Bike Frame With Rear Suspension

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Introduction

Mountain Biking's growth has been steadily rising over the years, drawing attention to full suspension mountain bikes and thus increasing the demand and price.

We will design a full suspension bike frame that can be manufactured in a skilled person's home workshop.

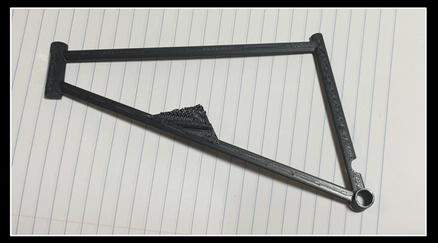

Fig. 1 Preliminary 3D Print

Executive Summary

Over the winter and spring quarters, our project focuses on designing and manufacturing an affordable, DIY-friendly full suspension mountain bike for garage-level construction. We've finalized decisions on suspension and frame design, emphasizing manufacturability. Currently, we're refining designs for compatibility and performance, initiating proof of concept trials, and developing welding skills. Future steps include completing a comprehensive CAD model, sourcing components, fabricating a welding jig, welding the frame, assembling components, and showcasing finalized design. This project fosters collaborative innovation and empowers makers to shape the future of mountain biking technology

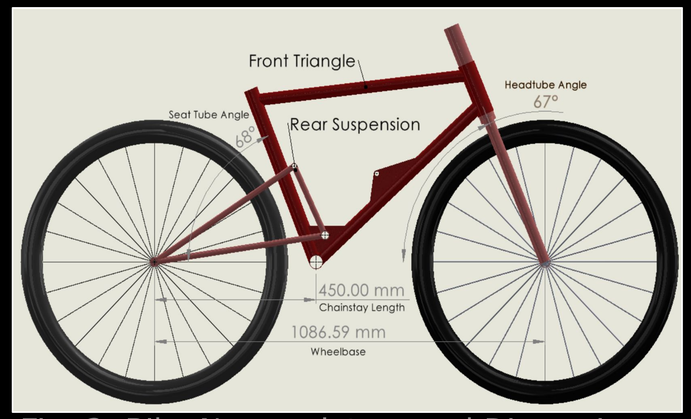

Fig. 2 Bike Nomenclature and Dimensions

Fig. 3 Preliminary Bike Model

Design Process Feature

-The following measurements were calculated to achieve the most efficient all-mountain bike frame geometry
Head Tube Angle: 67 degrees
Seat Tube Angle: 68 degrees
Reach Height: 416 mm
Stack Height: 517 mm
Chainstay Length: 445 mm
Wheel Base: 1081 mm
Seat Tube Diameter: 31.6 mm
Bottom Bracket Internal Diameter: 34.8 mm
-Leverage ratio, ratio between wheel travel and shock stroke, is influenced by rear triangle.
-Equipped with an appropriate leverage ratio and shock to achieve a total rear wheel travel of 150 mm (Fig. 7)

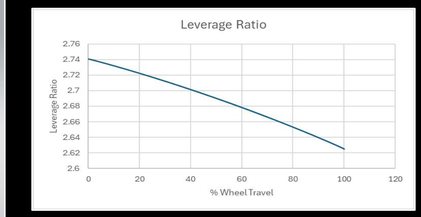

Fig. 7 Leverage Ratio vs. Wheel Travel

Goals and Objectives

Winter Quarter

- Completed 3D Model
- Rear suspension Model
- Completed Manufacturing plan

Spring Quarter

- Finish Manufacturing Jig
- Assemble frame and components
- Tune bike for finished product

Manufacturing Jigs

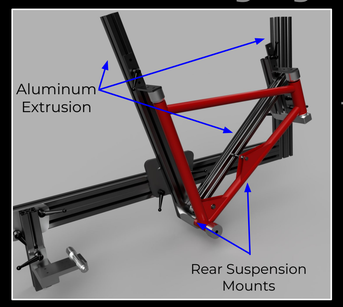

Fig. 4 Front Triangle Jig

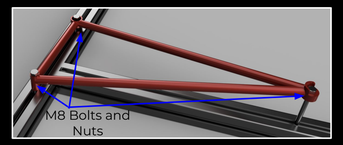

Fig. 5 Half Rear Triangle Jig

Fig. 6 Rear Wheel Travel

Conclusion

Proof of Concept
-3D CAD model (see Fig. 3, 4, and 5) showcases geometry
-Smaller physical model of the frame will verify potential points of buckling previously found through Solidworks simulations

End of Winter Quarter Progress
-A previous manufacturing jig was created prior and is the basis for our current jig design
-The team contributions consist of defining what the bike needs to achieve and designing a frame and welding jig around these set requirements. Other contributions include fabricating a 3D printed model of the frame.

Future Improvements
-Shortcomings: dependency on sponsorship for the rear shock and costly off the shelf-parts
-Future work: create a flexible manufacturing plan compatible with other rear suspension designs

References/Acknowledgements:

We would like to thank our sponsor Tyler Schuldt for his guidance and support. We also are incredibly grateful for the UCI bike builders club for their collaboration.

Environmental and Safety Concerns:

Safety: Our top priority is providing a reliable and safe bike frame that can withstand crashes and repeated use on rugged terrain
Environmental: Include eco-friendly practices in the home use manufacturing plan