

Rover Wheels Design for University Rover Challenge



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Client: Rice Robotics Club

Background

The Rice Robotics Club is participating in the University Rover Challenge (URC) for the first time. As part of this competition, our client has tasked us with designing a set of non-pressurized rover wheels to replace the team's current temporary, low-performance wheels. The objective is to provide wheels that can support a 50 kg four-wheel rocker-bogie suspension rover in completing the URC Delivery Mission, which involves navigating diverse Mars-like terrain, including soft sand, gravel, rocky and boulder fields, steep and loosely consolidated slopes, and vertical drops.

Motivation

Current wheels do not provide sufficient traction, durability, or reliability, which hinders the rover's performance. A new design would address these limitations, enhance competitiveness, and potentially lead to greater recognition and engagement for the Rice Robotics Club.

Problem Statement

Design and build four wheels that can be constructed while maintaining high maneuverability and traction, enduring extreme conditions, and allowing for quick and easy replacement.

Design Criteria

	TRACTION	25%	3.91N
	DURABILITY	25%	Handles 55kg for the duration of URC
	REPLICABILITY	20%	Values from UDS
	REPLACEABILITY	15%	< 1 min
	WEIGHT	5%	1.5 kg per wheel
	SIZE	5%	125-150mm diameter
	COOLNESS	5%	Values from UDS

Journey of Iterations

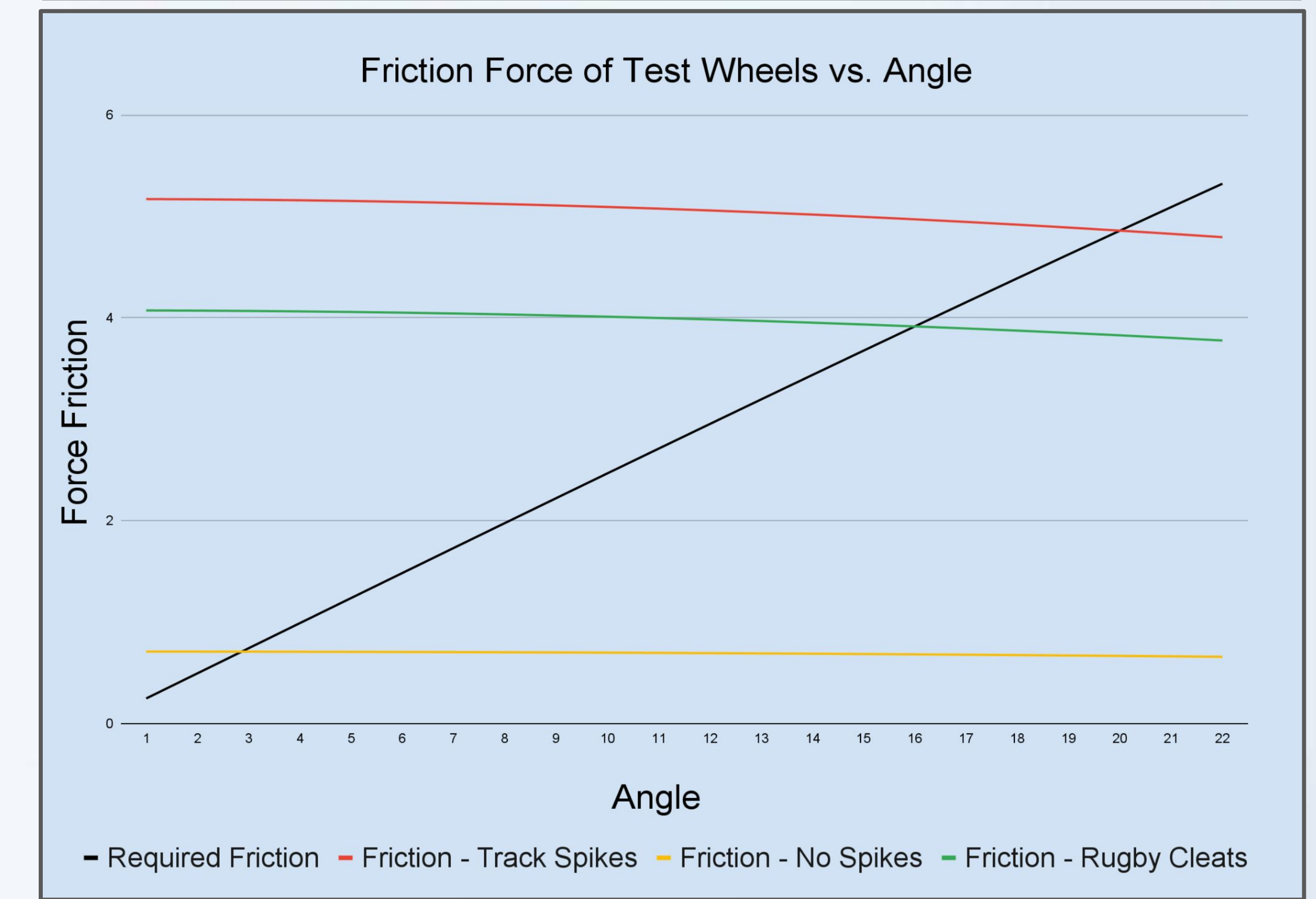


Design and Features



Testing Results

Durability Test			
Drop Height (in)	Wheel with Rugby Cleats	Wheel with metal spikes in linear layout	Wheel with metal spikes in diagonal layout
10	No damage	No damage	No damage
20	No damage	No damage	No damage
30	Light damage	No damage	No damage
40	Loss of 2 spikes	Light damage	No damage
50	Loss of 2 more spikes	Heavy spike blunting	Light damage



Future Improvements

Future iterations should focus on strengthening the spike attachment, potentially through mechanical fasteners or higher-strength adhesives. Additionally strengthening the spikes themselves with harder materials to reduce wear and blunting would be beneficial for wheel longevity.

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