TEAM INTERPLANETAR

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Preface: TEAM INTERPLANETAR is one of the leading robotics researcher teams in Bangladesh. The main aim of the team is focused on the development of space robotics and mechanics. After our successful debut in the European Rover Challenge 2015 in Poland, we participated in URC 2016 and became 5th in Phobos round. Now we are planning to take part in this year's URC with added resources and many improvements in our rover.

Team Structure: Our team consists of 2 divisions, Technical and non-technical, each working independently while communicating through their respective team leaders. Team leaders are studying in various engineering departments in BUET and were selected based on their experiences in robotics projects. Interested people in the campus were asked to send CV's and after thorough scrutiny by our team adviser and team leaders, they were recruited.

Figure 1: A few members of TEAM INTERPLANETAR

The 4 sub-divisions of the Technical team are Mechanical, Electrical, Communication & Software and Science Task team. The non-technical team is dealing with the Marketing and Sponsorship responsibilities. The mechanical team is further subdivided into the Body team, Wheels and suspension team and Robotic arm team. The electrical team consists of Rover control circuit team, Communication control circuit team and the Robotic Arm control circuit team. The communication and software team are working to build a GUI and establish connections between the bot and the controller. The science task team will test the rover in harsh environments to achieve the ultimate goal of building a rover for Mars.

Team Resources:

Cost of building the rover: $3000

Transportation cost: 12000-$15000 (We are planning to send 8-10 members each costing $1500)

We already have a few parts of the rover from the previous URC contest. Instead of building a new one from scrap, now we're modifying the existing rover and adding new modules to it to fulfil the task completion requirements of URC-2018. That reduces a lot of expenses and gives us enough time and scope for the development in different sections of the rover through R&D.

Right now, our financial support consists grant from Directorate of Students' Welfare (DSW) at BUET as well as donation from the Association of BUET Alumni. We already have two sponsors for electronics and communication material support. However, agreements with several corporate sponsors are going on for additional monetary support. The team members have also contributed to the fund to kickstart our project.

We are purchasing parts locally to cut down on costs as much as possible. Our rover's construction is going on inside BUET Robotics Lab which has all the necessary electronics and software support. Most of the mechanical parts are built at BUET Machine Shop which contains welding facility, lathes, drills, mills, CNC machines and other necessary tools.

Project Management Plan:

We had a few parts from previous rover competitions. At first the parts were reassembled and checked for any missing elements. The missing parts were purchased and built according to design. The wheels were assembled first with the axle with redesigned suspension. Then the arm was built from scratch with 6 degrees of freedom, 2-jaw grip with grabbing and sample collecting abilities. Finally, the parts were assembled with the body. The control circuit for the rover and the arm were attached after.

The communication module was designed for two purposes: Control and Telemetry data communication and Video communication. 900MHz and 5.8Ghz bands were used respectively. For the autonomous task, 2 video cameras are used with an on-board Raspberry Pi as image processor. A GPS module, accelerometer, gyro, temperature, UV, CO2, FC28 moisture sensor and a pH meter were also added.

A graphical user interface will be designed using Python which will show rover movement with GPS coordinate and camera and gamepad feed sent wirelessly from the rover.

Problems related to the development process of the rover are individually (by subgroup otherwise) are reviewed on each team meeting. Then probable solutions and ideas are discussed among the team members.

After reviewing the adherence and efficiencies of the solutions, a subgroup along with a definite time frame are formed who implements the chosen solution and reports back to main team about the progress.

Figure 2: The existing rover with robotic arm

The whole rover was designed with SOLIDWORKS. The CAD file was imported in ANSYS for stress analysis to find any flaws and cut down on weights anywhere possible.

For any problems with the rover during the test run, we will modify the existing design to nullify the problem. Then the rover will go through further 'trial and error' processes to gain the desired perfection.

Our advisory panel consists of professors and engineers from different disciplines to aid us in our approach to URC. For smooth communication, we are using the cloud services like Google Drive to share any documents necessary and we are also using our website *http://www.teaminterplanetar.com* to share our progress and updates.

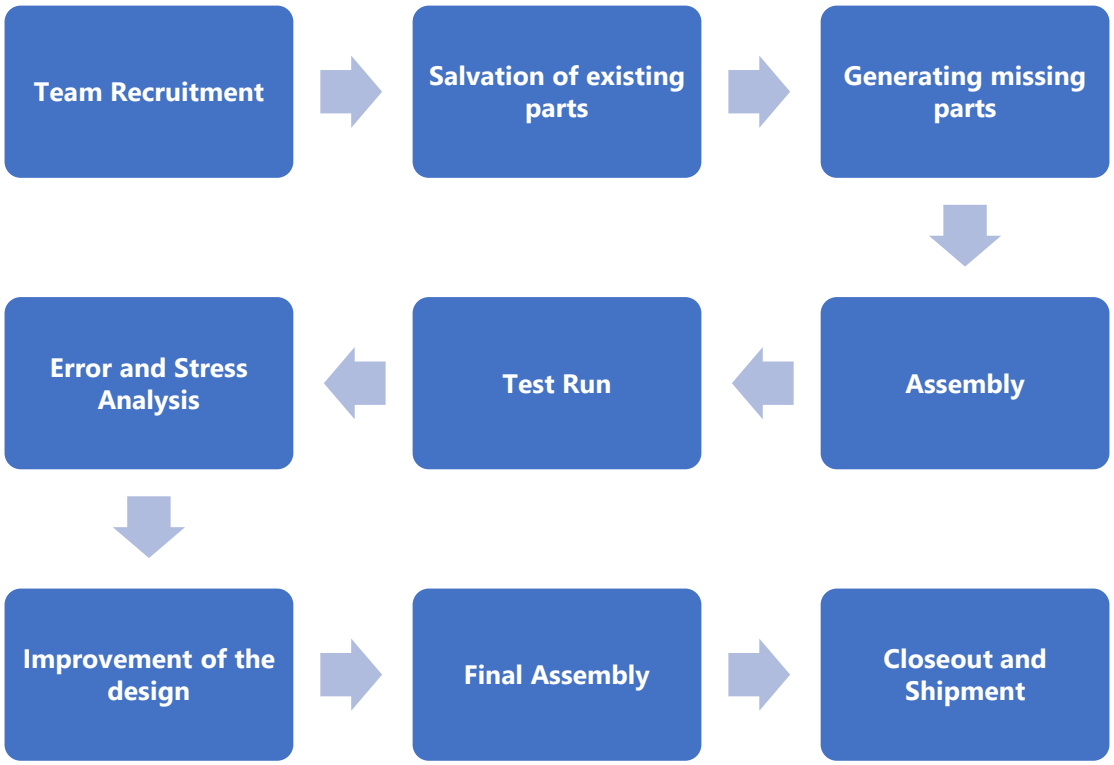

Figure 3: Project Management Plan

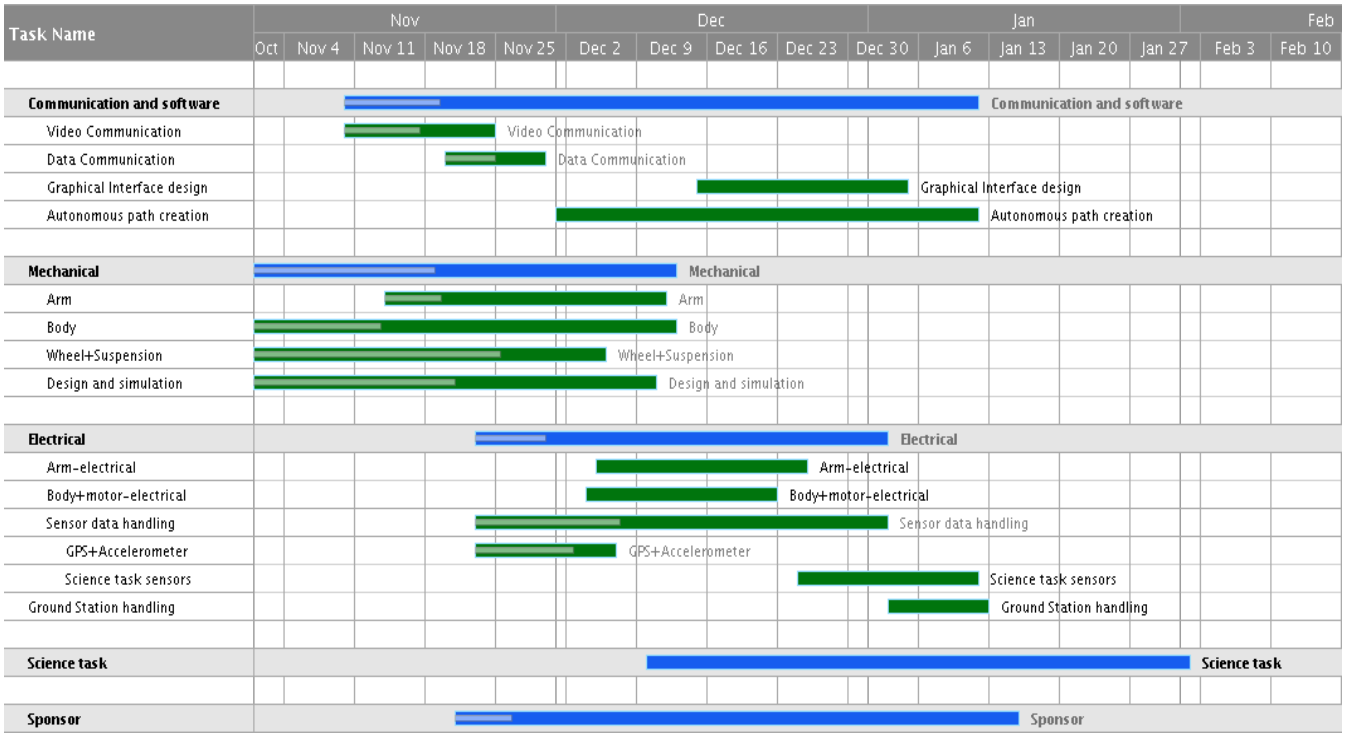

Figure 4: The Gantt Chart of the project