µAV - Linked Vehicles

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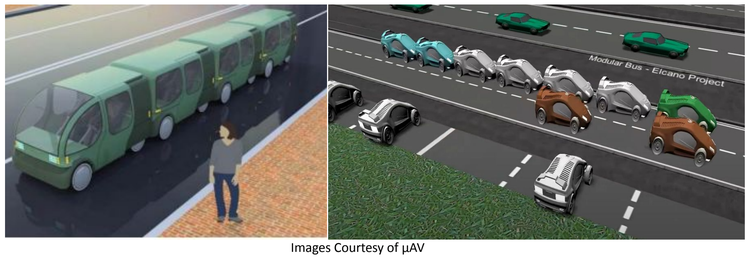
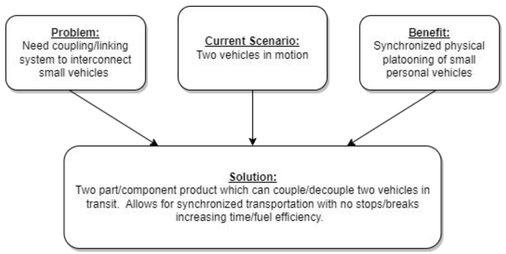
BACKGROUND & INTRODUCTION

µAV is a company which aims to address vehicular inefficiencies in transportation. Emulating truck platooning to reduce fuel expenditure, µAV seeks to physically link small electric vehicles together instead. As these smaller vehicles can move independently, this proposes a modular bus system where vehicles can link and unlink as needed during transportation. To accomplish this, the design of a coupling system is required.



Images Courtesy of µAV



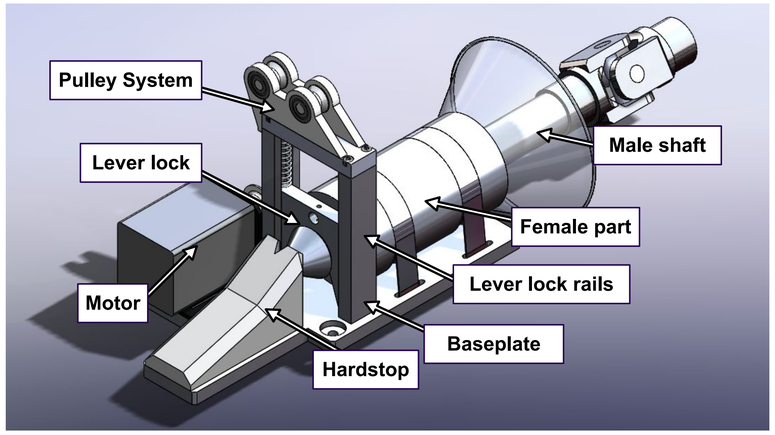
OBJECTIVES

Design an electromechanical system to allow coupling and uncoupling of small vehicles given requirements and constraints as defined below.

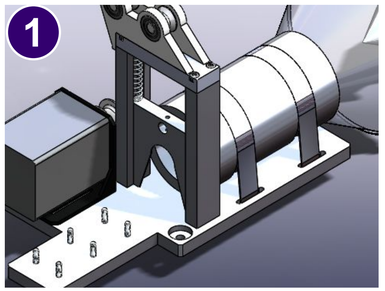
REQUIREMENTS & CONSTRAINTS

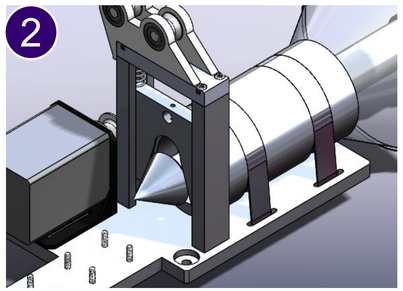
The system:
- is to couple automatically
- remains coupled until instructed otherwise
- does not require human intervention to decouple
- withstands collision forces with a 5 mph differential
- supports weights of 200 lbs
- approximately 30,000 couples

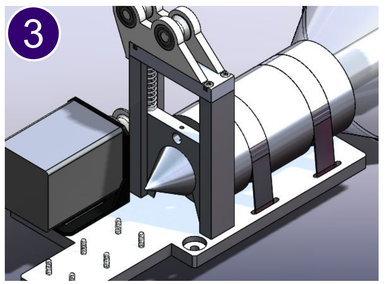
KEY FEATURES



Pulley system: Uses a 50 lb braided cable to lift the lever lock using the motor
Lever lock: Specialized CNC part that locks the male shaft into place
Motor: Geared stepper motor to lift the lever lock during decoupling
Hardstop: Remaining momentum of the system is absorbed into the hardstop
Baseplate: Main mounting surface for the system
Lever lock rails: Precision milled aluminum designed to hold the lever lock
Female part: Aluminum tube stock designed to take the initial forces of coupling
Male shaft: Precision turned aluminum that is the primary locking element







(1) Lever lock in the locked position ready for coupling
(2) Male shaft forces lever up
(3) Springs slam lever lock down to complete coupling

Uncoupling: Steps 3-1 aided by the stepper motor to lift the lever lock

TEST METHODS & RESULTS

Scanning the QR code will lead to a short video demo. This video demonstrates that the system is able to:
a) couple automatically upon collision to two vehicles
b) disengage the locking mechanism and allow the vehicles to uncouple

CONCLUSION/FUTURE WORK

The designed and manufactured solution meets the expectations of the previously listed requirements and constraints.
Future work of the system includes:
- Mount system to trikes (photo of trike shown below)
- Electrical connection between male and female coupler for inter trike data transfer
- Mechanism to allow additional degrees of freedom
- Integrate additional shock dampening system for increased user comfort during coupling
- Machine second set of couplers
- Further weight reductions

SPONSOR: TYLER FOLSOM

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