ASTRA ROBOTICS - RVCE

Who are we?

"Astra robotics" is the robotics chapter of RV College of Engineering. We actively participate in the various robotics events held across the globe. We focus on robotics and technology to boost innovation for a better tomorrow. We aim to create a platform for research and development in the field of robotics and automation to solve conundrums in the most economical and elementary ways. We consider ourselves a socially responsible club. We believe in sharing our knowledge and sharing the benefits of technology with the world.

Mission & Vision

We provide a platform for Interdisciplinary research and innovation in the field of robotics, with a focus on development of sustainable technology. We work towards developing next generation robots and incorporating the principles of Opportunistic and Experiential learning.

Perspective

We have been a platform for providing insight into the world of Robotics and encouraging students to pursue their interests in it. We being a socially responsible club have conducted various Robotics workshops in and outside Bangalore to develop interests among students in the field of Robotics. The students were taught basics of electronics, arduino and how to make a line follower. Teams were given kits to develop the bots that comprised of motors, chassis, arduino, cable, breadboard and others. The amount raised from conducting workshop is used for funding the student club.

We have also conducted many classes during summer for the students of our college about basics of Raspberry Pi and Internet of Things. We have also done many minor projects during summer which are very innovative.

PCB Design Training

ROBOTICS WORKSHOP AT BASE PU COLLEGE

With Shreekanta guptha Robotics Division head at Infosys Mysore

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Outcome

Some of the products developed after the training program are
1. I bot(Server robot for hotels),
2. Blind Assistance Bot,
3. Smart watering Bot,
4. Smart Waste Collecting Bot ,
5. Smart Home,
6. Mini Art Bot,
7. Ant Bot, etc.

Our achievements:

1. **2015 – Anveshan Runners**

    Anveshan aims to build system level engineering expertise among Indian engineering student community. Organized once in two years, the fellowship offers students an opportunity to showcase their innovation, product design and problem solving abilities. Continuing the legacy, Anveshan 2015 - the student design fellowship project - outlines an innovative technological solution to address growing system level challenges faced by the world. The Fellowship helps to give shape to the ideas and makes it a reality.

2. **2015 – 'Semi Autonomous Bot' Shastra IITM Runners**

    Shaastra is the annual technical festival of the Indian Institute of Technology, Madras. Being a completely student-run festival, it holds the distinction of being the first of its kind in the world to be ISO 9001:2008 certified. Heralded as the largest student managed festival in India,

3. **2016 – Microbotics challenge(IIT-M) Finalist**

4. **2016 – Quest ingenium hackathon   Runners**

    QuEST Ingenium is a National level flagship competition in its 7th year. This event conducted by QuEST Global Engineering Services India, engages, final/pre-final year B.E/B.Tech/Dual Degree students across India. Innovative Engineering projects from across the country are screened through, to find the country's Best 200 engineering project and provide the team members with placement opportunity at QuEST Global.

5. **2016 – Mercedes benz hackathon Winners**

    A total of 65 participants through 15 teams were selected to develop creative ideas and code prototypes related to digitalization within a given time frame of 24 hours.
    Christened Hack.Bangalore, which was inaugurated by Manu Saale, MD & CEO, Mercedes-Benz Research and Development, India (MBRDI) and Markus Haegele, Head of DigitalLife@Daimler, Germany, involved students from the fields of IT, software engineering and computer science from various colleges.
    The team's prototype would use vehicle detection and dynamic traffic mapping that would in turn give information on the most efficient lane to which the cars should shift (based on Swarm Logic) to make way for the ambulance. Their motto – 'Change a lane and save a life'. The winners were awarded by Raghavendra Vaidya- Senior VP and Head of IT, MBRDI

6. **2016 – Trail blazer challenge(NIT-K) Winners**
7. **2017 – Phyxit,pravega,iisc Third Place**
8. **2017 – Dexter's lab, pravega, iisc First Place**

> `Pravega is a three-day fest organized by the Undergraduate community of the Indian Institute of Science. Derived from the Sanskrit word for acceleration, Pravega accurately describes the sentiment of the work culture in the scientific and student community of accelerating in life.

9. **2017 – E-Yantra 4th among 2000 teams**

> E-Yantra Robotics Competition (eYRC) is a unique annual competition for undergraduate students in science and colleges. Selected teams are given a robotic kit complete with accessories and video tutorials to help them learn basic concepts in embedded systems and microcontroller programming. Abstracts of real world problems assigned as "themes" are then implemented by the teams using the robotic kits.

10. **2017 – Smart India Hackathon 2nd place in ministry of disabilities**

> Smart India Hackathon 2018 is a non-stop digital product development competition, where problems are posed to technology students for innovative solutions.

11. **MoU with Hyperverge**

> HyperVerge Inc. is a Silicon Valley based startup, founded by young IITians.
> At HyperVerge, we are using the technology of deep learning and computer vision to create breakthrough innovations. Deep-learning networks built by HyperVerge are powering applications in domains such as Security, BFSI, Satellite Imaging unlike ever before.

12. **2017 – University Rover Challenge**
13. **2017 – Winners, IEEE Hackathon**

Details about the projects carried out in our team:

1. DEFENCE BOT
This robot is specially designed for defence purpose with below features,
   ➢ Can be operated from wherever mobile network is available
   ➢ Operates through MOBILE/PC using DTMF technology.
   ➢ Equipped with bomb detector to detect bombs, and capable of defusing them.
   ➢ Sensed human motions.
   ➢ This can be operated from remote place to shoot the enemy
   ➢ Camera, an eye for the robot used in surveillance and can also record them. Hence can be used in military and other unmanned missions
   ➢ 360 degree rotatable with zero radius.

2. FLAPPY BOT (RHEX)

The rhex, a six legged robot provides mobility in a wider variety of terrains than a regular set of wheels. It can be used as an agricultural assistance device, surveillance bot & also in certain defence oriented tasks.

3. BIONIC ARM

A next generation robotic prosthetic hand (self adjusting limb) which works by capturing the signals generated through muscle movements in the residual limb, and controlling the limb accordingly.

4. MICROBOT

A miniature robot- line follower of size approx. 10×10×10 cm3. It's applications can be extended to remote controlled spy bots, with extended battery life due to its low power consumption.
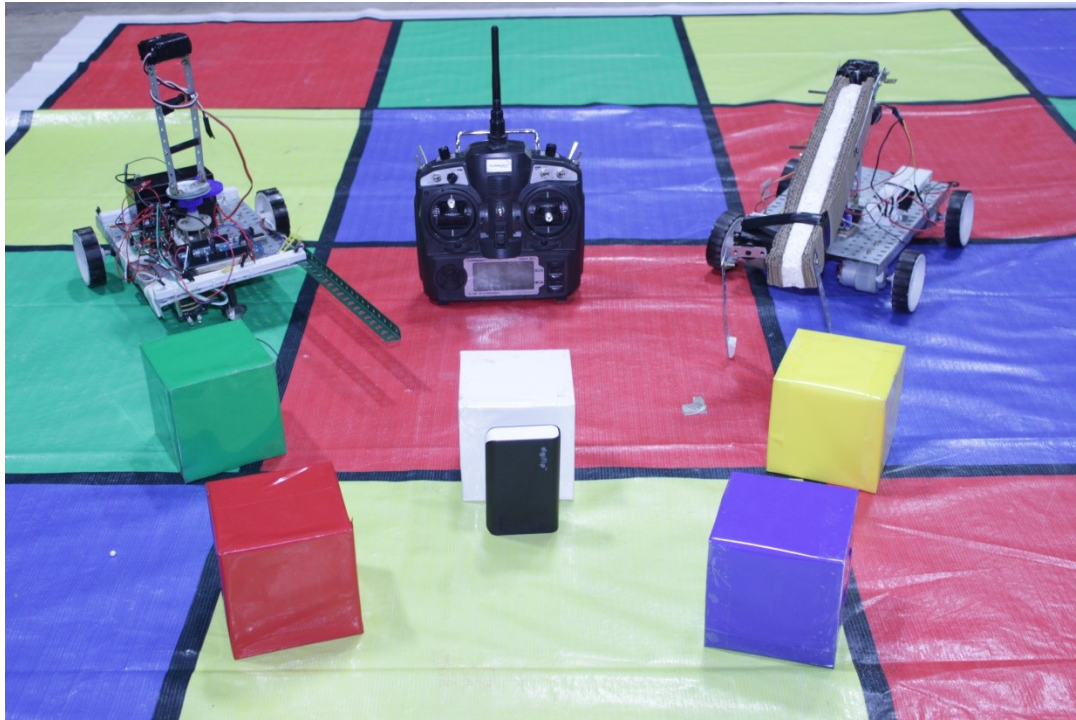
5. ROBOTIC ARM

A Robotic arm having five degrees of freedom, facilitating 360 degree wrist rotation designed keeping in mind its functionality – providing assistance like easy pick up & delivery of objects from one point to another. This could be used as a part of the URC rover, increasing its utility as a whole.

6. MIND CONTROLLED BOT

A bot which receives input from the neuro-sky mind wave headset, extracts the information from the headset in the form of alpha, beta & gamma waves. It responds in accordance to the input parameters.

7.AUTONOMOUS BOTS

Autonomous navigation and local perception of environment will be the future of automotive industry. IIT madras honoured us with 3rd place in their annual autonomous robotic event.

8.ROBOTIC AESTHETICS

We developed a next generation robotic prosthetic hand which can be controlled by listening to muscles remaining in the residual limb that the patient can still contract. Awarded 2nd place in the Anveshan 2014 design contest organised by analog devices india, along with cash price of Rs.1,50,000.00. LEGGED ROBOT "Legs" provide mobility in a wider variety of terrains than wheels or tracks can. We are currently working with six legged robots for agricultural, surveillance and defence applications.
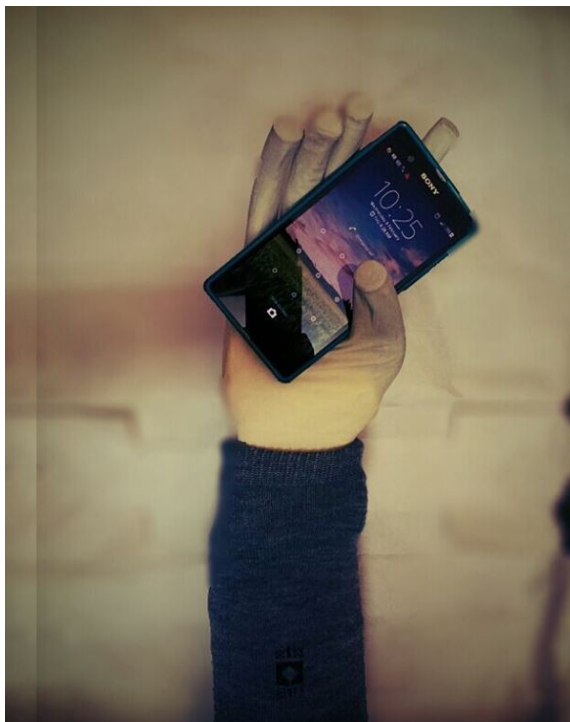
9. Centre Of Excellence By Cisco

In a recent development, RV College of Engineering and Cisco announced the launch of COE for Internet of Things, with an aim to facilitate the next gen students with digital skills and training necessary in this technical area.

The COE , which was inaugurated by Sri Gaurav Gupta, IAS, principal secretary, department of IT, BT and S&T , Govt. of Karnataka, along with Mr. VC Gopalratnam, SVP - IT and CIO – international, Cisco, would be located in the RVCE campus. The RVCE faculty will work towards inspiring and educating thousands of students and working professionals to sharpen their skills and prepare them for technology based careers. The cisco- rvce coe-iot box was developed by astra robotics. The box was developed for the inauration program and was made to open up wirelessly.

Competitions and our showcases

1. **ELECTRO-PRENUER**

Electro-prenuer was the technical flagship event of ece dept. For 8th mile, the annual techno-cultural fest of rv college of engineering. It was an event that required entrepreneurial flair along with technical finesse to succeed. The event that took part in 3 gruelling rounds saw a massive footfall of participants. The teams were tested on the basis of problem solving skills, ingenuity and creativity. The teams engineered original products that displayed immense creativity and had the potential to bring about a significant social impact. Astra robotics played a pivotal role in sponsoring the final round with the electronic components necessary for the top teams to create an out of the box product.

2. **SRISTI 2017 ART BOT**

Art bot is a mini bot which writes any number from 0-9 as insisted by the user,when the command is given to the bot via bluetooth. Its functionality can be extended to writing any character, symbol or even simply doodling. GRID SOLVER The grid based robot navigation system is one of the most dynamic areas of material handling today. Transportation of raw materials and finished products is typically adopted in industries for controlled transportation and product identification, as well as safe movement throughout the process. Home automation is another key field where this can be implemented today.

Theme of ASTRA ROBOTICS

AUTONOMOUS CAR

An autonomous car and unmanned ground vehicle is a vehicle that is capable of sensing its environment and navigating without human input.We, at astra are working on designing and developing an autonomous car that will help us solve many everyday problems that we face on the roads today. We are developing the framework on which we will base our car and discussing the opportunities in this arena with the major players in the industry.

ASTRA MARS ROVER

Each year the Astra Team develops a Mars rover to compete in the University Rover Challenge organised by the Mars Society in the Mars Desert Research Station ,Utah, United States.
The competition is held in the months of May/June and is open to both graduate and undergraduate students.

The University Rover Challenge (URC) is the world's premier robotics competition for college students. Held annually in the desert of southern Utah in the United States, URC challenges student teams to design and build the next generation of Mars rovers that will one day work alongside astronauts exploring the Red Planet.
URC was launched in 2006, with competitions being held every summer since 2007. URC consistently draws an international field of the most talented and promising students around

There are 4 main parts in the event .First ,would be registering in the competition .Second, a preliminary design review would have to be submitted .Third, a Critical design review along with a video would have to be submitted .Finally , the competition itself will have various task that the rover would have to perform based on which points will be provided including Extreme Retrieval and delivery ,Equipment servicing, Autonomous traversing and Science Cache.

Our team has gone through great efforts in preparing for this competition.
The entire design was made using solid-works and tested through ansis

The chassis is based on the double lambda implementation using commercial grade aluminium. The team has created a robotic arm with five degrees of freedom having linear actuators and a motor having a gripper with a three pronged design . A dedicated controller is used for the drive system controlling six DC motors for linear motion and four stepper motors for steering control.

To establish communication between the rover and base station two router are used operating at 2.4 GHz. Image processing and GPS is employed so that the rover is autonomously able to traverse the terrain avoiding obstacles .Motor control and arm control are accomplished using joystick interfaces. Test for Humidity and temperature of the soil , sieve test , permeability test ,PH test ,Nitrate test ,Oxidative tests , Munsell test among others are performed as part of the science cache task.
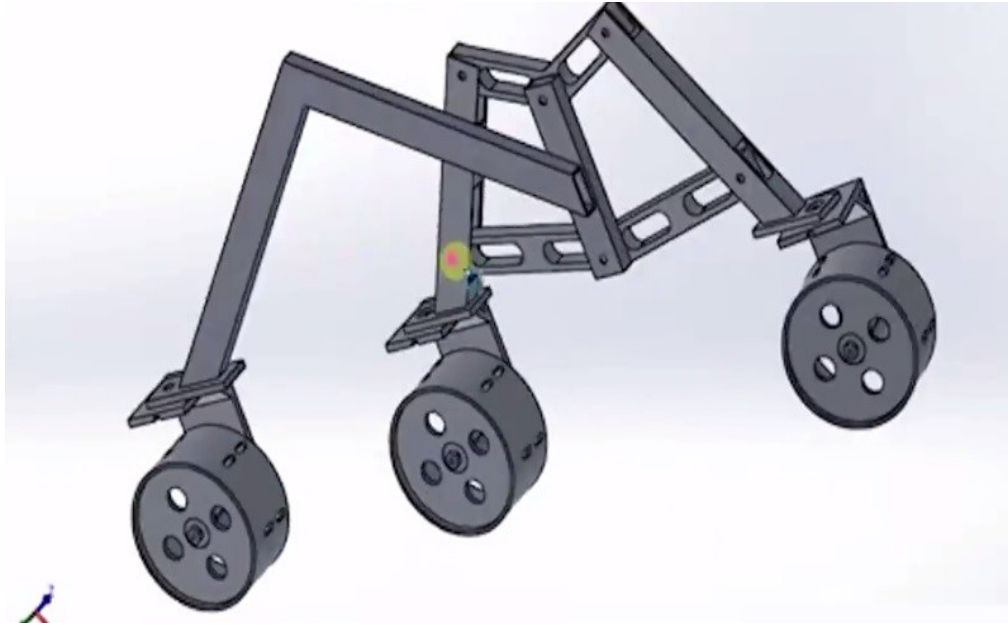
## TECHNICAL SPECIFICATIONS OF MARS ROVER

### CAED Design 2016
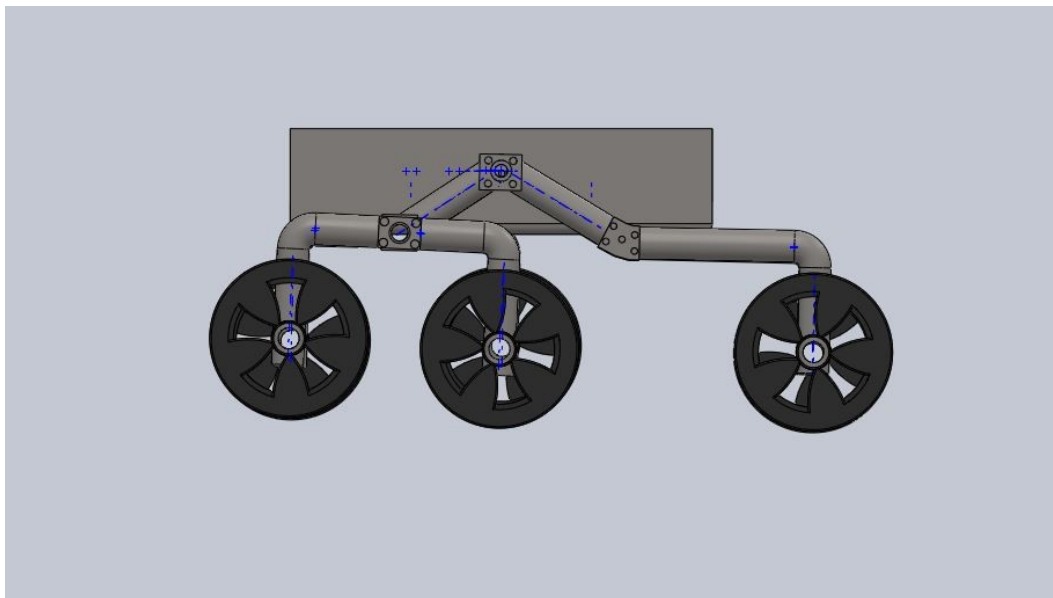
CAED Design 2017

The new bogie of the suspension system was designed by connecting two lambda mechanisms symmetrically. Hence both the wheels move on straight line but in opposite sense of each other. Thus balancing the reaction forces on each of the wheel and the traction force remains equal for both wheels if one of the wheel is in upper position.

Connection of two mechanisms symmetrically is a difficult process. As both the sides of the bogie has to work in straight line path of the curve, one side of the bogie has to be in opposite position of other side of the bogie.
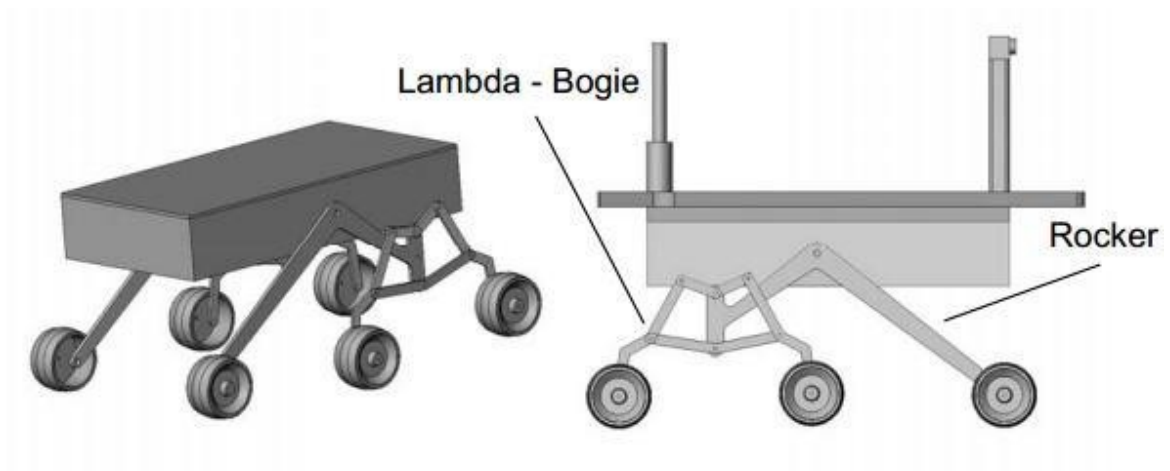

DESIGN TESTING

STATIC STRUCTURAL ANALYSIS
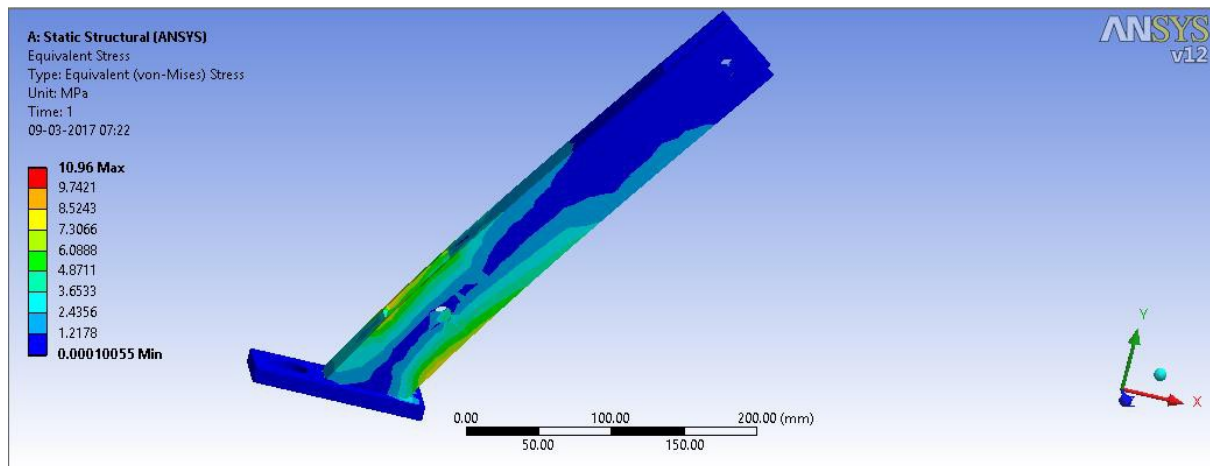
The above Figure shows the stress analysis of front and rear leg. The stress analysis was done by applying loads at the joints by fixing the part at bottom surface. In front and Rear legs as per the mechanical design calculations we found that there are two component forces i.e. one is horizontal component force and other one is vertical component of force acting on it. So in order to find out the stress distribution at these two points and across the cross-section the ANSYS analysis was done. From the analysis the results obtained are as follows,

- Applied Load – 100 N
- Maximum stress value – 10.96 MPa
- Minimum stress value – 0.000105

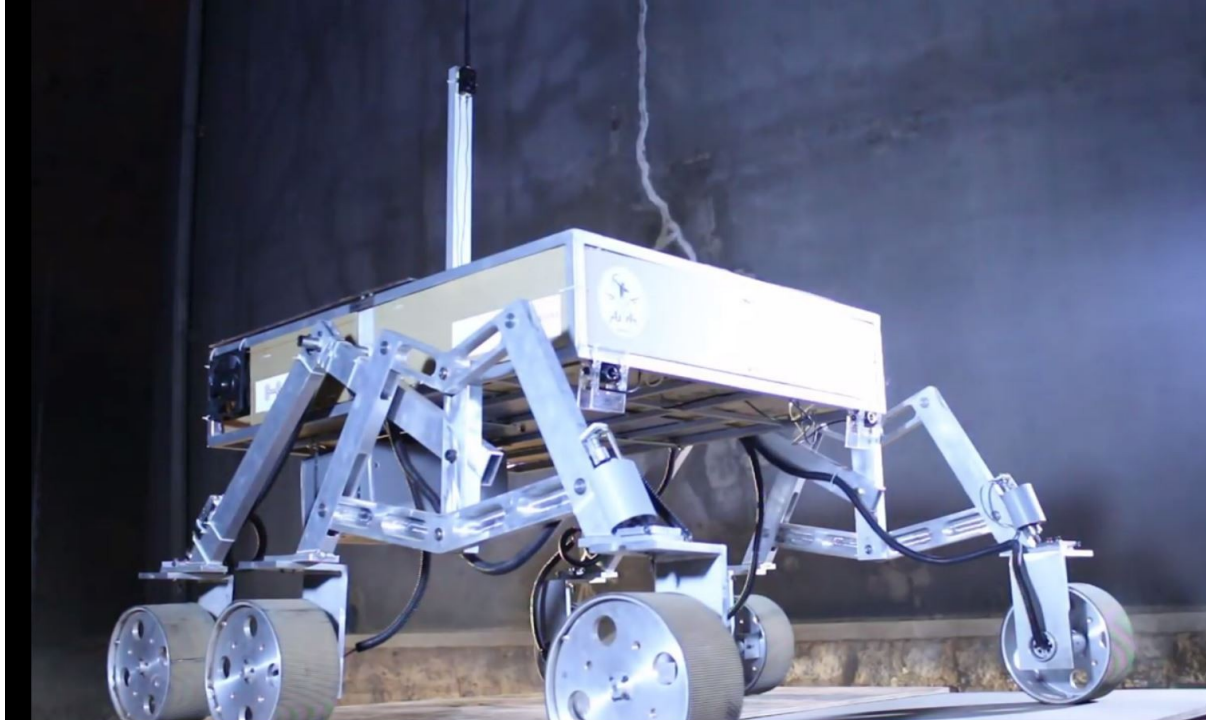## Deformation Analysis of Rocker
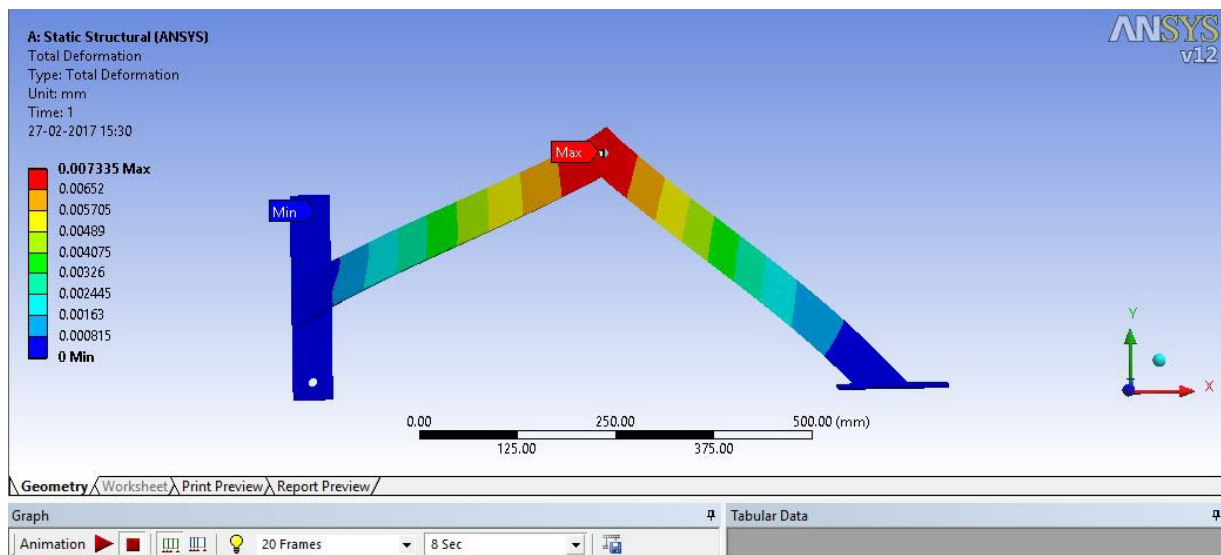
The deformation analysis was done by applying loads at the hinge point and it was fixed at the bottom surface. So in order to find out the deformation under load across the cross-section the ANSYS analysis was done. From the analysis the results obtained are as follows,

- Applied Load – 250 N
- Maximum deformation value – 0.007335 mm
- Minimum deformation value – 0 mm
- Element size – 4 mm mesh

ASTRA MARS ROVER 2017

5 DOF Robotic Arm

Our Team Photo