Kyle Reppenhagen

kreppenh@umich.edu   https://kreppenhagen.github.io/portfolio/

Education

University of Michigan - Ann Arbor   **September 2015 - May 2020**
M.S.E. Mechanical Engineering *(Specialization: Mechatronics)*   GPA: 3.850/4.000
B.S.E. Mechanical Engineering   GPA: 3.714/4.000

Experience

Digital Control of Active Suspension for Off-Road Vehicle   **April 2020**
- Designed a digital controller to actuate damping force of an active suspension on an off-road racecar to reduce tendency of vehicle to pitch forward when going over jumps, reducing the likelihood of rollover
- Developed a half-car model in MATLAB capable of capturing vehicle dynamics when going over jumps
- Theorized controller model to optimize damping force for minimal vehicle pitch velocity when jumping
- Implemented model in simulation and tuned control parameters, showing controller could drastically reduce likelihood of rollover for a wide range of jump sizes and vehicle speeds

Cold Regions Research and Engineering Laboratory   **July – August 2019**
Robotics Engineering Intern   *Hanover, NH*
- Upgraded hardware and software on a robotic vehicle to increase sensing capabilities for improved autonomous mobility, enabling implementation of wheel slip detection and adverse terrain avoidance
- Programmed robot's main computer using Modbus, TCP/IP Socket, and RS-232 Serial protocols to set up communication with the sensor and actuator array (wheel speed/torque sensors, radar, GPS, radio transmitters/receivers, and 3-phase BLDC motor controllers), enabling remote control of robot and expanding possibilities for feedback control and data collection

Adient   **May – August 2018**
Mechanical Design Engineering Intern - Automotive Seating   *Plymouth, MI*
- Redesigned folding headrest mechanism to increase strength and rigidity to fulfill all federal and OEM strength/stiffness requirements while reducing part cost and weight, increasing product marketability
- Performed destructive strength testing on original headrest design and performed root cause analysis of failures to identify design weaknesses as target areas for redesign efforts
- Modeled design changes in CAD and assessed strength/stiffness of mechanism using FEA, showing changes would increase load carrying capability by 1300N, exceeding the strictest OEM requirements
- Conducted study to assess how to best tolerance parts using GD&T to ensure mechanism functionality

Michigan Baja Racing Team   **September 2016 – June 2019**
Technical Director, Subsystem Owner – Suspension   *June 2018 – June 2019*
- Performed experiment to determine effects of steering kinematic changes on vehicle turn radius, enabling optimization of suspension design to achieve a 4.5 foot reduction in turn radius (37% improvement)
- Fitted rear suspension links with strain gauges and collected load data from on-car testing to derive all six forces/moments acting on the rear wheel to correct inaccurate load cases used in finite element analysis
- Used corrected load cases to redesign failed rear suspension link to withstand all driving loads without yielding, increasing component life and preventing undesirable rear wheel toe-angle changes

Subsystem Owner – Brakes   *June 2017 – June 2018*
- Redesigned custom hydraulic braking system to eliminate 13 seals and improve system serviceability, reducing potential for system failure through leakage and drastically shortening service time
- Reduced system part count by 50% to decrease overall complexity and cut system weight by 1 pound
- Designed brake rotors using topology optimization software to achieve a very mass-efficient design

Skills

Software: CAD (SolidWorks, CATIA, NX), Teamcenter, FEA (HyperWorks), LabVIEW, MSC Adams
Manufacturing: TIG welding, CNC machining, composite layups, 3D printing, waterjet, lasercut, and soldering
Programming: proficient with MATLAB, Simulink, Python, and Arduino; familiar with C, C++, and JavaScript