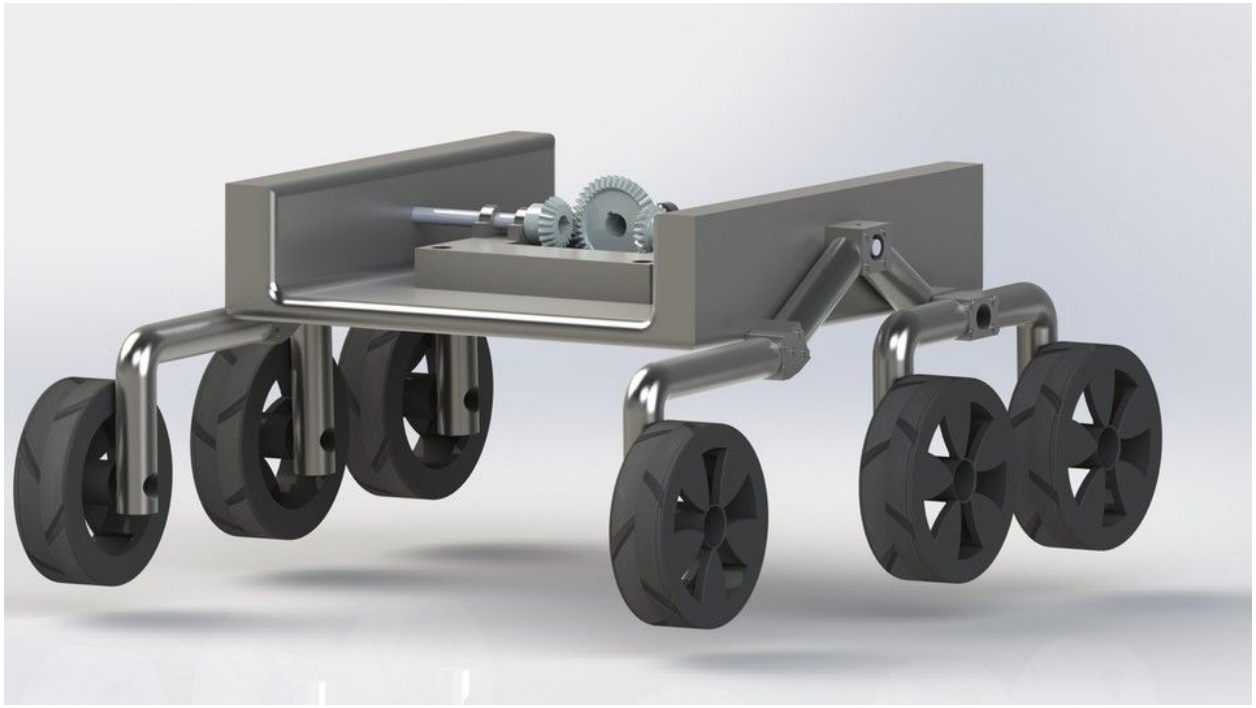

Bogie Rocker System Project

09.12.2017

Kajanth Kirupananthan & Muhammad Saifuddin

Executive Summary

The goal of the following project is to implement the rocker-bogie system into an autonomous robot; which will have the function of keeping a level surface; that will be able to carry a cup from one end of a harsh simulated rocky surface to the other. The following project will involve designing, programming and building an autonomous robot that will be inspired by the bogie-rocker system implemented on the mars rover, said bogie rocker system will be tasked with maintaining a level body even through harsh rocky environments.

Table of Contents

The Problem

Many Space organizations such as Nasa, create explorer devices to go explore the unknowns of our universe and send information back to earth. These devices cost billions to build and produce; these major investments would go to nothing if the explorer robot sustained damaged by the harsh surfaces of the unknown worlds because all the money and time spent on the robot would be lost. To summarize many explorer robots sent to other planets need a system to keep a level surface to protect said robot from sustaining any damage over the course of the exploration mission.

The Fix

To ensure that all valuable information gets back to earth these robots attempt to implement the rocker-bogie system. The rocker-bogie system uses a series of gears and movable wheels to ensure a level surface that would protect all components from the harsh terrain at all times. Thus, preventing critical blows to the valuable technology and information that is housed in the robot. The following project will attempt to implement the bogie rocker system on a small scale robot as a proof of concept. Said robot will be tasked

with proceeding through a simulated rocky path while keeping a level surface at all times to prove the concept of the rocker-bogie system.

The Execution Plan

Phase 1: Design Phase (due at the end of September 2017)

- Components that are crucial to the robot must be decided beforehand to ensure the design will account for proper housing or said components.
- Drawings of the exterior body must be drafted to ensure a body that will be able to house both the components of the rocker-bogie system as well as the glass of water itself.
- An inventor cad must be designed to be able to print the frame in such a way that all components may interlock thus, making the assembly of the robot easy. The framework must be designed to be sturdy while also accounting for hidden sections for the wiring to work through.
    - Assembly of Robot must show a movable, working wheel and gear system, to ensure that after being built the robot will maintain a level surface.

Phase 2: Prototyping Phase (1 month)

- The prototype must be made through scraps in the shop at that time to verify a working rocker-bogie system.
    - If said prototype does not show the system working successfully, iterations must be made to the cad and the prototype.
    - Iterations must be done until Mr.Rattray and both group members are confident with the design of the robot.
    - After the design is completed all materials needed must be finalized and ordered.

Phase 3: Building Phase (until December 2017)

- Building will commence when all materials have arrived
- Parts must be 3d printed beforehand to ensure enough time to build the robot
- All wiring and components must be secured and wiring must be hidden to ensure all components take no damage
- All joints must rotate smoothly

Phase 4: Programming (second week January)

- Using an Arduino (model to be decided) and all other electrical components on the robot, it must be coded to execute and safely move through a path and keep a stable body to carry a glass of water
    - Timings must be made and iterated upon to ensure the robot moves through path correctly
    - Code must run perfectly back and forth before the final stage of

Phase 5: Testing

- The end product must successfully make it through path consistently.
- The end product must also prove its rocker-bogie system is working by keeping a cup of water full even after making it through the path.

Budgeting

Product	Price	Quantity	Website
Vex motor	$19.99	4	Robotshop
Vex cortex	$324.99	1	Robotshop
Vex battery	$12.99	2	Robotshop
Vex Wiring			
3D print material (PLA Filament)	$19.99	2	Robotshop
bearings	To be decided		
Differential gear system	To be 3D printed	1	N/A
Metals rods	$19.98	To be decided (diameter of rod is under determination)	Home Depot
Block of wood for cnc	$33.20	To be decided	Home depot
LED strips	$21.99	1 roll	Amazon.ca
High traction vex	$6.99/each	6	Vex Robotics

wheels			
Estimated Cost	$550		

Team Qualifications: the "Who?"

- Kajanth
  - Coding
  - Building
  - Cading/ CNC
  - Designing
- Muhammad
  - Cading/CNC
  - Building
  - Presentation design
  - Path design

Path Followed by Designed Robot

- Description
  - The path is designed in this manner for two reasons
    - Because conditions on said planet are extremely unpredictable (one part of the rover can be on a different level than the other)
    - To demonstrate the capabilities of the rover