

Design of a Trike for Paraplegic Use with FES

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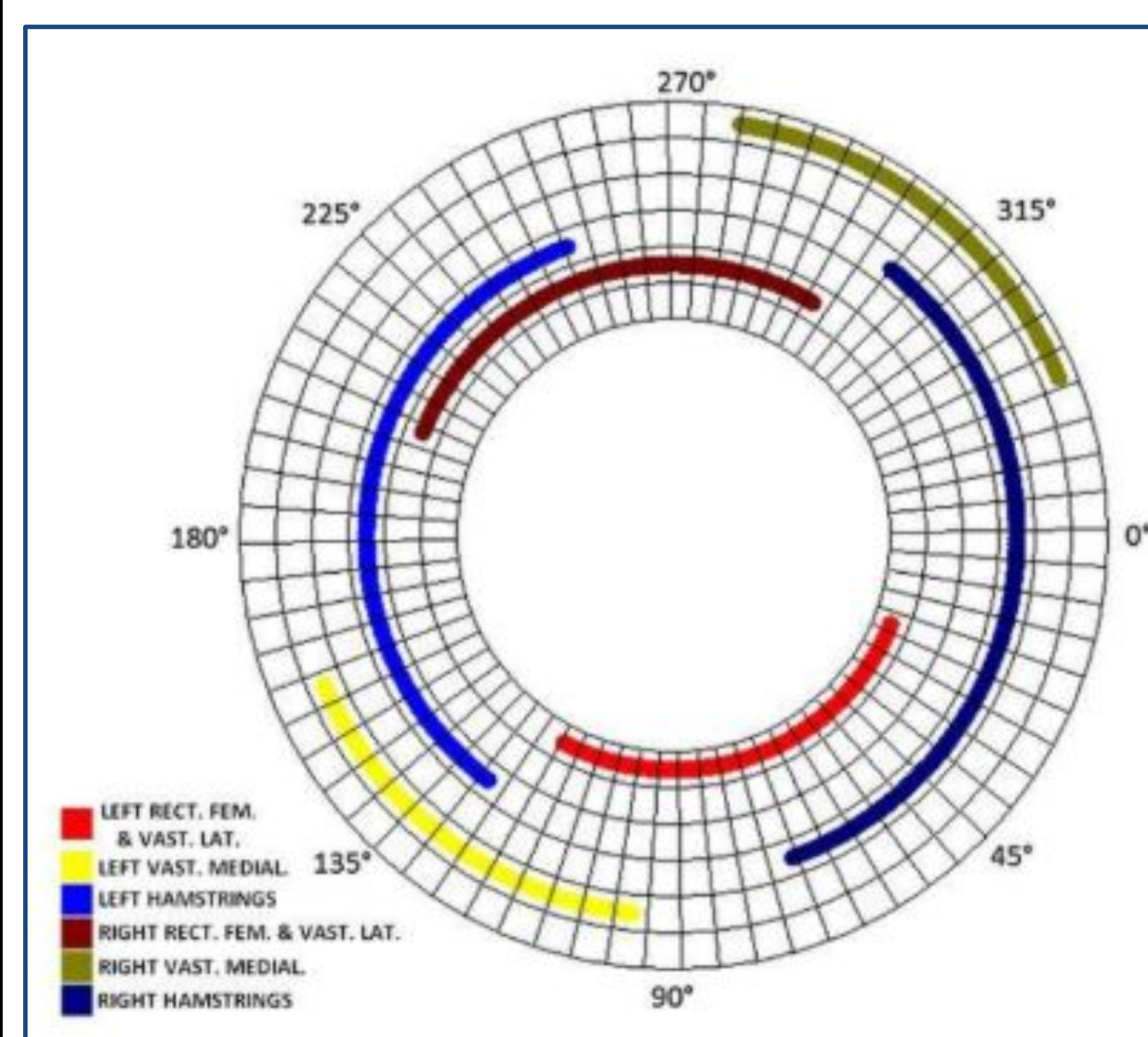
Objective: To develop an effective method of transferring variable torque, generated by electrically stimulated muscle contractions, to the rear axle in the interest of propelling the bike forward.

Motivation

Functional electrical stimulation (FES) supplies very little power to the trike. Dead-points in the cycling process create further complications and make FES Cycling impractical in non-ideal scenarios. A design that overcomes dead-points and efficiently transmits torque will provide these individuals the opportunity to maintain a healthy, active lifestyle.

Muscle Stimulation

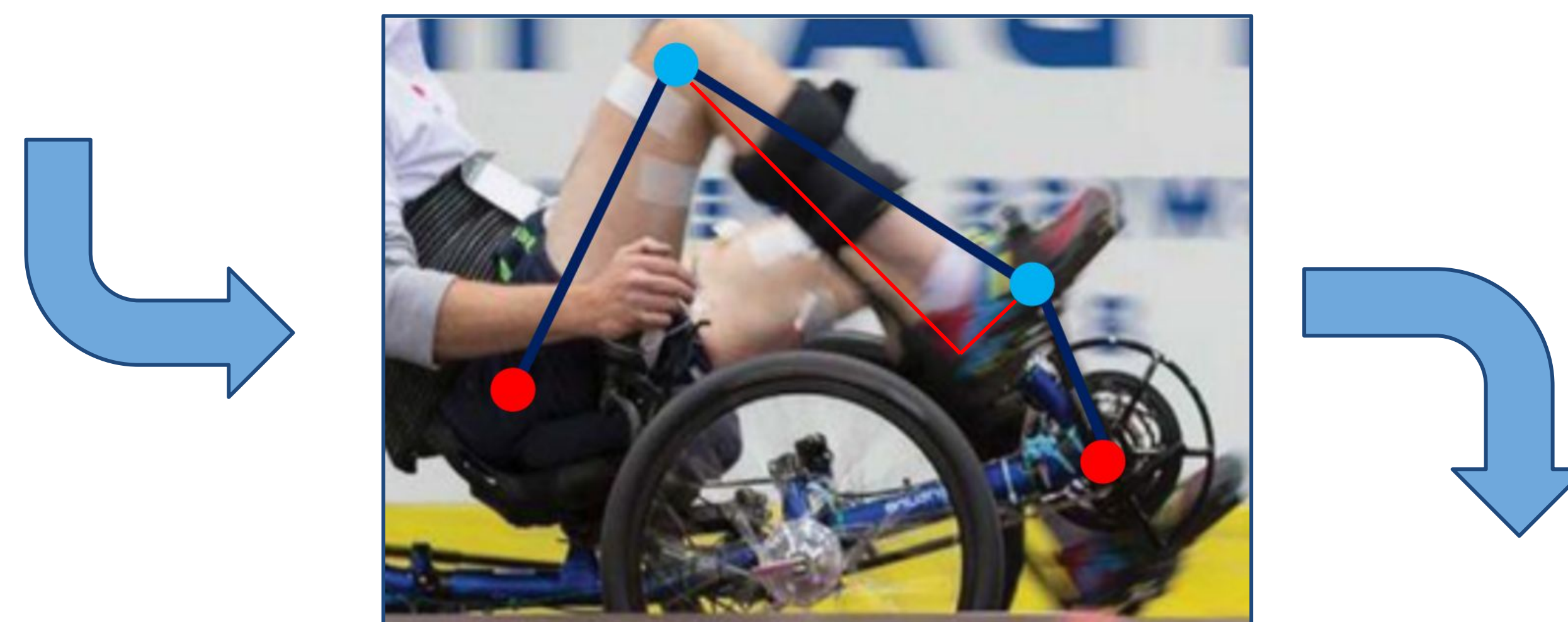
- FES is used to stimulate individual muscle groups in the leg
- Muscle contractions must be timed to pedal position
- Muscle contractions produce approx. 10-25W



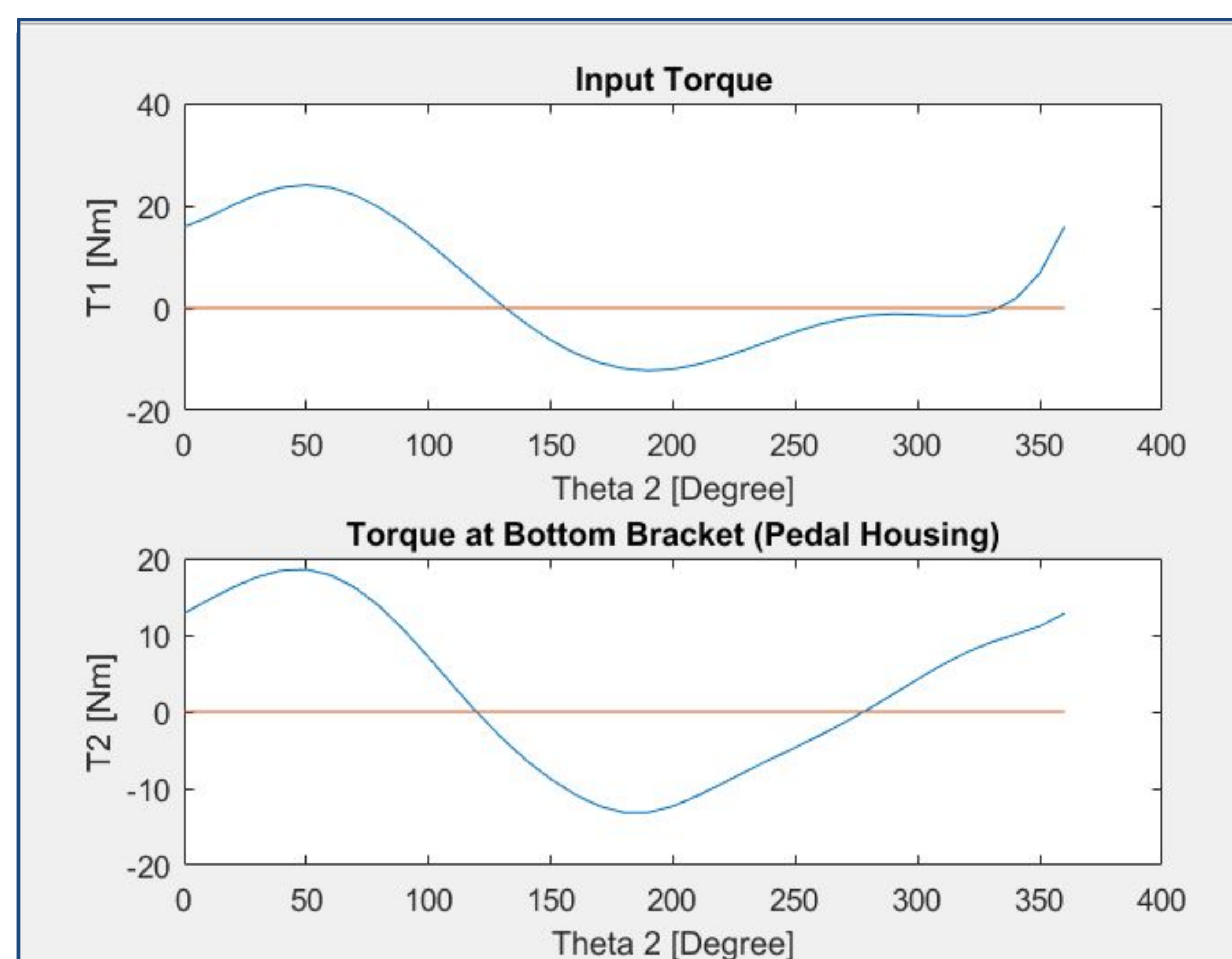
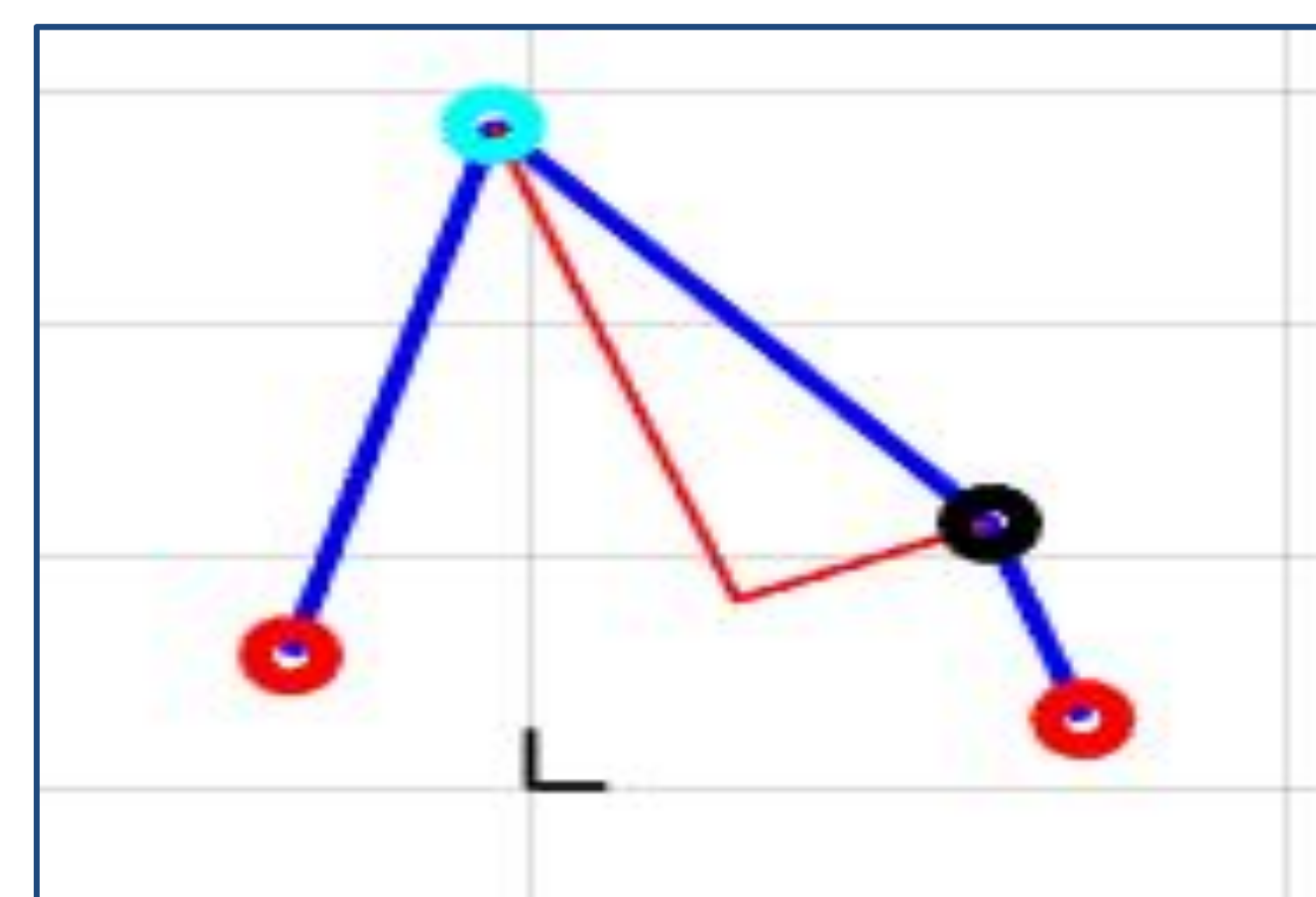
Four Bar Mechanism Model



A Four Bar Mechanism was used to model the bikers leg.

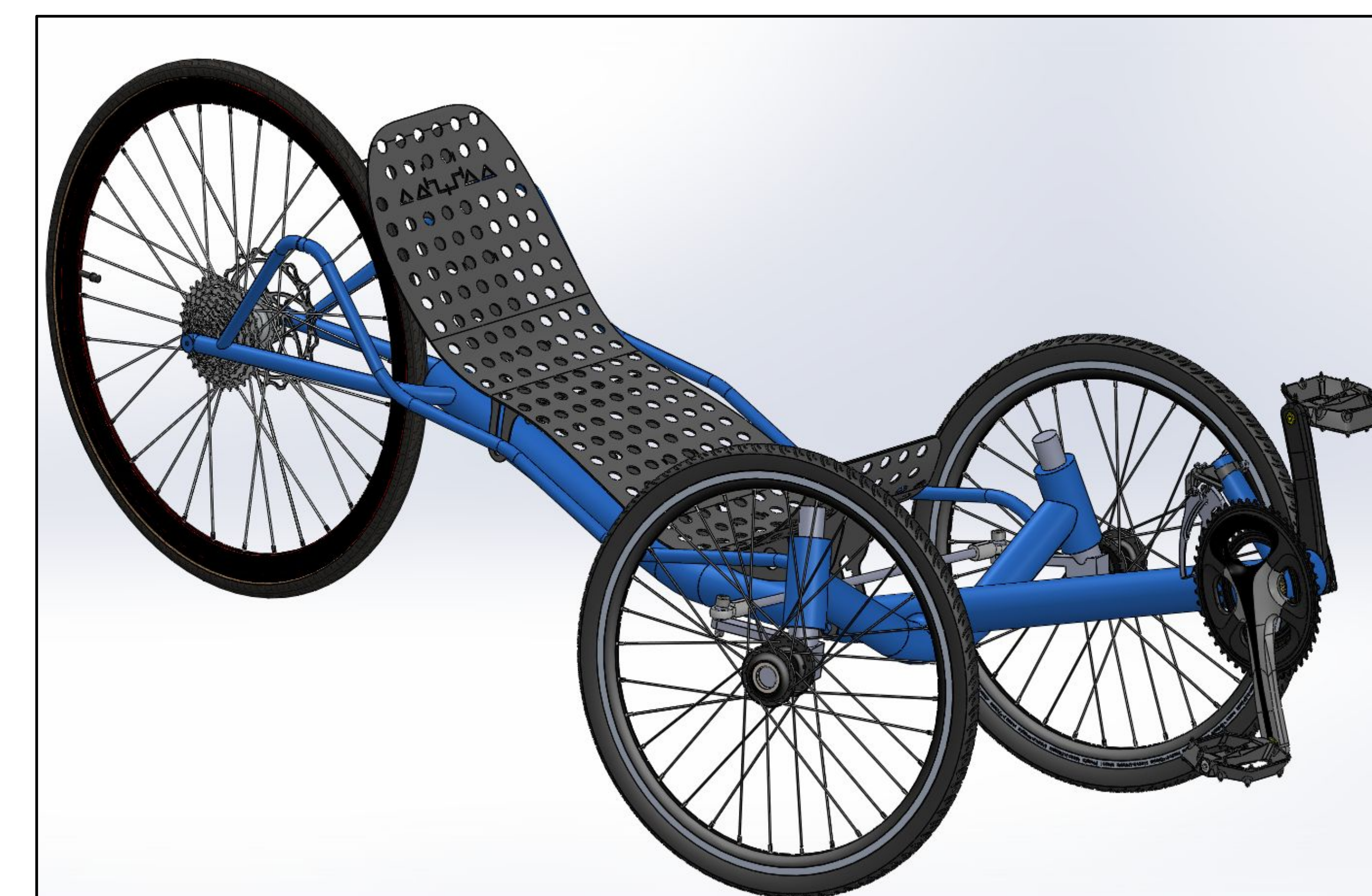


Our model statically calculates the system's torque which will be used to develop new, innovative bike designs. (below)



Modeling

A model of the trike to be used has been reverse engineered to model alternative powertrain designs to optimize the rider's power output.



Future Work

Innovate new mechanisms to create more effective torques that overcomes dead points. Find which drivetrain design is optimal for reducing dead zones and transmitting the most amount of torque.

