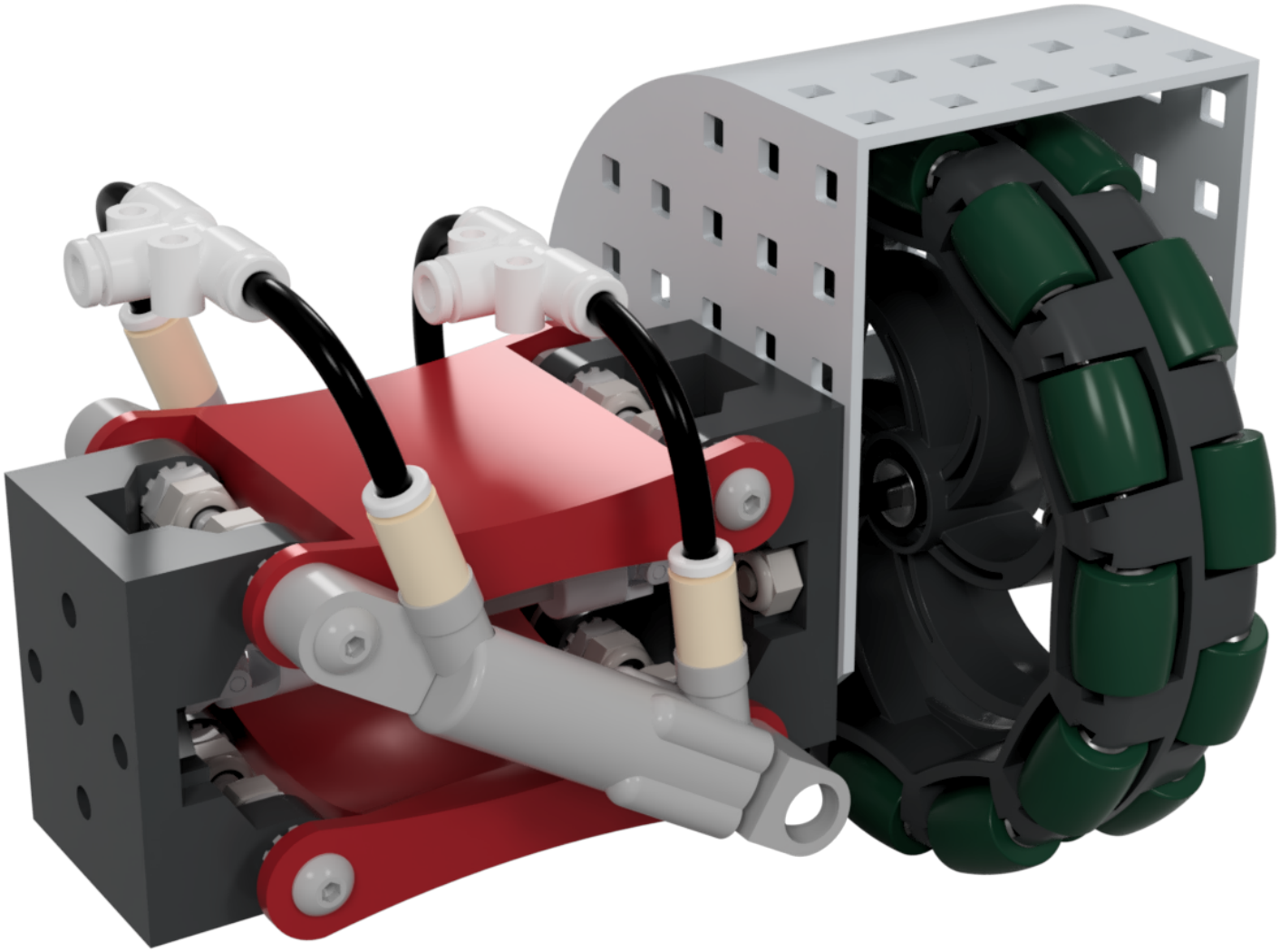
Pneumatic Twin Bar Suspension Kit

Make it Real CAD Challenge



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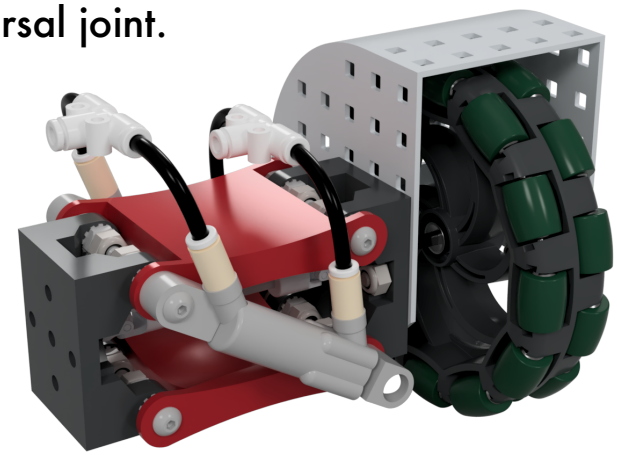
Introduction

The pneumatic twin bar suspension kit was created to provide improved flexibility and torque to the robot chassis. This part will allow for a greater range of configurations with robot design. Most chassis systems generally have a fixed drivetrain unit and none of the shafts shift to different positions. Currently, robot designs are constrained by the fact that any form of a moveable drivetrain unit requires a significant amount of resources and space. This pneumatic twin bar suspension kit addresses these constraints without compromising overall mobility.

Functionality

The pneumatic twin bar suspension kit consist of twin aluminum bars with a pneumatic piston and a universal joint. The 2 bar suspension is fitted between the chassis frame and the wheel.



Twin Bar

Two aluminum bars of equal length alternate between 2 position; a horizontal position (Fig. F5) and a diagonal position (Fig. F6). The height of the wheel changes by 1.9in when alternating between positions. As shown below the mount that connects the 2 bars stays perpendicular to the ground which secures the wheels perpendicular with the ground.

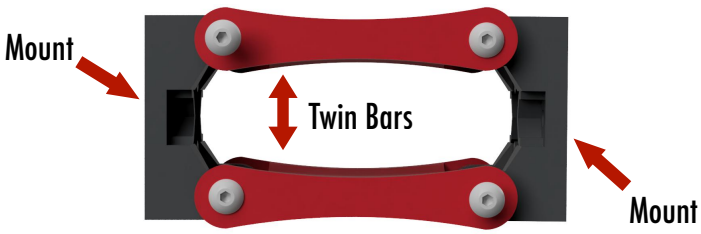


Fig. F5

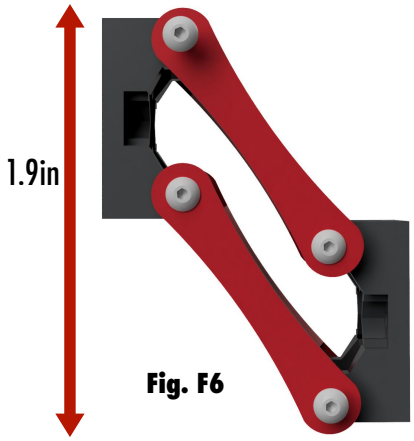
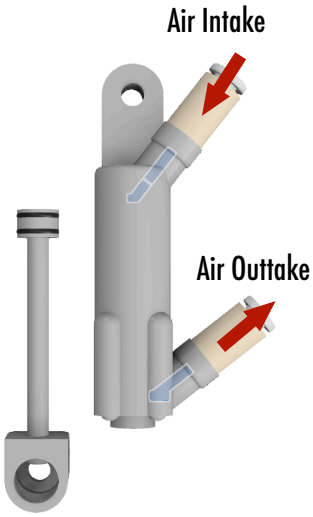


Fig. F6

Pneumatic Piston

The pneumatic pistons are what enables the twin bars to move between positions and are fitted diagonally on both sides of the bars. The force of the piston pushing against the opposing joints forces the bars to move down to the diagonal position (Fig. F7) or back up to the horizontal position (Fig. F8). Both pistons connect to a single VEX solenoid and the solenoid valves are tilted at an angle to keep the air tubes from interfering with the movement of the twin bars.



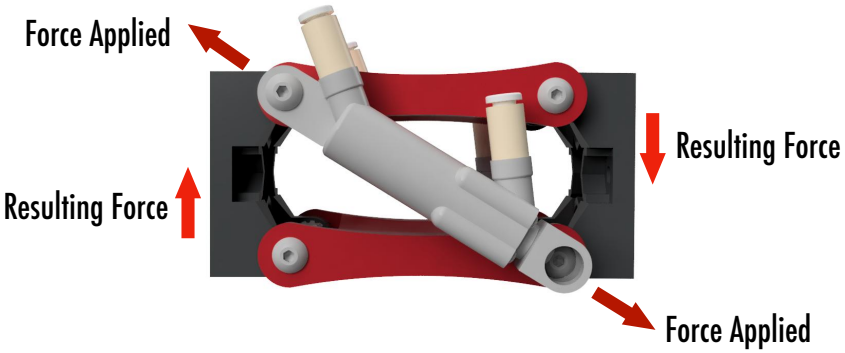


Fig. F7

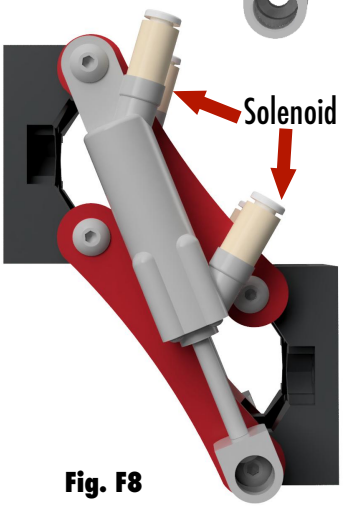


Fig. F8

Universal Joint

The universal joint transfers the power of the motor to the wheel and maintains the same velocity even when the drive train is not straight. The velocity is kept in the same direction because one end of the shaft is connected to the motor and the other while the other end of the shaft is connected to the wheel and both ends are kept parallel (Fig. F9 and F10)

Fig. F9

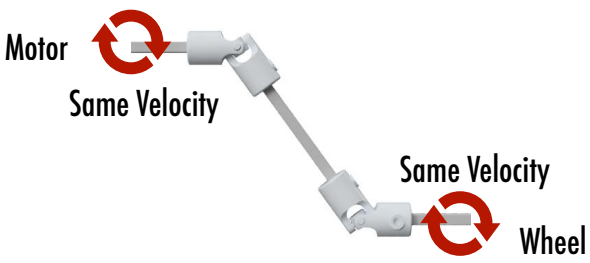
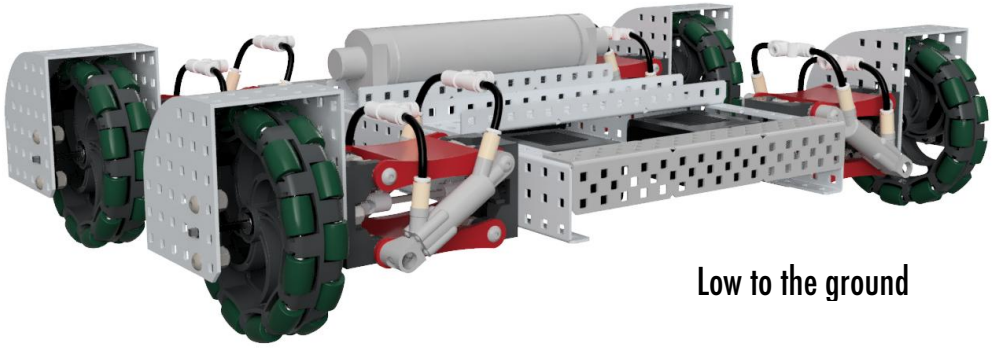


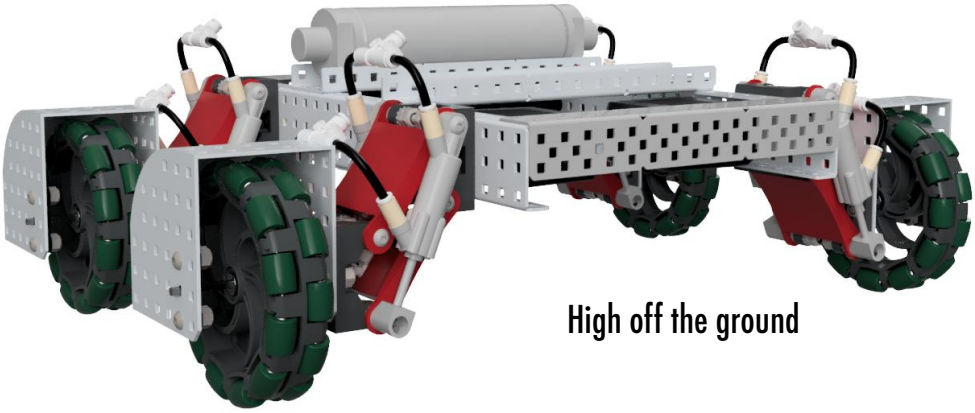
Fig. F10

Configurations

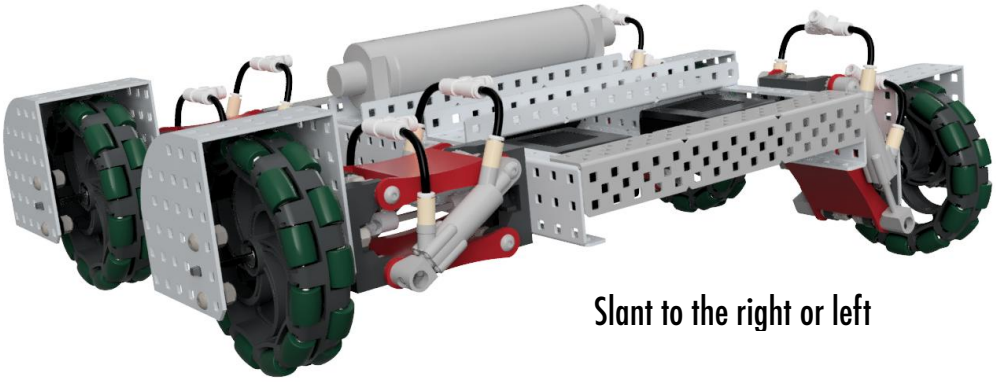
On a completed robot, 2 sets of the pneumatic twin bar suspension kit will be placed on each side of the chassis creating a 4 wheel bot. This will enable the robot to easily transform into a range of configurations;.



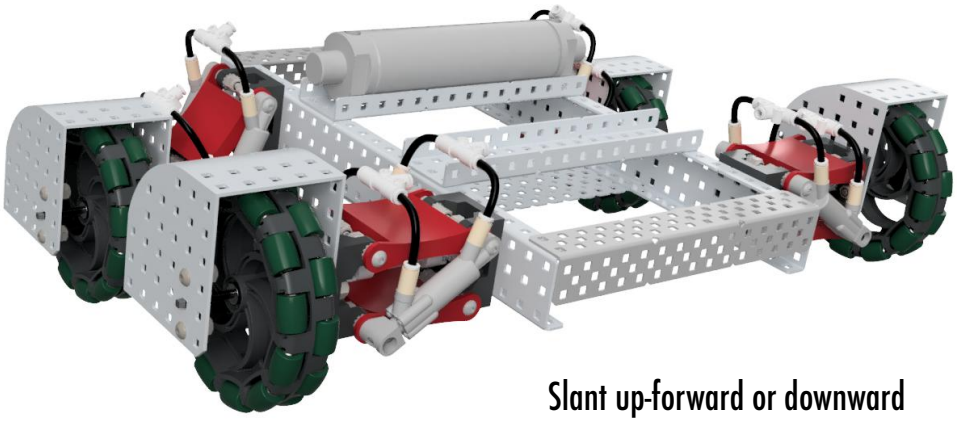
Low to the ground



High off the ground



Slant to the right or left



Slant up-forward or downward

Design

This design was inspired by combining my passions for robotics and automotive. Inspired by the air lift suspension that adjusts the ride height on customized cars, I created the pneumatic twin bar suspension kit. Leveraging Fusion 360, I started the design by sketching generic geometric shapes and then through repeated testing in Fusion 360, trimmed each component until the part matched my intended design detail. In final assembly, all components, rigid groups and joints were used to make the final kit functional.

Conclusion

The pneumatic twin bar suspension kit enables a single chassis to perform as 4 uniquely configured chassises which enhances a robot's performance through greater mobility on a wide range of terrains.

Fusion 360 version 1.45.2 was used for each step of designing the pneumatic twin bar suspension kit. This was a useful tool as the functions proved easy to learn and was ideal not only illustrating the initial brainstorming but also for communicating and collaborating on improvements. Fusion 360 proved to be quite handy to showcase changes and provide members with step-by-step guidance for building specific components.

I plan to further develop my Fusion 360 skills to create solutions that can improve the way environmental energy is harnessed and stored.