

## ASSIGNMENT :- TRANSMISSION ( RRT PLANNER IN A 3D SPACE)

### Environment:

MATLAB is the programming tool used in this assignment unlike our previous assignments as this includes modeling of gears in 3D space and then planning a path for a 3D model.

The gear box includes primary shaft, fixed shaft and side walls( case) is modeled using the dimensions given by the professor in STL files. In MATLAB, we can directly use Collision checker as their inbuilt functions for collision detection.

Primary Shaft :- Green color

Fixed shaft:- Orange color

Casing :- Purple Color

Random nodes :- Blue color circles

Node explored ( branches) :- Red color

Final path traced :- Light green color

### Planning Algorithm :- RRT

Note :- This algorithm is referred from one of the github repositories in github[1].

Pseudocode:-

#### Initialization:

- 1) Start and goal node
- 2) list\_of\_nodes *#to keep track of all the nodes explored*

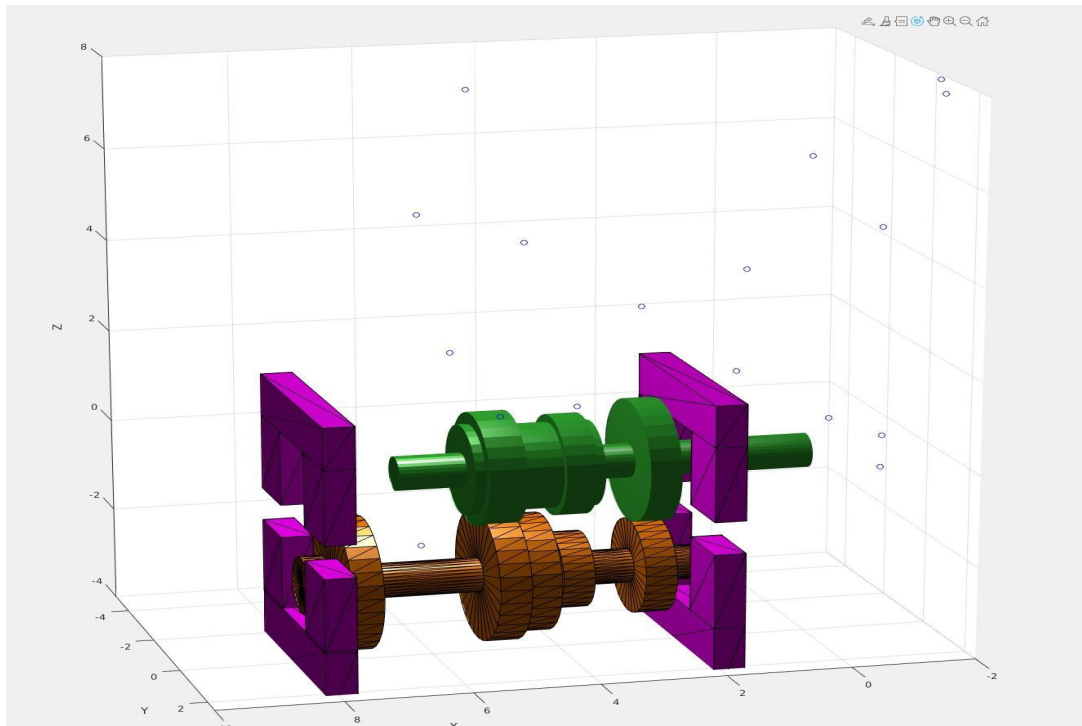
#### Algorithm:

While True:

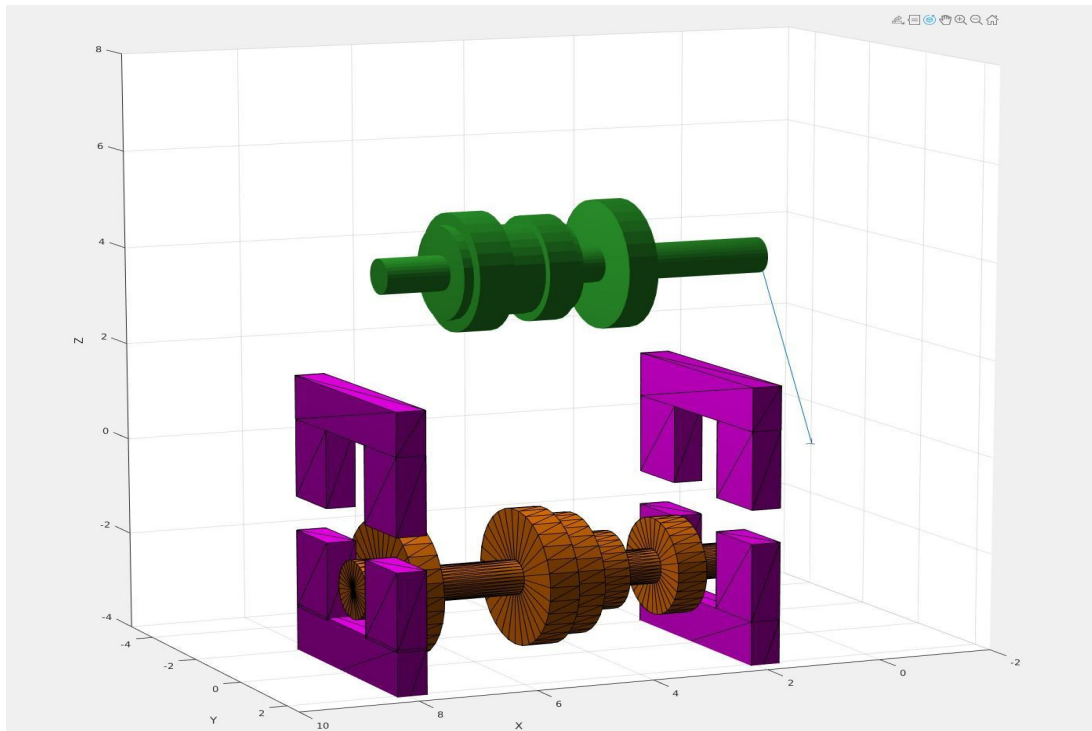
- 1) Randomly generate the node anywhere in 3d space
- 2) If distance between random node and goal node  $< 0.1$ :
  - a) Connect the path
  - b) Break
- 3) Find distance between random node and all nodes in list\_of\_nodes
- 4) Choose the node with minimum distance
- 5) New\_node = Draw the branch with an incremental step size of 0.1 from the node with minimum index
- 6) Perform the collision check to check if primary shaft collides with walls and fixed shaft else continue
- 7) Add New\_node to the list\_of\_nodes

## Results

### Initial Position

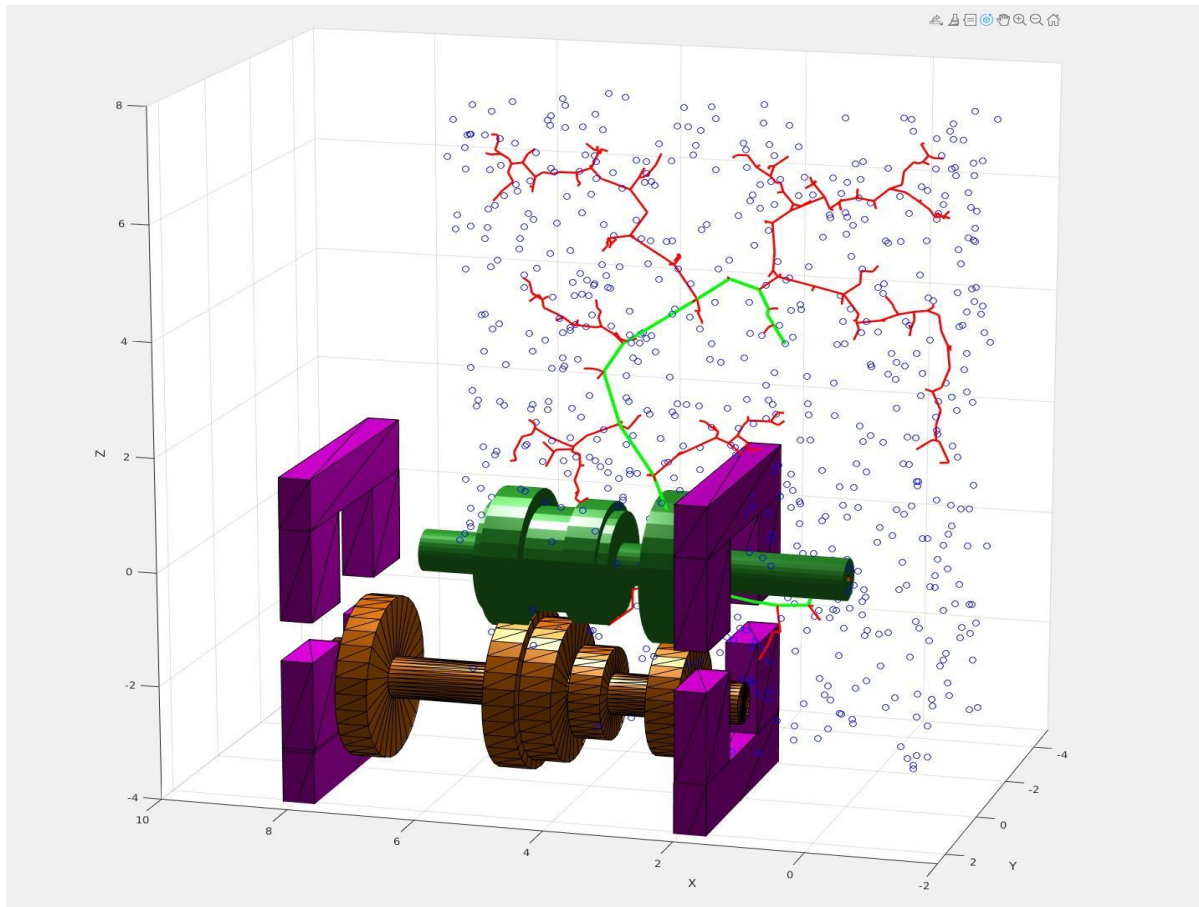


### Final Position



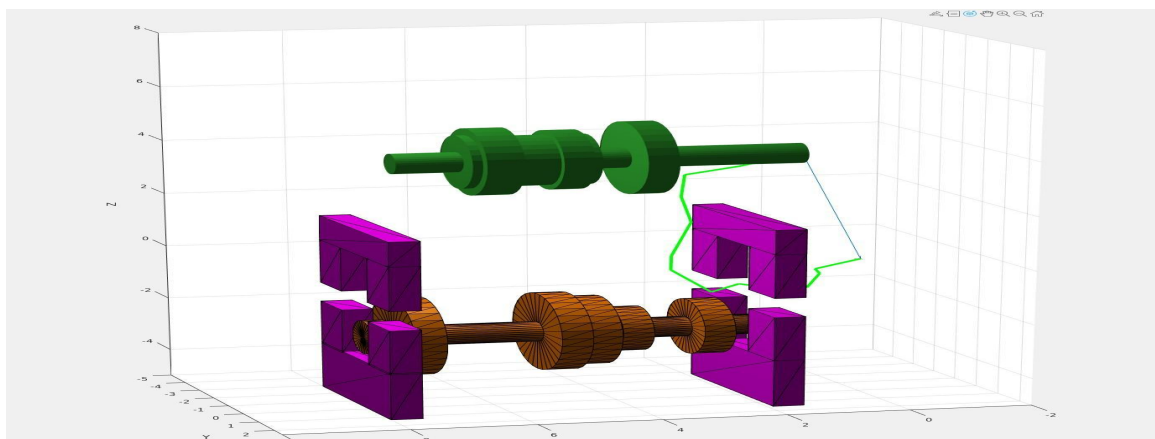
### Configuration after exploration of all the nodes.

The red color lines are the nodes explored by the RRT algorithm.



### 3D Plot of Final Path Planned from start to goal location

The green color path is the path found by the RRT planner from the goal to the start location. Finally after back tracing the path, the green color line shows the path found by RRT algorithm after exploring the nodes. In the above image, the path in green and the nodes in red explored are plotted in one figure.



The ugliest vehicle I found with SM465 transmission gear box ( asked in RESULTS section of the assignment)



## REFERENCES

[https://github.com/nikunjparmar828/Motion-Planning/blob/main/Theft/main\\_rrt\\_3d](https://github.com/nikunjparmar828/Motion-Planning/blob/main/Theft/main_rrt_3d)

<https://www.mathworks.com/help/nav/ug/moving-furniture-in-a-cluttered-room-with-rrt.html>  
# [MovingFurnitureInAClutteredRoomWithRRTExample-2](#)