Josh Boyden

Mechanical Engineering Student — University of Alabama
Mechanical Design • CAD • Prototyping • Electromechanical Systems • Artist & Small Business Owner



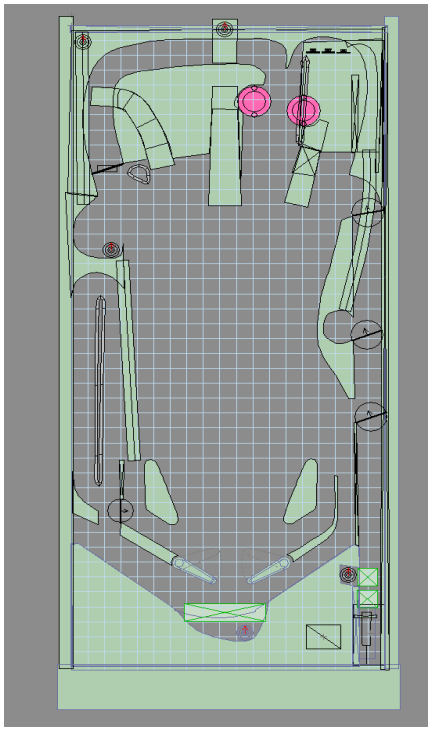
I enjoy projects that combine mechanical design, electronics, software, hands-on fabrication, and the creativity and artistry behind bringing an idea to life.

Jcboyden@crimson.ua.edu | LinkedIn | Paintedbyjosh.com

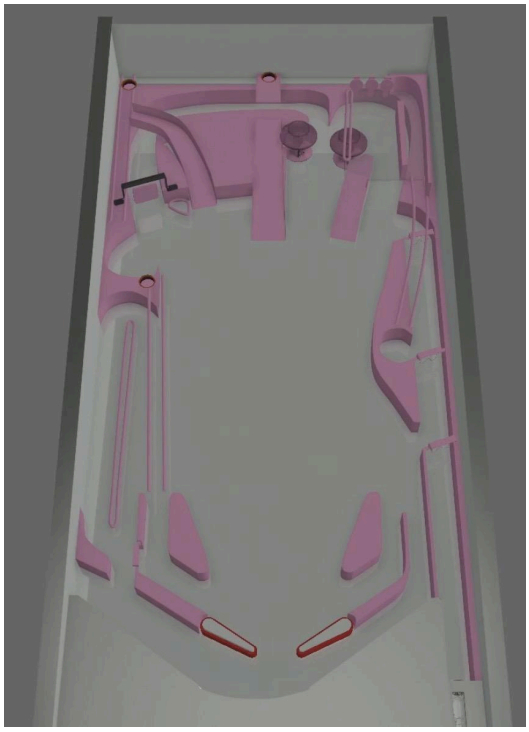
Custom Pinball Machine

Design and Development

Designed and built from the ground up, combining mechanical design, CAD, fabrication, electronics, controls, and software into one electromechanical system.



VPX Playfield Design



Gameplay Simulation



Physical Build

- **Playfield Design:** Designed the full playfield layout in VPX, using virtual modeling to determine feature placement, geometry, shot paths, and how the different mechanisms would fit together before physical construction.
- **Gameplay Development:** Tested a playable virtual version of the machine to evaluate ball flow, shot difficulty, feature interaction, and overall gameplay, making adjustments to create a smoother and more enjoyable game.
- **System Integration:** Integrated mechanical systems, Arduino controls, wiring, electronics, switches, lighting, scoring, and game logic into a complete functioning electromechanical system.

Tools & Skills

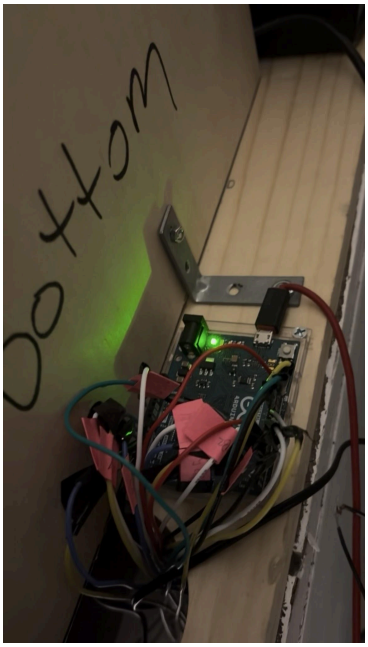
Visual Pinball X • Autodesk Inventor • SolidWorks • Arduino • CAD • Mechanical Design • Fabrication • Woodworking • Electronics • Wiring • Controls • Programming • Prototyping • Testing • Troubleshooting • System Integration8

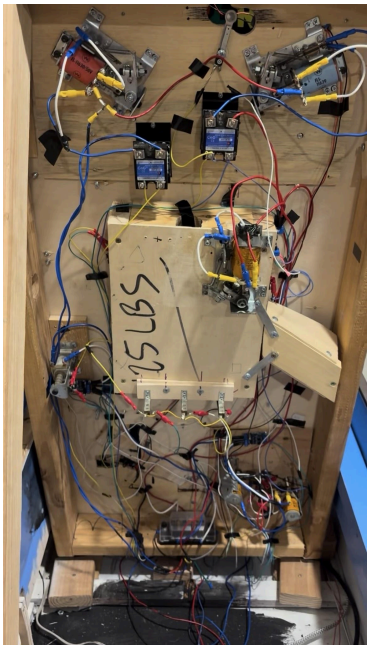
Custom Pinball Machine

Engineering & Integration

The physical machine required mechanical fabrication, embedded controls, electrical integration, software logic, testing, and repeated troubleshooting to integrate all subsystems into one functioning game.







Mechanical Systems

- Designed and fabricated custom mechanisms and structural components
- Integrated flippers, targets, switches, ball guides, and other playfield features
- Modified components through iterative testing when real-world behavior differed from the initial design

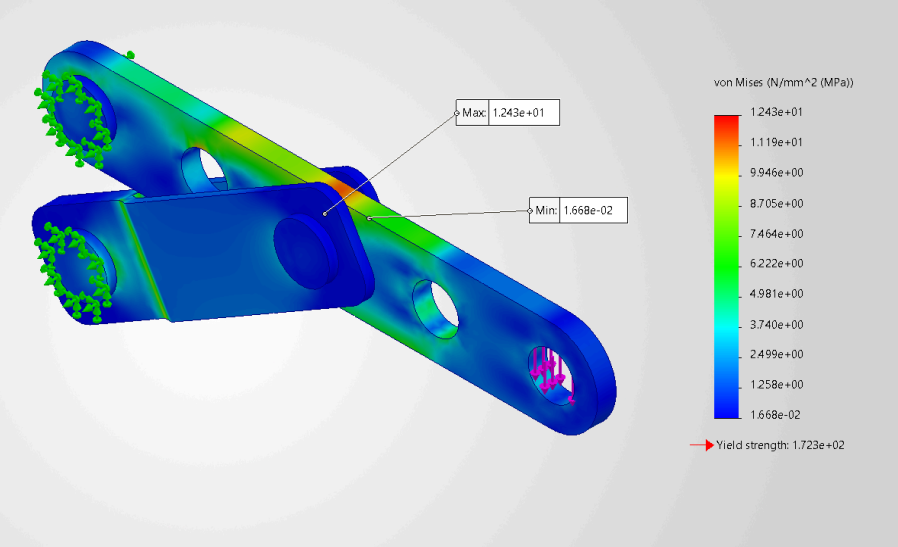
Electronics & Controls

- Wired switches, lights, solenoids, sensors, and other electrical components
- Developed Arduino-based controls to process switch inputs and command lights, solenoids, and other outputs.
- Troubleshot electrical and hardware problems during system integration

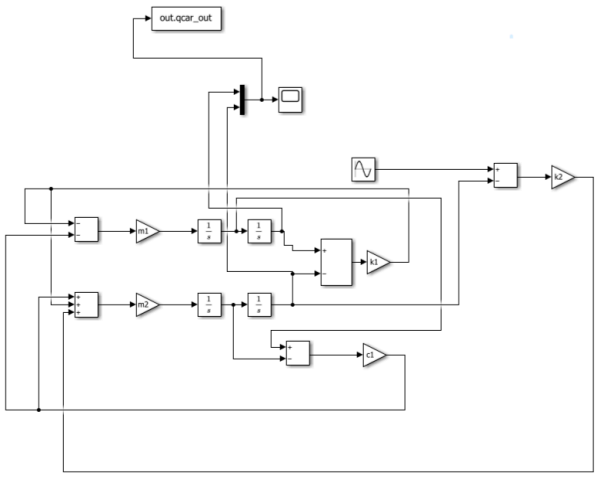
Software & Game Logic

- Programmed scoring, lighting behavior, game rules, and feature interactions
- Coordinated software with physical switches and mechanical events
- Tested and refined game behavior to improve reliability and gameplay

Mechanical Design & Analysis



SolidWorks Simulation



MATLAB/Simulink

SolidWorks Simulation

Used SolidWorks Simulation to evaluate von Mises stress and structural response in a mechanical assembly. The analysis included defining material properties, applying fixtures and loads, generating a mesh, and reviewing stress concentrations to determine whether the design remained below material yield limits.

MATLAB/Simulink

Built a quarter-car suspension model in MATLAB/Simulink to evaluate how the vehicle responds to different road excitation frequencies. The model was used to study suspension motion and identify resonance behavior, with response peaks occurring near the natural frequencies of the suspension system.

Tools & Methods: SolidWorks • Finite Element Analysis • MATLAB • Simulink • Stress Analysis • Dynamic Modeling • Numerical Analysis • Mechanical Systems