DESIGN AND FABRICATION OF ROVER ROBOT

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Introduction:

Mars is a fascinating planet. It's icy cold and covered in reddish dust and dirt. Like earth, it has volcanoes, gullies, and flat plains. Scientists can also see channels that look like they were carved by rivers and streams a long, long time ago. Over the years, Nasa has sent four robotic vehicles, or rovers, to learn more about mars. The perseverance rover is intended to examine the rock record in order to learn more about the geologic processes that produced and modified the Martian crust and surface over time. The rover is used for digging, scraping, and collecting fragments of the red planet. The design of the perseverance rover evolved from that of its predecessor, the curiosity rover. The two rovers have a similar body plan, landing mechanism, cruise stage, and power system, but the design has been enhanced in a variety of ways for endurance. The project work is carried out to design and construction of a similar prototype of a perseverance rover with stainless steel parts and limited attachment of scientific components, hardware, and tools, among other things. The rover has the ability to manoeuvre in various terrains and may be controlled manually or automatically to work in various terrain situations, providing constant input to the end user. The rover is outfitted with a 12v power source, crucial hardware such as Arduino boards, metal gear servos, uv sensors, and other sensors, as well as other hardware components.

Objectives:

- **Technical skill development:** building a rover involves various technical skills, such as mechanical design, electronics, programming, and control systems. The project can serve as an opportunity to enhance your skills in these areas and gain hands-on experience with real-world applications.
- **Problem solving and innovation:** developing a rover project allows you to tackle challenges related to design, navigation, obstacle avoidance, and remote control. It

encourages you to think creatively and develop innovative solutions to overcome these obstacles.

- **Practical application of theory:** many concepts learned in the classroom can be applied practically in a rover project.
- **Research and development:** a rover project can provide an opportunity for research and development, where you can explore new technologies, algorithms, or methodologies related to robotics, sensors. Creating a functional rover as a final year project showcases our competence and understanding of the engineering principles and concepts we have learned.

Methodology:

Prototype design of rover:

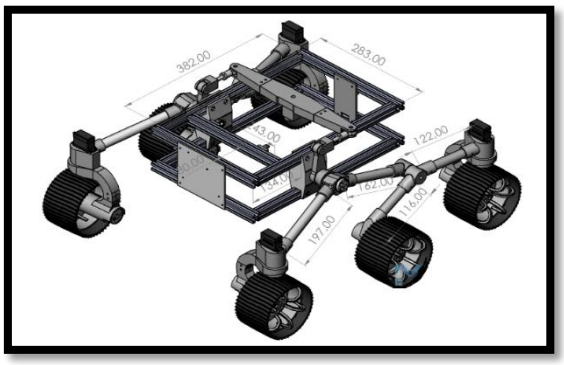


Fig. Prototype design the rover bogie

The above figure shows the prototype of the rover, the design of this frame and chassis is similar to actual design of the rover bogie. We have used this prototype design to study the different motions and links and other dimension prospective also.

Drafting from prototype:

The above figure shows the 2-d drafting of the rover bogie, which includes the side view and front view. The figure represents the different angle movements in terms of degrees. It also highlights the important parts used for the drafting.

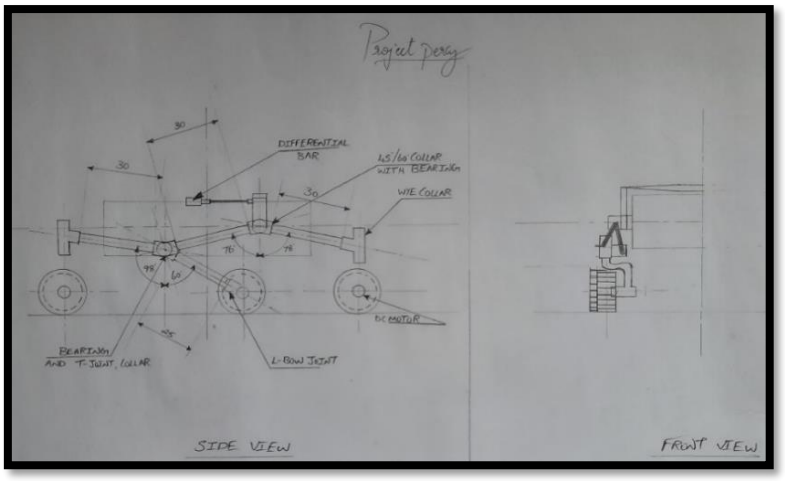


Fig. 2-d drafting from the prototype design of bogie

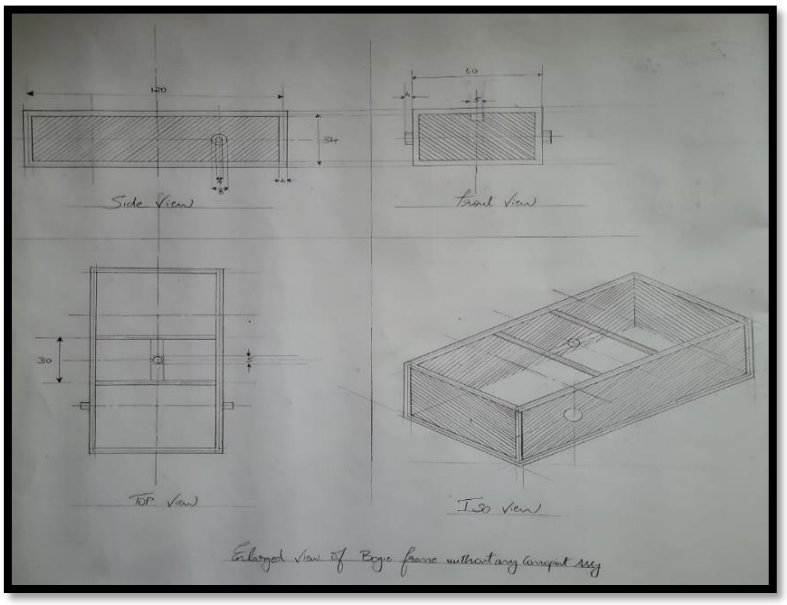


Fig. 2-d drafting of main body of rover

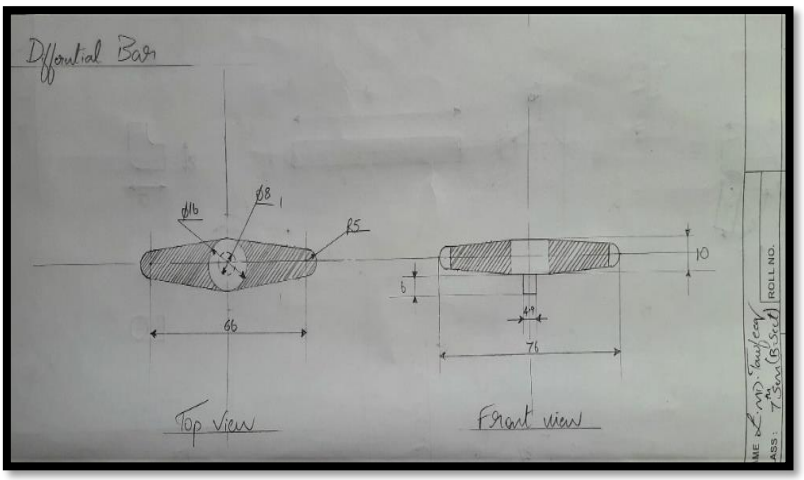


Fig. 2-d drafting of differential bar for rover bogie

The figure shows the 2-d drafting of different views of the main body of rover bogie, differential bar for rover bogie. The views include side view, front view, top view, and isometric view. The drafting of the differential bar mechanism is used to steer the rover in order to maneuver in different terrains. Using this 2-d drafting we have designed the cad model of the bogie body, using solid edge software, for which the cad design and computer aided drafting is produced.

Development of cad design:

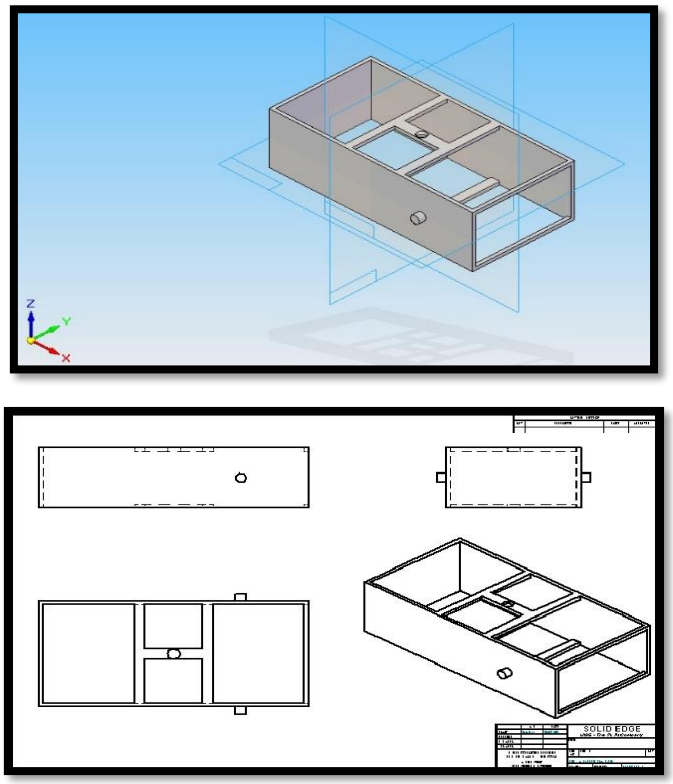


Fig. Cad design of main body of rover bogie with different views

The 2-d drafting of the main body of the rover bogie is developed in to cad model using solid edge- v19 software. The cad design of the of the main body of the rover bogie is shown in the figure. The design is made keeping in mind the design of actual frame of rover bogie.

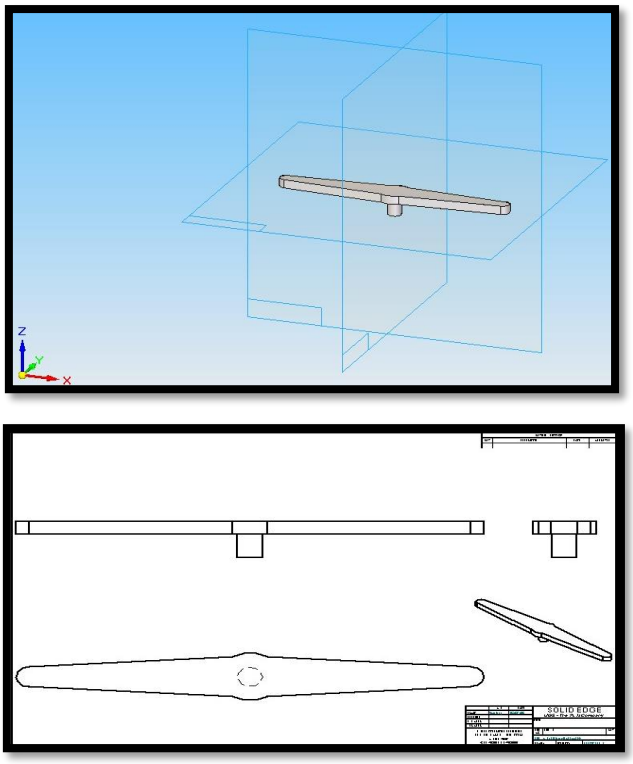


Fig. Cad design of differential bar for rover bogie with different views

The 2-d drafting of differential bar for rover bogie is developed in to cad model using solid edge- v19 software. The cad design of the of the differential bar for the rover bogie is shown in the figure. The differential bar mechanism is used to steer the rover in order to maneuver in different terrains.

Fabrication work:

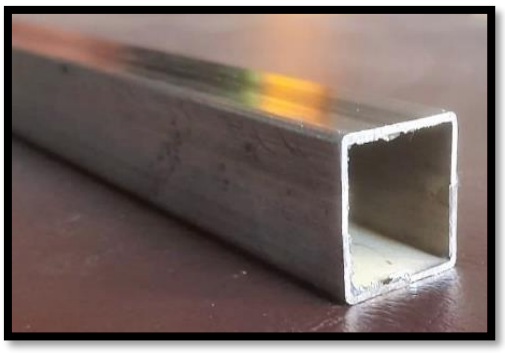


Fig. Stainless-steel of 22 gauge

Stainless steel of 22 gauge refers to a specific thickness of stainless-steel sheet metal. Gauge is a measurement unit used to determine the thickness of various materials, including metals like stainless steel. In the case of stainless steel, the higher the gauge number, the thinner the sheet. So, 22-gauge stainless steel is relatively thin. The stainless steel of 22 gauge used for

fabrication of rover bogie body is shown in figure. To give you an idea of the approximate thickness, 22-gauge stainless steel is usually around 0.030 inches or 0.76 millimetres thick. This thickness is commonly used in applications where moderate strength and durability are required.

Welding process:

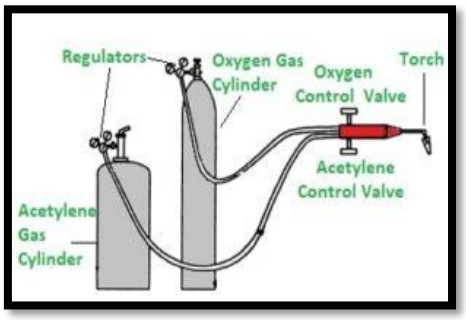


Fig. Gas welding arrangement

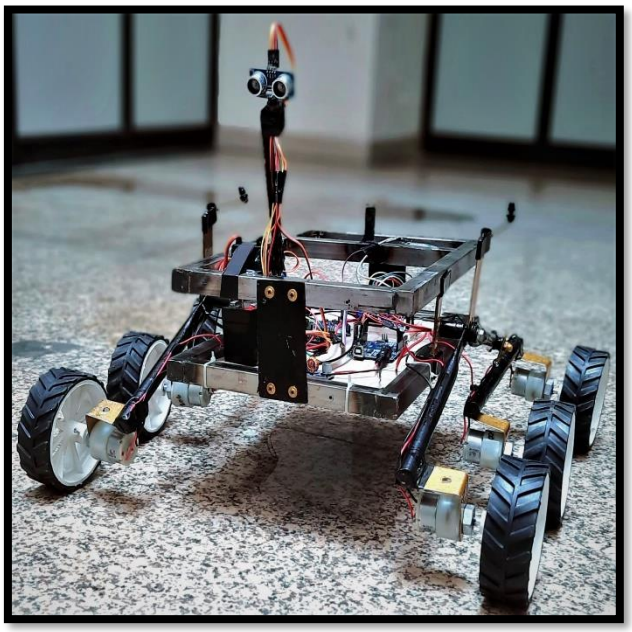
gas welding is a welding process that uses a fuel gas and oxygen to produce a flame for joining metals together. It is an older welding technique that has been largely replaced by more advanced processes such as arc welding and tig (tungsten inert gas) welding.

Fig.5.7. Welding process

In gas welding, a fuel gas, typically acetylene, is combined with oxygen in the correct proportions to create a flame with high temperatures. The flame is directed at the metal surfaces to be joined, causing them to melt. A filler rod or wire may be added to the molten pool to provide additional material for the weld joint.

Results and conclusion:

- Based on the study carried on perseverance and other rovers, we have designed a similar prototype which is low cost and light in weight.
- The prototype is limited to our final project requirements and cost effectiveness, and we have tried to reduce the hardware as similar to real perseverance rover as much as possible as per our requirements and limits.



Scope of future work:

At present existence as per our final year requirements we have designed and developed a similar prototype of rover and in future in consideration of further extension of the project, the team can rebuild the project with advanced equipment's with mounting of cameras, advanced sensors, automate the function of rover and to get the frequent data output from the functionality of rover can be displayed to end user wirelessly and the whole design can be enhanced to their requirements and redesign the concepts.