HANS Cycle – Reciprocating Lever Transmission

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Overview

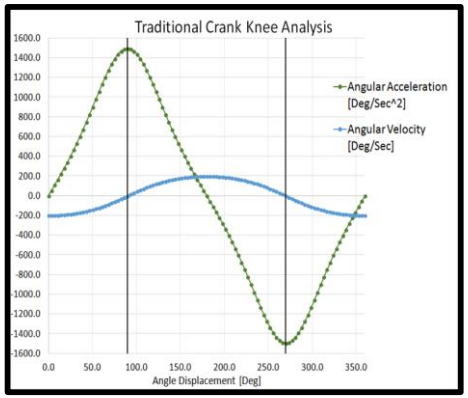
Problem Statement:
The rotation of conventional bicycle cranks can harm knee joints and doesn't produce enough torque.

- Utilize sponsor's existing RLT patent
- Utilize last year's project prototype
- Make commuter/city cycling easier
- Increase torque and power output
- Reduce strain on riders joints

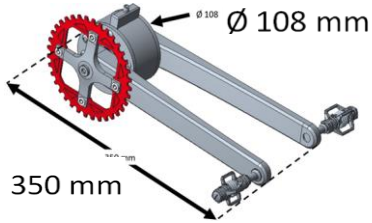
Motivation:
The increase in population has increased the need for reliable and comfortable transportation. The HANSCycle will aim to increase rideability during city commutes as well as reduce stress on the rider's knees and joints.

Objectives and Constraints

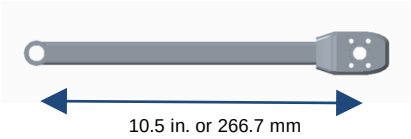
- Optimize and test the Reciprocating Lever Transmission
- Produce enough torque to climb steep hills
- RLT must be reliable and sturdy for daily use
- Utilize the previous prototype frame incorporating RLT
- Design for a maximum weight of rider 250 lb or more
- Utilize a standard sized 26" wheel
- Utilize crank arms up to 12" with an arc no greater than 100°
- Accommodate rider heights between 5'3" to 6'3"
- Have the ability to fit complete prototype into a 26"x26"x10" box for shipping purposes
- Incorporate ability to use conventional crank for testing
- Optimize existing prototype while maintaining budget of $2000



Prototype Reciprocating Lever Transmission Bicycle



Steel crank arm design



Design

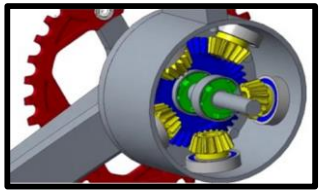
- 10.5 inch long crank arms made from 1018 Steel and 4130 Chromoly
- Dependent crank arm motion
- SUS303 stainless steel bevel gears
- Internally contained gear housing
- Free wheels to transmit power in one direction
- RLT neutral plane positions for adjustable riding angle
- Bicycle torque couplings (BTC) for frame collapsibility
- New output shaft is 40% larger with a hexagonal mating surface that is 50% larger than the previous square surface

Testing

Requirements:
- Proof of torque increase
- Proof of decreased joint wear
- Comparable cadence rate
- Adequate power generation

Results:
- Current prototype travels at a slower speed than desired
- Further testing and adjustments are needed
- Preliminary testing shows average speed as 7 mph whereas the target is 15 mph to compete with a traditional bicycle

Testing Rig



RLT Internal Components

Assembled RLT

Conclusion

Success as proof of concept
Design needs to be refined:
- Ergonomics

Component Implementation
- Potential ratchet and pawl alternative
- Possibly sprag clutches

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