Notebook Analysis:

The values used to threshold the navigable areas was (160, 160, 160) so anything above these is considered as areas that the rover is able to navigate.

To get the pixels where there is obstacle, first threshold the warped image with values (0, 0 ,0) and then subtracted the navigable areas from it to get obstacle areas.

A separate function was used to detect the rock in image; pixel values with R-channel and G-channel > 100 and B-channel < 60 are considered as rock. The function to accomplish this task is called rock_thresh().

For process_image() function:

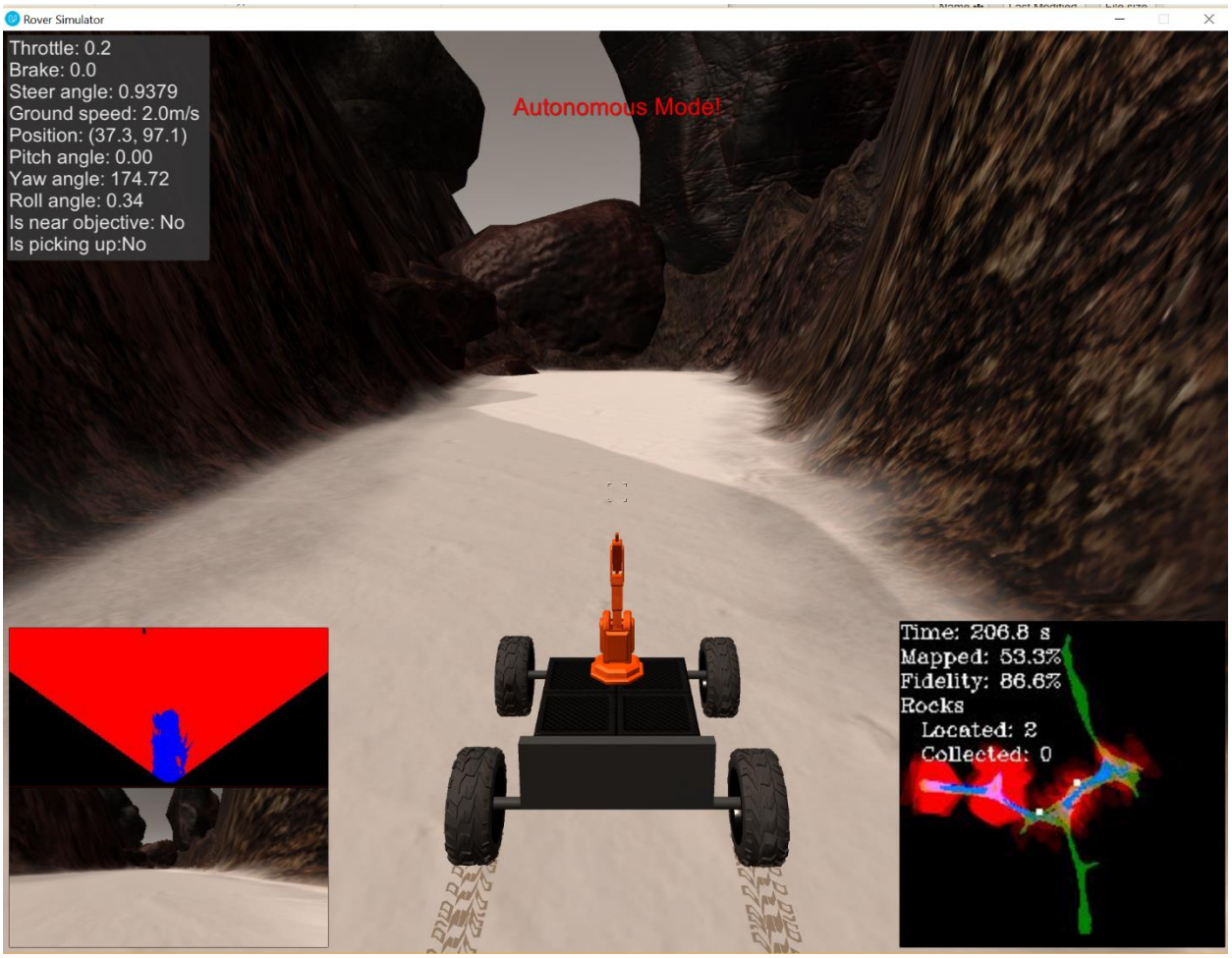
- After perspective transformation, threshold the warped image to find navigable areas, and then the rest would be considered as obstacles.
- To get the location of rocks a different function described above is used.
- Using all images that were thresholded, we find the corresponding areas in rover-centric coordinates and then world coordinate using robot pose.

I have only tested the notebook on test-data provided.

Autonomous Navigation and Mapping:

I have not modified the decision.py since it was not required, that's what I will be working on at my free time and explore.

For perception_step() the same approach that was used for process_image() in Notebook Analysis is used with the same thresholding functions and also I have added a check to update the map whenever roll and pitch angles are close to 0 degrees to make sure the map is update at correct time and with have a more accurate fidelity. I ran the simulator with 1920x1440 resolution and screenshot of the simulator is in the next page. Sometimes the rover goes back and forth between the locations it has already traveled and seen and adding the condition to not go where it has already visited would be a good idea, also to pick the rocks the robot needs to be going close to the boundary between obstacle and navigable areas so adding that to the decision would also help the robot to pick the rocks up and find them faster.


Rover Simulator
Throttle: 0.2
Brake: 0.0
Steer angle: 0.9379
Ground speed: 2.0m/s
Position: (37.3, 97.1)
Pitch angle: 0.00
Yaw angle: 174.72
Roll angle: 0.34
Is near objective: No
Is picking up:No
Autonomous Mode!
Time: 206.8 s
Mapped: 53.3%
Fidelity: 86.6%
Rocks
Located: 2
Collected: 0