JOSHUA HALPERT

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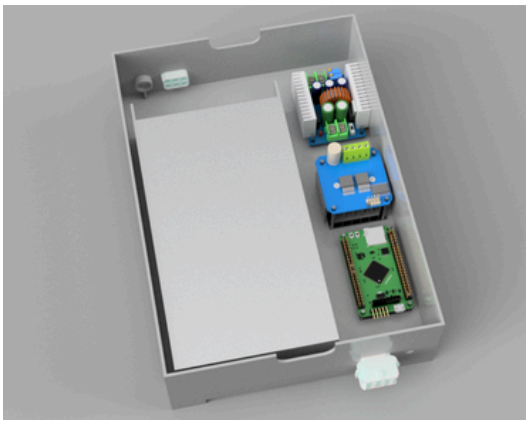
3D PRINTED FORCE FEEDBACK RACING SIMULATOR (INDEPENDENT)



Goals

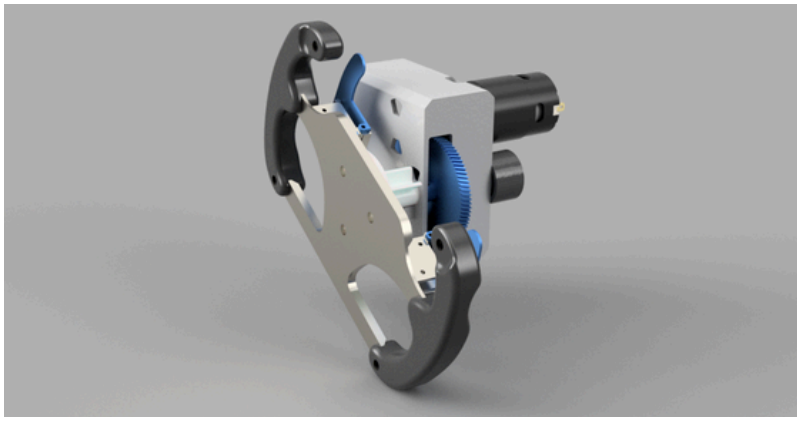
- To design and fabricate a mostly 3D printed racing simulator with a force feedback steering wheel and integrated pedals
- Design for easy use with PC racing video games
- Allow for easy disassembly and portability

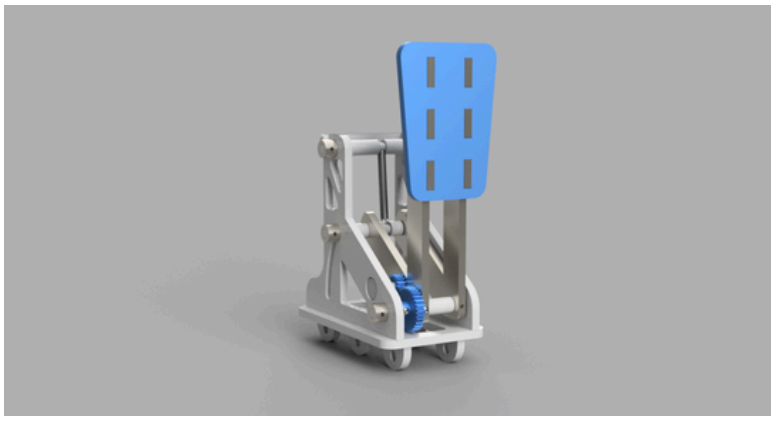
Mechanical

- Used Fusion 360 to design every mechanical and structural component
- 3D printed every component except fasteners and electronics in PLA
- Created a custom helical gearbox for more torque and for rpm/noise reduction

Electrical

- Used the open source software "Openffboard" and an STM32 microcontroller to control and integrate the electronics with racing video games on PC
- Wired together in three distinct components using molex connectors for quick and easy disconnections and portability





Features

- Easy-to-use force feedback steering wheel and paddle shifters
- Integrated pedals with different press-force levels for brake and throttle
- Easy steering wheel clamping feature for all kinds of tables
- Easy assembly (Connects to PC with USB-C cable)

Design Process Challenges

- Moved beyond Arduino-level electronics to learn STM32 programming, power management (buck converters, voltage/current limits), and integration of motors and encoders.
- Solved issues with wiring, grounding, and mechanical/electrical fit through iterative redesigns.
- Gained hands-on experience reading datasheets, troubleshooting, and applying higher-level mechatronics concepts.

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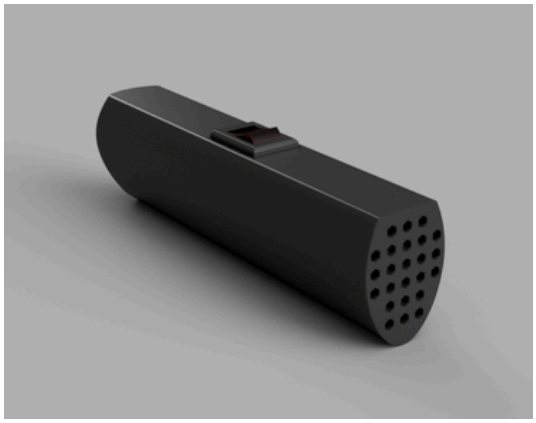
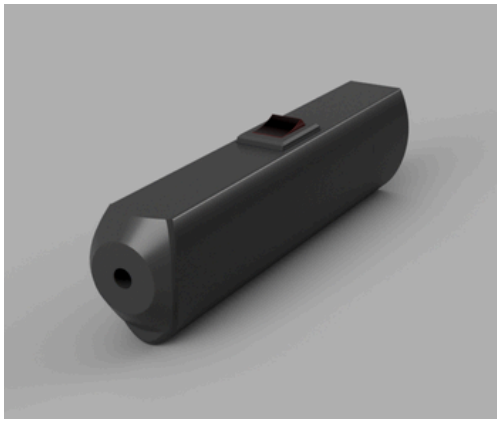
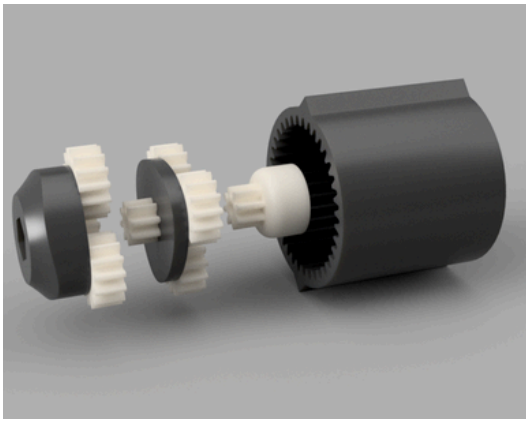
3D PRINTED HANDHELD ELECTRIC SCREWDRIVER (INDEPENDENT)







Goals

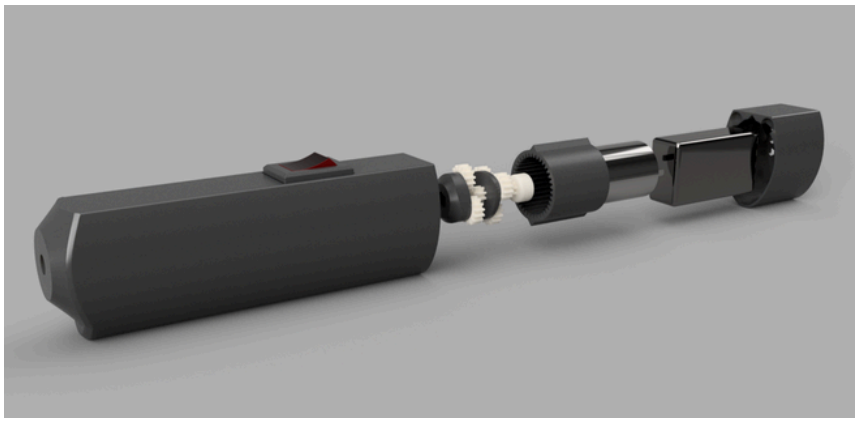
- To design and fabricate a mostly 3D printed handheld electric screwdriver
- Design for easy use with standard bits
- Allow for easy recharging

Mechanical

- Used Onshape to design every mechanical and structural component
- 3D printed every component except electronics in PLA
- Created a custom planetary gearbox for more torque

Electrical

- Used a reverse polarity rocker switch to direct a 12V DC motor powered by an enclosed battery
- Wires are soldered together inside the outer shell
- The battery easily disconnects for charging using jumper cables



(REAL LIFE IMAGE)

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Design Process Challenges

- Overcame the challenge of designing a functional 3D-printed planetary gearbox, learning gear ratios, alignment, and torque distribution
- Gained hands-on experience with soldering and electronics, learning how to wire and connect components for a functional circuit