Human Powered Vehicle Competition

Department of Mechanical and Aerospace Engineering at the University of California, Irvine

MISSION:

Design, fabricate and assemble an electrically-assisted, recumbent trike with off the shelf parts that is compact, ergonomic, adjustable, strong, and durable to compete in the National ASME competition.

HPVC TEAM:

Advisor
Professor David Copp

Chief Engineer
Angelo Ilagan

Project Managers
Christian Mason
& Sophia Shannon

Dynamics Lead
Jeffrey Lasher

Statics Lead
Gabriel Sackinger

Electrical Lead
Aviraj Singh

MAE 93 Team
Rogel Aguilar, Jason Dick, Naethan Fajarito, Albert Huang, Wilson Huang, Sunny Lin, Ethan Macias, Steven Mejorado, Ocean Mou, Henry Nguyen, Jacob Pham, Neal Purohit, Matthew Quach

LATE AUGUST
eHPVC Rules 2024 Rules

FALL QT.
Design Definition

WINTER QT.
Manufacturing & Testing

LATE APRIL
West Coast Competition BSU

DYNAMICS SUBTEAM

Objective: Implement efficient drivetrain with robust braking and steering systems.

Drive Train: 8-speed cassette with a 500W electric, mid-drive motor

Braking System: Two front hydraulic brake calipers with 160mm rotors

Steering: 10-bar indirect steering linkage, Rollover threshold of 0.6 G's, wheelbase length of 52", track width of 31"

ELECTRICAL SUBTEAM

Objective: Safely provide power and data

Electrical Box: Polycarbonate weather-proof enclosure with a polyurethane gasket

Emergency Stop: button to isolate the battery and motor in case of an emergency

Arduino: microcontroller used to process IMU positioning data and display onto LCD screen

STATICS SUBTEAM

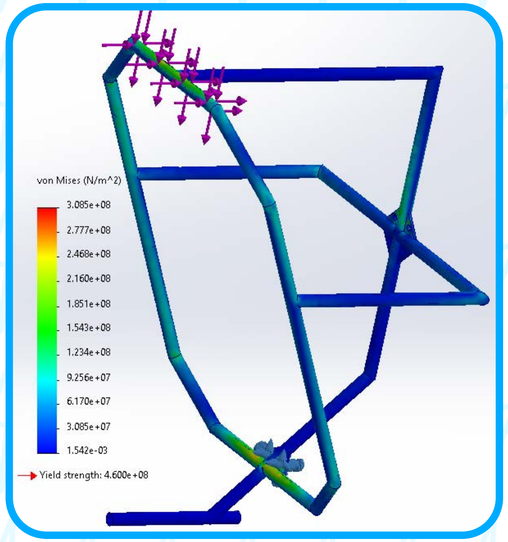
Objective: Keep the rider safe and comfortable.

Rollover Protection Bar: Protects passenger during loss of control

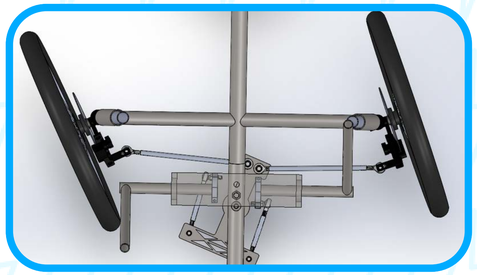
Carbon Fiber seat: Set at 29 degrees from the horizontal for optimal comfort and is placed on an adjustable seat mount.

Custom Frame: Split in two to make transportation easier and welded in house to reduce costs.

FINITE ELEMENT ANALYSIS



STEERING MECHANISM



KEY FEATURES

- Material: 4130 Chromoly Steel Tubing | RPB 1.25"-0.0625" | Front Frame, 1.5"-0.0625" | Factor of Safety: 1.5
- The rollover protection system can withstand a side load of 1330 N and a top load of 2670 N (see "Finite Element Analysis").
- The top speed of our bike is 29.6 MPH @ 100 RPM, and the maximum braking force from 25 KPH is 744 N and the braking distance 3.66 m
- 48V Lithium battery, emergency stop, electric motor to assist pedaling.

BUDGET

Dynamics	Electrical	Statics
Drive Train | $758.27	Battery | $180	Tubing | $1199
Steering | $479.81	Motor | $490	Harness | $70
Braking | $169.71	E-Stop | $12.91	Mirrors | $16
	E-Box & Contents | $257	

TOTAL COST: $3,632.70

SPECIAL THANKS

Professor David Copp, we couldn't have done this without your guidance and support.
Tyler Schuldt, Jake Chutney, and Patrick Jerome Smyth for invaluable advice as well as making manufacturing on-campus possible.
President Ailsa Watt and Vice President Ryan Mawlawi of ASME@UCI for supporting the team every step of the way.

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