Development of Light Detection And Ranging (LiDAR) based autonomous Automobile

Abstract:

- In this project an autonomous driving automobile using Light Detection and Ranging (LiDAR) sensor, All Wheel Drive (AWD), and Mecanum wheel (multi-direction wheel) are designed and developed.
- Raspberry pi 4B and STM32 are used for controlling the Lidar output and the motion of the Automobile.

Problem Identification:

- Self-driving and obstacle detection is used to prevent an accident. Comfortable riding and damping the vibration of the Automobile.
- More maneuvrability in the sharp corner and crooked spaces in the industry.
- This can be used in a warehouse where turning vehicles will be very difficult with a minimum turning radius.

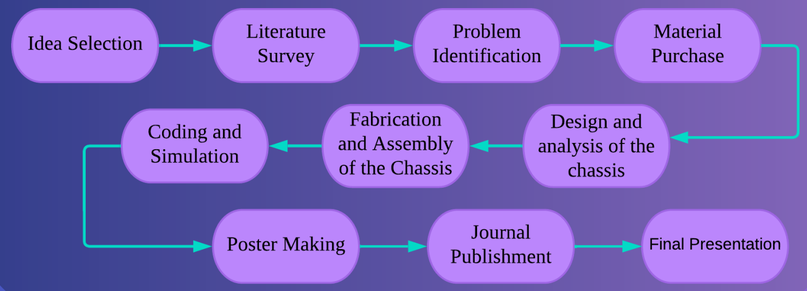
Objective:

The objective of this project is to build an Autonomous vehicle using raspberry pi4 and STM 32 motor driver unit. This must drive using a mecamun wheel for multi-direction motion

Products Used:

1. RP A1M8 Lidar
2. Raspberry PI4
3. STM32
4. DC Geared Enoder motor
5. DC-DC regulator
6. Aluminium chassis
7. Mecanum wheel
8. Fasterners

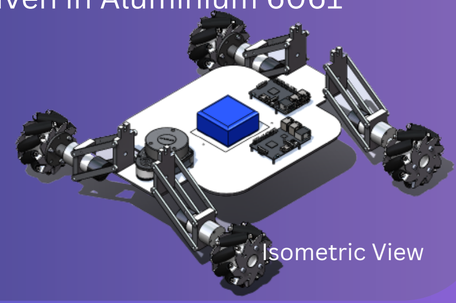
Methodology:



3D Design:

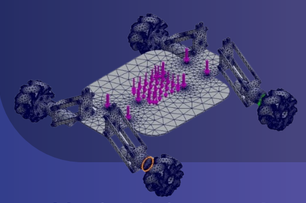
The design of the chassis is done in SolidWorks. Each part was created separately and assembled.
Then the chassis was given in Aluminium 6061

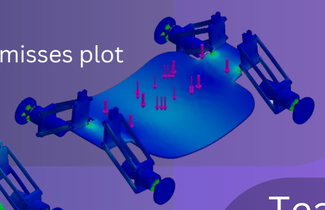

Top View

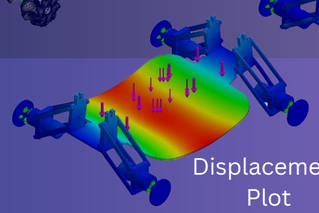

Isometric View

Analysis:

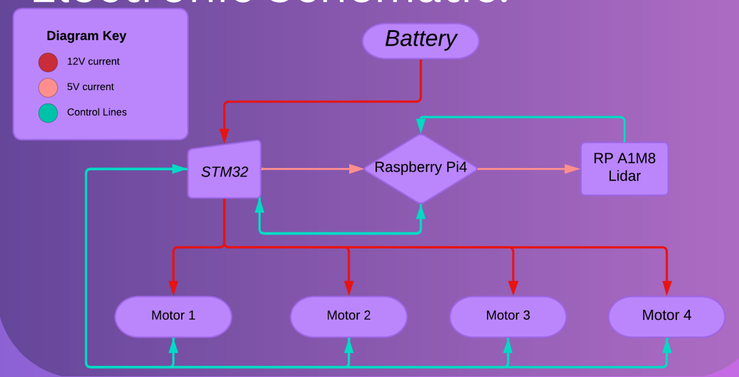
The analysis of the chassis is done in SolidWorks. Two types of analysis are done on the chassis :


Meshed plot


Von misses plot

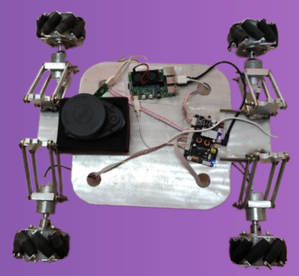

Displacement Plot

Electronic Schematic:



Machining Process:

The chassis of the robot is done of aluminum for lightweight capabilities. The machining of the chassis is done in three different methods: VMC, CNC Lathe, and EDM for precise machining for each part. The photos of the assembly are added:



Conclusion:

In this project, mecanum wheel drive and the autonomous system have been designed and fabricated, which can be used in industrial platforms and forklifts.

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