Balancing Robot Concept Report

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Table of Contents

[1] Goal

The purpose of this project is to create a preliminary self-balancing robot to be used for a balancing robot. The robot shall have a suspension system and be capable of surviving a 0.2 meter drop three times. It should also be able to balance even when the wheels are not the same level and be capable of jumping to at least a height of 0.2 meters. It shall be controlled from a distance.

[2] Mechanical Expectations

[2.1] Chassis

- **Two wheels:** will be limited to only two wheels.
- **Suspension**: will have a suspension system
- **Survivability**: will survive a 0.2 meter drop test and have a protective frame
- **Mobility**: will balance even when wheels are not on the same height and be capable of jumping to a height of 0.2 meters.
- **Electronics:** will hold all electronics
- **Volume**: initial size will not exceed a 600 by 600 by 500 millimeter cube. Expanded size will not exceed a 800 millimeter cube.
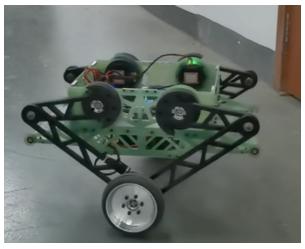- **Weight**: will not exceed 25 kilograms.
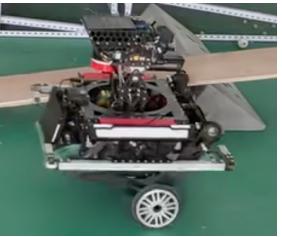
[3] Software Expectations

[3.1] Control

- **Bluetooth:** utilizes a bluetooth controller to move
- **Balancing**: will balance without movement, with movement, and when pushed

[4] [Existing Robot Analysis](#)

6 different robots were analyzed. Most of the robots utilized a scissor lift mechanism to change the height of the robot. All the robots used a box configuration for the chassis and to hold the electronics.

These are the two robots with the most interest. The robot on the left showcases the barebones design that is needed for the success of the mission. The robot on the right showcases extra functionality; for example, the ability to balance with one wheel on the ground and one wheel on the ramp at the same time.

[5] Electronics Study

This study was meant to brainstorm components needed. Specifics have not been decided yet. The following electronic components will be used in the project:

- Motors and motor accessories
- Power management board
- Bluetooth receiver and transmitter
- Inertial measurement unit
- Batteries
- Control board

[6] Software Study

- This study was meant to brainstorm software needed. Some depend on the type of control board. The follow software is expected to be used for the project:

- IDE (can vary): VSCode, MBed Studio, Geany
- CAD: SolidWorks
- FEA: Ansys
- Controls Simulation: Simulink
- ROS (only if Raspberry Pi is used)
- Electronics Design: KiCAD, FalSTAD/LTSpice

[7] References

- RoboMaster Building Specifications

- BiliBili