al., "Feeling is believing: Using a force-feedback joystick to teach dynamic systems," J. of Engineering Education, 2002.

[2] Rose, Chad G., et al. "Reflection on system dynamics principles improves student performance in haptic paddle labs." IEEE Trans on Education 61.3 (2018): 245-252.

Haptic Paddle Overview

- Version 1 for initial development and outreach
- Version 2 incorporated feedback from students and educators
- Cost <\$50

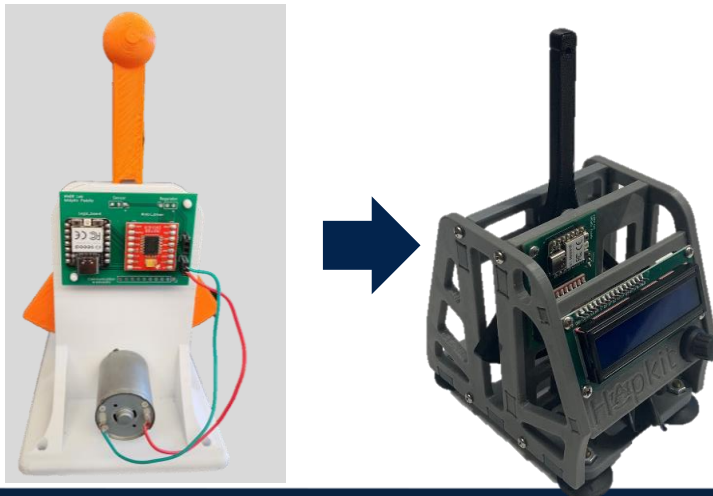


open source
hardware



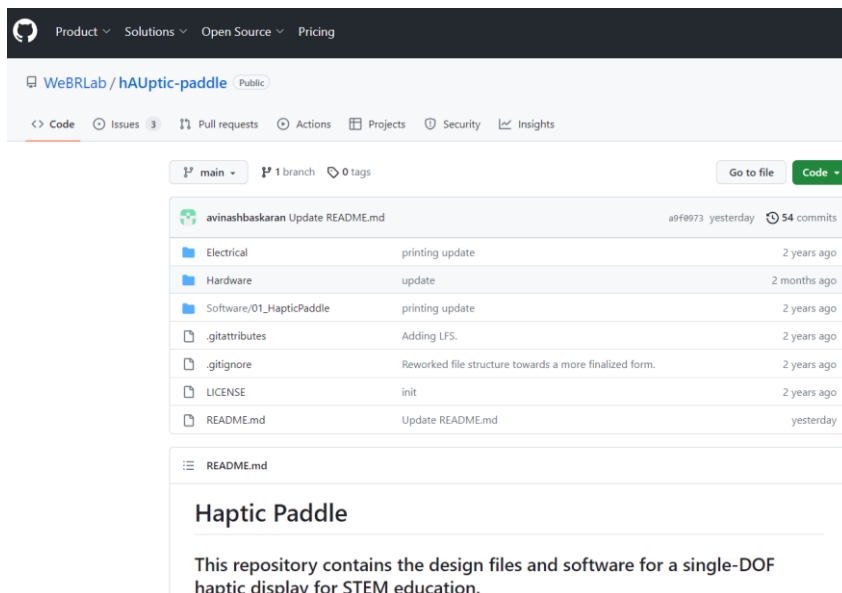
Hands-on Outreach

- Destination STEM – hundreds of middle schools in east Alabama region.
- Design and implementation feedback from high school robotics educators
- Informed Version 2



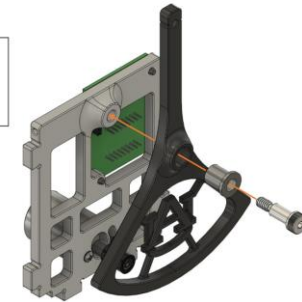
Open-Source Design

- GitHub Repo for all files
- <https://github.com/WeBRLab/hAUptic-paddle>
- CAD (paddle and circuit), assembly instructions
- Base code (e.g. – virtual springs, dampers, walls)
- 20+ assembled paddles for demonstration purposes



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Attach the paddle to the assembly using the 1/4 inch shoulder bolt and the 1/4 inch Sleeve Bushing. Make sure the paddle can freely rotate on the shoulder bolt.



Future Work

- Expand single hands-on activity to a series of activities (multiple days)
- Collaboration
 - Dissemination of design, curriculum, and results
 - Post lessons plans :
https://matc.unl.edu/education/trc/lesson_plans.php
 - Open to working with any UTC interested in using, developing, or modifying the AUTRI Haptic Paddle
- The support from CUTC is acknowledged and appreciated: Thank you