Re-Sizeable Autonomous Cleaning Robot

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

Introduction

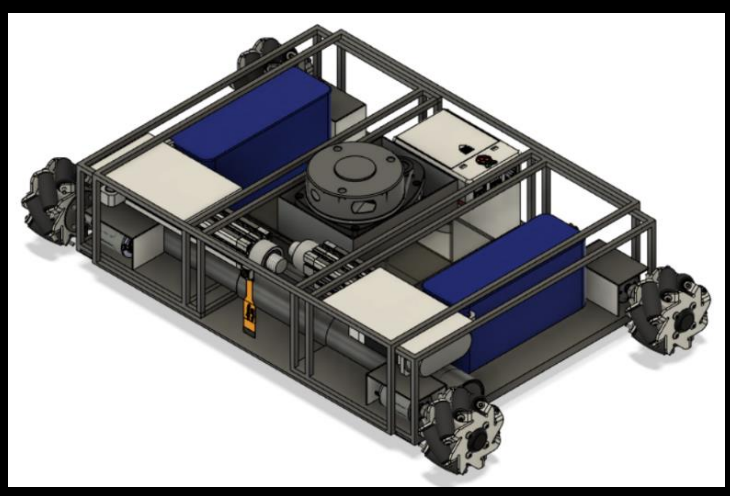
- There is a strong demand for the application of cleaning robots in domestic settings.
- Most robots in the market are of a fixed configuration.
- Development of a re-sizeable robot that can increase its size in open spaces to cover more area in a single sweep, or can reduce its size to reach inaccessible areas is the focus of this project.

Scope of the Project

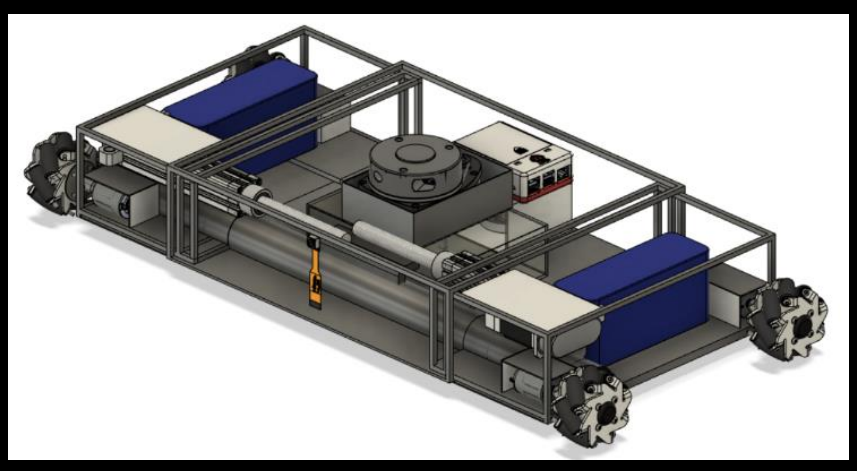
- The project focuses on the development of a re-sizeable cleaning robot. The re-sizing mechanism can also be exported to other robots depending on needs.

Methodology

- Definition of the problem statement and development of the Functional Architecture.
- Finalization of components and development of CAD model.
- Conduction of a Simulation study and development of a Functional Prototype as a proof of concept.



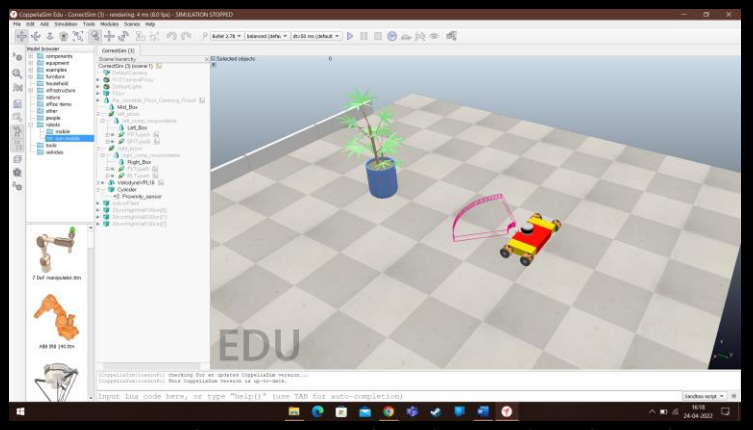
Minimum Length



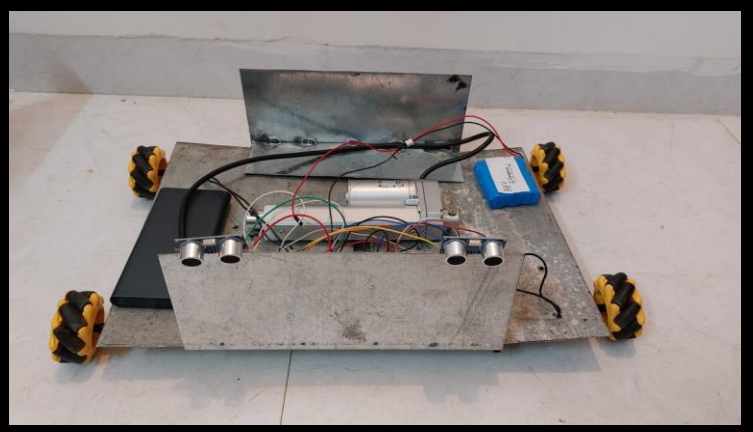
Maximum Length

Result and Discussion

- A simulation study has been conducted to demonstrate the efficacy of the system.



- A Functional Prototype has been developed to compare with the Simulation study.



- A stress analysis on the MS sheet used to make the chassis has been conducted. The FOS is 15.

References

- Designing and Optimization of An Autonomous Vacuum Floor Cleaning Robot
- Autonomous Self-Reconfigurable Floor Cleaning Robot
- Development of a Vacuum Cleaner Robot

Conclusion and Discussion

A simulation study has been demonstrated to verify the efficacy of the system. Further, a functional prototype has been developed as a proof of concept to test the system in the real world. A static stress analysis has been conducted to determine the factor of safety of the chassis, which is the main load bearing element of the robot. Since the chassis is made of MS sheet, the weight of components will introduce stresses and bending. The stress analysis as well as the model developed prove that bending and subsequent failure are not a problem. Future work will involve integrating SLAM using LIDAR, for more efficient and systematic cleaning.

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