DesMod - Design Report

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1. Two-Wheel Drive Bicycle(problem 2)

The 2015 atlas mountain bike challenge will be held in a marshy wasteland in Kutch, where the extra traction provided by an extra driven wheel might be the enhancement that shaves off the few precious seconds that might be the difference between a winner and a loser.

An all-wheel drive vehicle has the advantages of better traction, more control in rough trails, sharper turn radius, less likelihood of getting stuck in mud, and ability to tow more weight and climb steeper slopes.

Design a 2 wheel drive bicycle with that might be useful in the competition. Remember that both the wheels have to rotate at the same speed, except when turning.

2. Give a detailed description of the working mechanism of your design.

The working mechanism of our 2 wheel drive bicycle is mainly comprised of

1) Drive train(Shaft drive mechanism)
2)CVT(continuous variable transmission replacing conventional derailleur)

DRIVE TRAIN

This mechanism can be briefly pointed as

1)The input torque from the pedal shaft is transferred to both the wheels via the shafts(such as in automobiles)
2) A driving pinion is mounted on pedal axil which acts as input for the CVT(explained later)
3) A hypoid gear is mounted on the output shaft of the CVT
4) Through this, shafts with spiral-bevel pinions are used to transmit the torque the wheels.
5) These shaft assembly consists of few universal joints and arrangements for rotating them with axial flexibility.

6)The front wheel drive comprises of combination of different gears(transfer box) which accounts for driving the front wheel during turning.

7) The transfer gear box has provision for steer compensation.

The entire drive mechanism is shown in fig1

Transfer box mechanism is shown in fig2

CVT

A continuous variable transmission system is used in place of traditional derailleur Assembly (chain drive) in order to vary the output speed according to input, continuously. There are many types of CVT systems.

We employed a planetary variable transmission system as shown in the figures below. This is also called CVPT hub.

A commercially available Nuvinci CVPT hub mechanism is shown in the below youtube link.

http://www.youtube.com/watch?v=2bvcmsGtnNQ

3. How is it better than existing designs?

The design which is a combination of

1) Shaft drive train and

2) CVT has many advantages.

- The shaft drive has a consistent performance &efficiency.
- They do not need any adjustments(tightening such as in chain drive).
- Therefore polygon effect is eliminated.
- The maintenance required is very less.
- By employing a CVT we eliminated gear shifting.
- The speed variation is very smooth & gradual.
- The gear ratio speed range is around 350%.
- Best suited for two wheel drive bicycles without sacrificing the torque.
- Improved traction and stability.

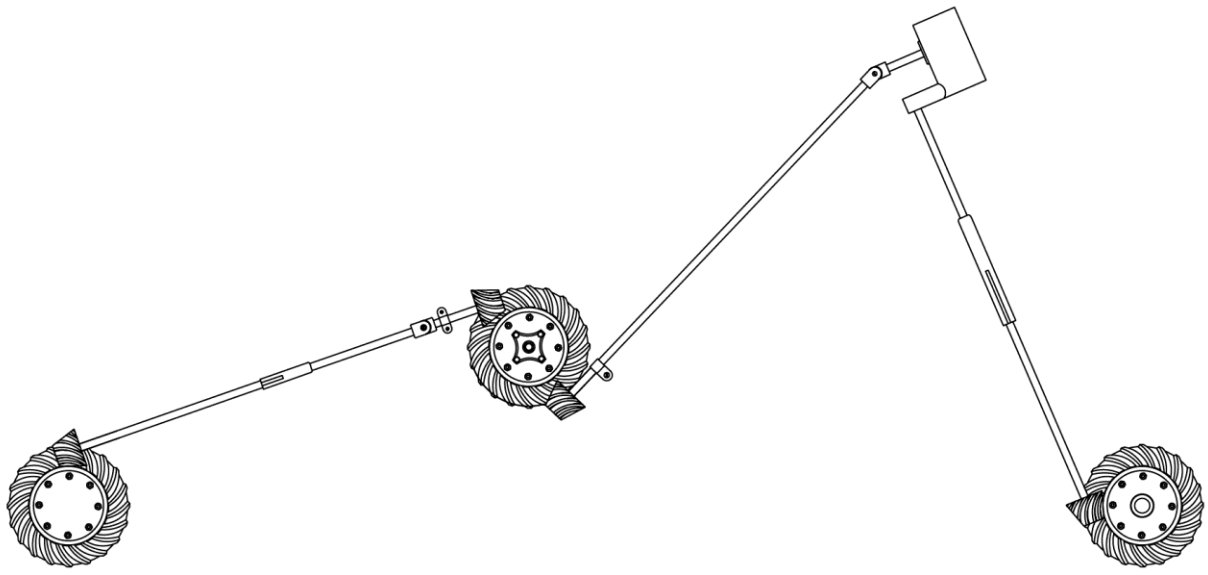


FIGURE1

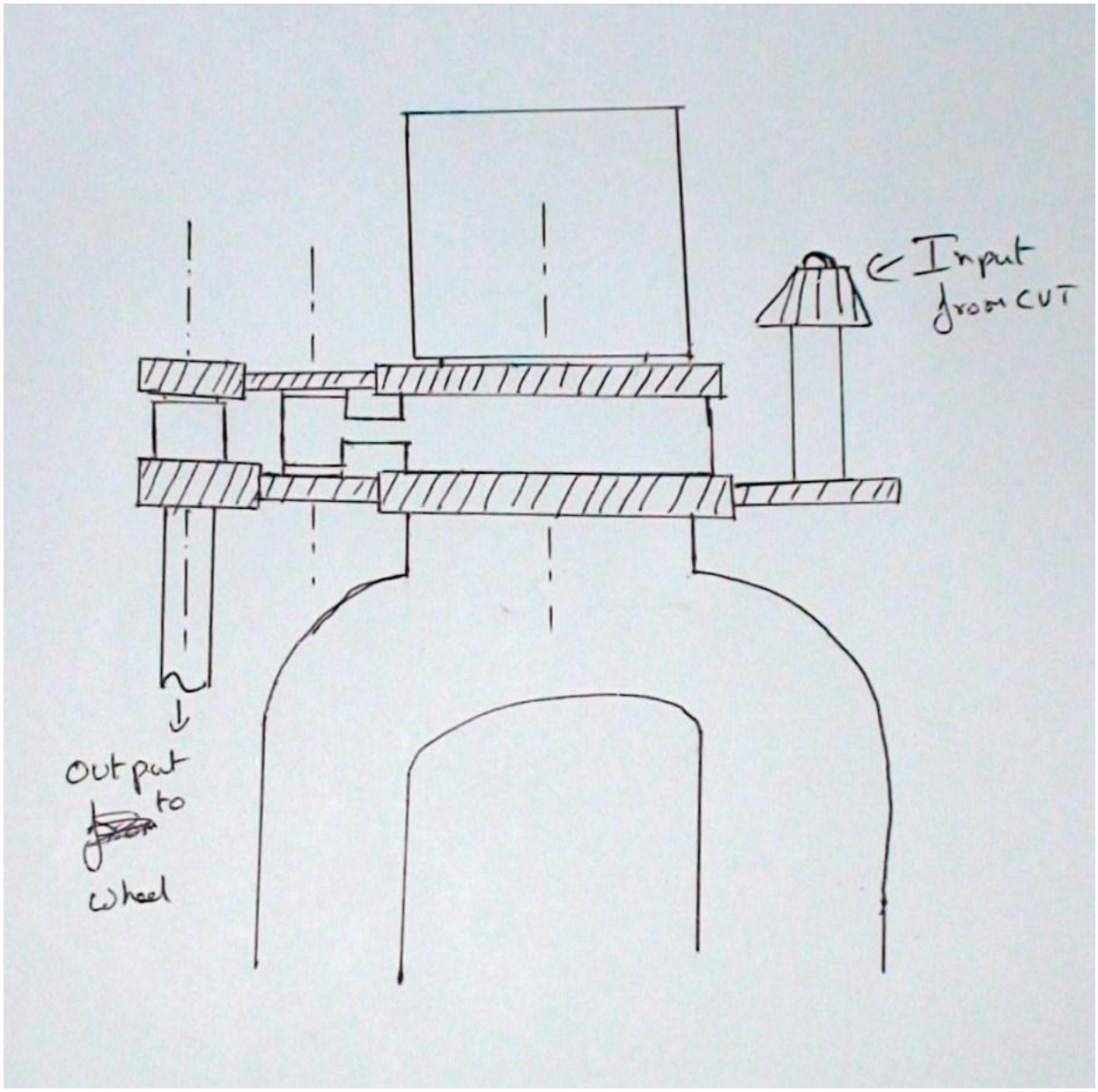
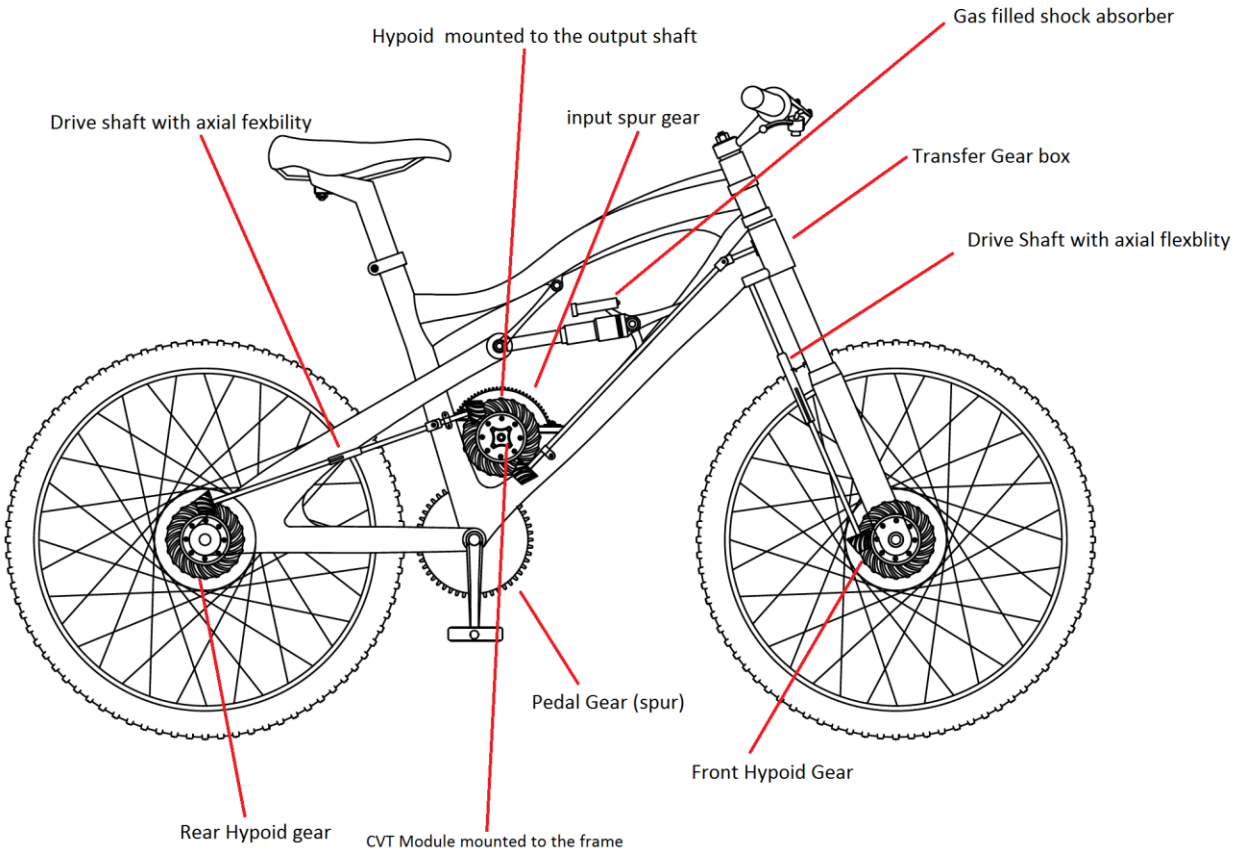
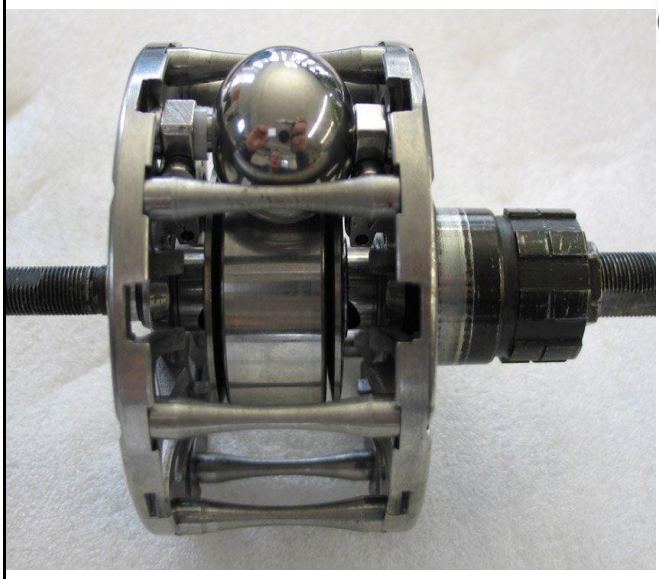
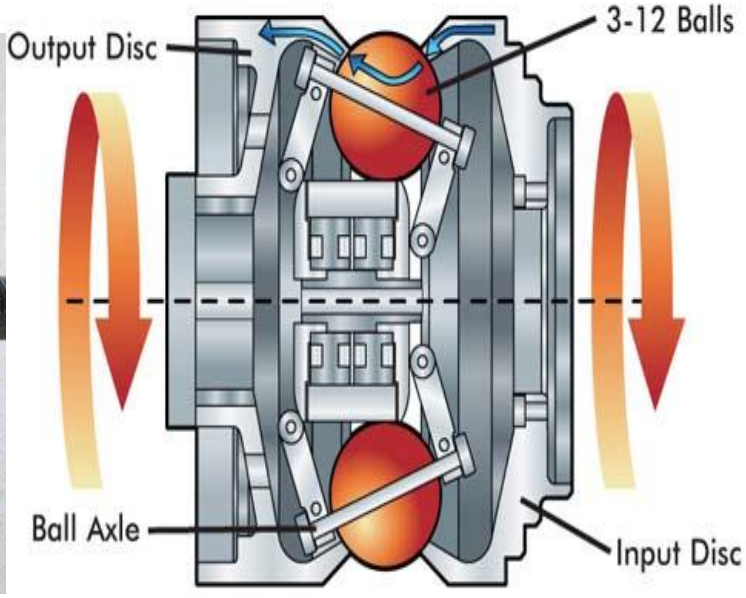


Figure 2(transfer gear mechanism-front steering)



OUR 2WD MOUNTAIN BIKE





CVT illustrated.

ILLUSTRATION OF OUR 2WD MOUNTAIN BIKE