Proposal for Observatory (STAC)

The members of the Space Technology and Astronomy Cell are enthusiastic about making an observatory. An observatory is a room or building housing an astronomical telescope or other scientific equipment for the study of natural phenomena.

It can be used to gather scientific data which can be further used for research in fields of Astrophysics and Astronomy. An advantage of having an observatory in the campus is that if one has to do some kind of research, take some serious observations, he/she can do it in the campus itself. It would provide a permanent place for such research within the campus. Currently, we will be placing a 12" Giant Newtonian Refractor in that observatory which can be upgraded to 14-15" Schmidt Cassegrain in the near future.

Benefits

Building an observatory will enable students to practically apply all their theoretical knowledge. The project will bring out and enhance the engineering skills of the students. Main element of the observatory, i.e. the telescope is in its final stages. We will make the telescope in nearly 1 month's duration. The project involves students from all domains of engineering, i.e. Computer Science Engineering, Electrical Engineering, Mechanical Engineering and Civil Engineering.

Completion of this observatory will help understand the events happening in the space in a better way. We will be able to photograph the sky as we already have these equipments. We will try to make an app of dictionary for various messier objects by clicking photographs from this observatory.

As a computer science student, the following are some relevant skill sets:

a. Data Analytics, databases, BigData
b. Software development skills
c. Networking (later stage of the project)
d. Automation
e. Web Development
f. UI/UX Development
g. Image Processing
h. Exoplanet Detection

As an electrical engineering student, the following are some relevant skill sets:

a. Circuit analyzing and designing
b. Electromagnetic Theory
c. Digital Electronics
d. Microelectronic circuits
e. Control Systems
f. Automation
g. Networking

As a mechanical engineering student, the following are some relevant skill sets:

a. CAD designing and then analyzing structures
b. Knowledge of materials
c. Robotics
d. Telescope Designing
e. Knowledge of Optics

As a civil engineering student, the following are some relevant skill sets:

a. CAD designing
b. Surveying
c. Structural Designing

Also, the observatory would help the members of the Space Technology and Astronomy Cell (STAC) develop its skills.

The project also involves working in teams and coordinating with other teams that will be working on other aspects of the project. It also involves other skills such as handling sensitive equipments, understanding industrially used circuit elements, soldering and testing circuits.

The project has been broken down into three phases:

First Phase

The first phase of the project involves the designing and building of the basic structure of the telescope and observatory. The telescope will be a 12" Giant Newtonian Refractor which will be made at an extremely inexpensive cost of around Rs. 15,000, the market price of which would be nearly Rs. 2.95 lakhs (https://goo.gl/7ERB71). The dome of the observatory will be designed to open and rotate manually.

Second Phase

The next phase of the project involves automation. This includes automation of the telescope and the dome of the observatory. The telescope would be set to auto align to the required object in the sky, using microprocessors. The dome would open and rotate to the required position using similar mechanisms. We will use the computer in the control room to operate the telescope.

Third Phase

The last phase of the project is to achieve remote operation for the set up. An internet connection would be set up from the observatory to the main Kamand campus, allowing establishment of an Internet of Things that would allow exchange of data via the campus server. A webend would be designed as the interface for the remote operation of the observatory. We can also make the remote access open to a specific person on internet that would allow us to access the astronomical data while sitting anywhere in the world.

Future Scope

The long term plan of this project is to replace the 12" Newtonian refracting telescope with a 14-15" Schmidt Cassegrain telescope and to collaborate with Indian Space Research Organisation (ISRO) and Indian Institute of Astrophysics (IIAp) to provide scientific data as the sky and location of our observatory is ideal for astronomical observations. We can also extend this laboratory to a radio observatory as we are working to make a radio telescope in near future.

Land Requirements

We need almost 9*12 ft control room near the observatory dome. The observatory dome will be of radius 8ft. We need a dark area with no light pollution. If we are given a steep area, we need some stairs to reach to the observatory. The observatory must be free of dew/moisture. And more importantly, it should not let dust come inside the dome when it's closed.

We have identified 3 different places as recommendations for the observatory. These are listed according to priority (1-Highest Priority):

1) Hill side just after one blind turn ahead of Medicinal Plant Garden
2) Inside the Medicinal Plant Garden

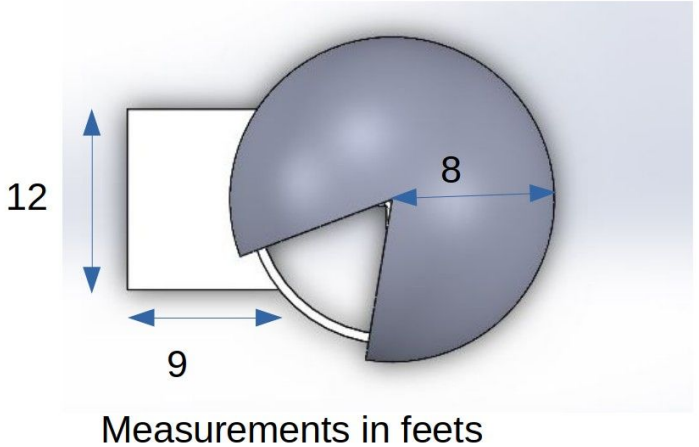
3) Besides Medicinal Plant Garden Gym on the hill

Resources

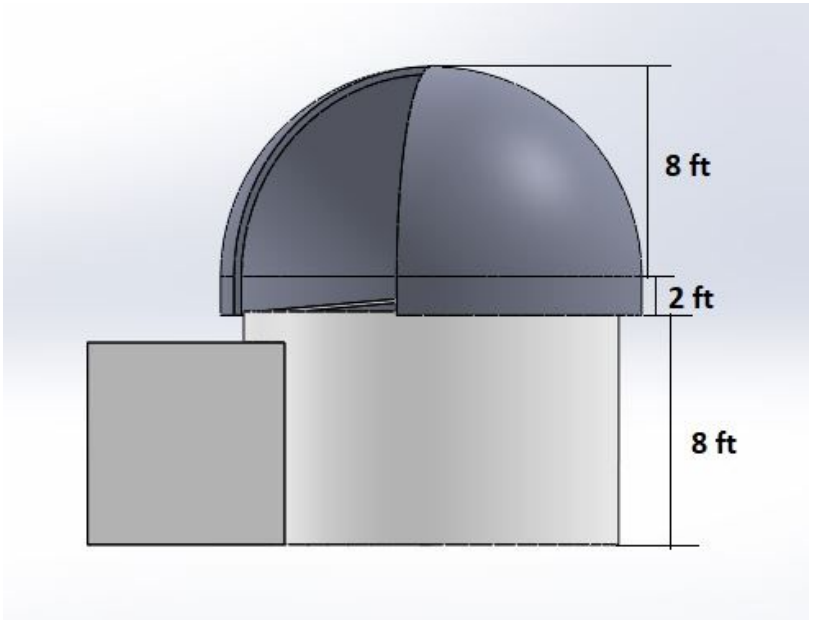
We need some basic requirements for an observatory:

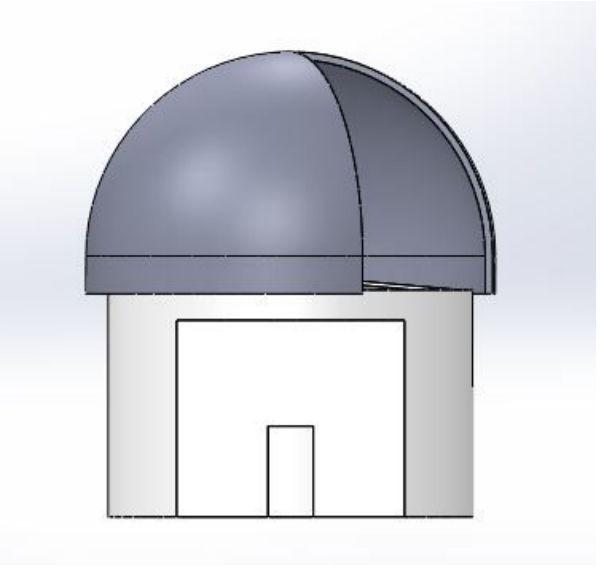
1) Heater to protect our telescope from dew.
2) Internet connection for remote access
3) Electricity connection
4) A PC for automation / data analysis / exoplanet detection etc

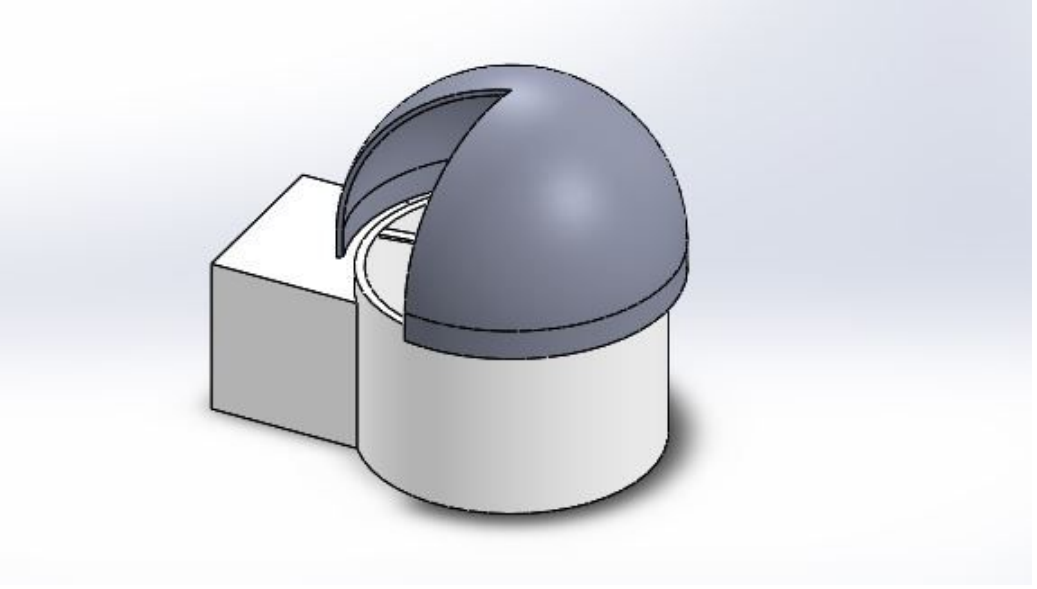
Design of the Observatory (Which we have planned)



Measurements in feets


8 ft
2 ft
8 ft





Inspiration:

1) Tarleton State University : This University has an operational 32 inch telescope in the observatory. The goals are similar to what we have. One can find the related details here: https://www.tarleton.edu/observatory/specs.html
2) IIT Kanpur : The Student Gymkhana IIT Kanpur holds one of the largest telescopes in IITs (14 inch) . The telescope is a purchased one and costs around Rs. 7.35 Lacs. which does not include the cost of it's mount and observatory. We are planning to make the whole telescope in just 30 thousand rupees.