Visualizing Simulation Data

Authors: Ana Siesto Pérez and Xavier Marti Llull

Team: G11-A

Shared Link with the teacher: https://drive.matlab.com/sharing/b9ade108-0470-417b-9d56-c747ce4fbb80

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Run the simulation model

```
clear
close all
sim('sl_lanechange')
```

```
ans =
  Simulink.SimulationOutput:

                    t: [504x1 double]
                    y: [504x4 double]

    SimulationMetadata: [1x1 Simulink.SimulationMetadata]
          ErrorMessage: [0x0 char]
```

Robot parameters and visualizing robot (robot and front wheel at origen)

```
Robot = [0 1 0; -0.3 0 0.3; 0 0 0; 1 1 1]
```

```
Robot = 4×3
         0    1.0000         0
   -0.3000         0    0.3000
         0         0         0
    1.0000    1.0000    1.0000
```

```
T_Robot_0 = transl(0,0,0)
```

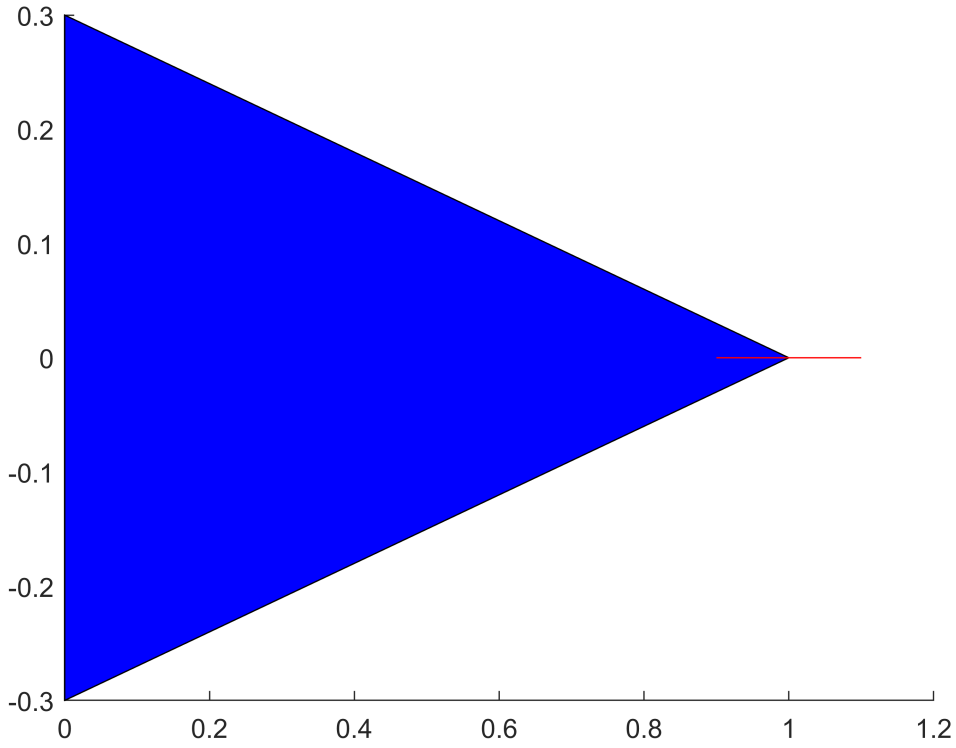
```
T_Robot_0 = 4×4
     1     0     0     0
     0     1     0     0
     0     0     1     0
     0     0     0     1
```

```
Front_wheel = [-0.1 0.1; 0 0; 0 0; 1 1]
```

```
Front_wheel = 4×2
   -0.1000    0.1000
         0         0
         0         0
```

```
    1.0000    1.0000
```

```
patch(Robot(1,:), Robot(2,:), [0 0 1])
line(Front_wheel(1,:)+1, Front_wheel(2,:), 'color', 'r')
```



Workspace Data

```
x = ans.y(:,1)
```

```
x = 504×1
         0
    0.0002
    0.0012
    0.0062
    0.0200
    0.0400
    0.0600
    0.0800
    0.1000
    0.1200
      ⋮
```

```
y = ans.y(:,2)
```

```
y = 504×1
     0
     0
     0
     0
     0
```

```
     0
     0
     0
     0
     0
     ⋮
```

```
o = ans.y(:,3)
```

```
o = 504×1
     0
     0
     0
     0
     0
     0
     0
     0
     0
     0
     ⋮
```

```
g = ans.y(:,4)
```

```
g = 504×1
     0
     0
     0
     0
     0
     0
     0
     0
     0
     0
     ⋮
```

Animation

```
close all
scatter(x,y,0.1)
axis([0 11 -0.5 1.5])
grid on
axis equal

hold on
hRobot = patch(Robot(1,:), Robot(2,:), 'b')
```

```
hRobot =
  Patch with properties:

    FaceColor: [0 0 1]
    FaceAlpha: 1
    EdgeColor: [0 0 0]
    LineStyle: '-'
        Faces: [1 2 3]
     Vertices: [3×2 double]
```

```
  Show all properties
```

```
hFront_wheel = line(Front_wheel(1,:)+1, Front_wheel(2,:), 'color', 'r')
```

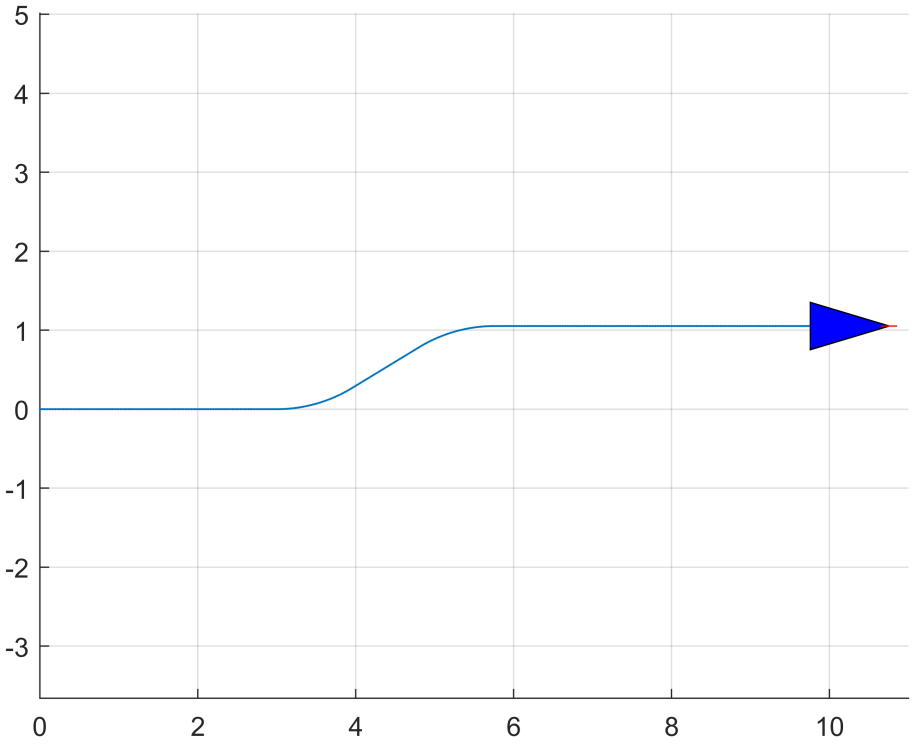
```
hFront_wheel =
  Line with properties:

            Color: [1 0 0]
        LineStyle: '-'
        LineWidth: 0.5000
           Marker: 'none'
       MarkerSize: 6
  MarkerFaceColor: 'none'
            XData: [0.9000 1.1000]
            YData: [0 0]
            ZData: [1×0 double]

  Show all properties
```

```
for i=1:504

    delete(hRobot);
    delete(hFront_wheel);
    T_Robot_0 = transl(x(i,1),y(i,1),0)*trotz(o(i,1));
    Robot_Pose = transl(x(i,1),y(i,1), 0) * trotz(o(i,1)) * Robot;
    Front_wheel_Pose = T_Robot_0 * transl(1,0,0) * trotz(g(i,1)) * Front_wheel;
    hRobot = patch(Robot_Pose(1,:), Robot_Pose(2,:), 'b');
    hFront_wheel = line(Front_wheel_Pose(1,:), Front_wheel_Pose(2,:), 'color', 'r');
    pause(0.01);
end
```



Visualizing wheels foot print

```
close all
scatter(x,y,0.1)
axis([0 11 -0.5 1.5])
grid on
axis equal

hold on
hRobot = patch(Robot(1,:), Robot(2,:), 'b')
```

```
hRobot =
  Patch with properties:

    FaceColor: [0 0 1]
    FaceAlpha: 1
    EdgeColor: [0 0 0]
    LineStyle: '-'
        Faces: [1 2 3]
     Vertices: [3×2 double]

  Show all properties
```

```
hFront_wheel = line(Front_wheel(1,:)+1, Front_wheel(2,:), 'color', 'r')
```

```
hFront_wheel =
  Line with properties:

              Color: [1 0 0]
```

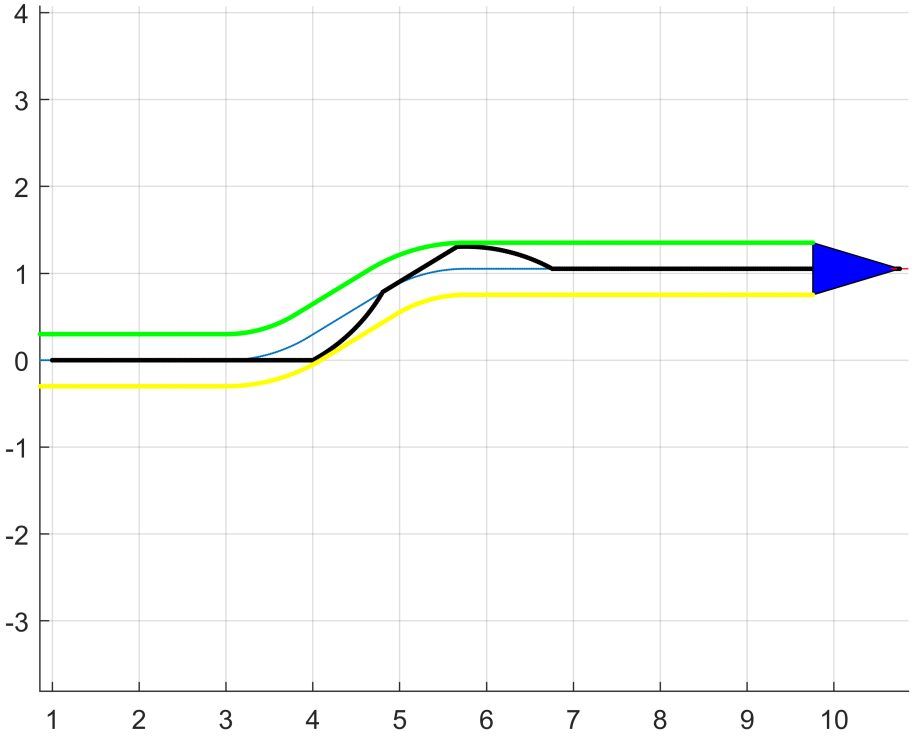
```
          LineStyle: '-'
          LineWidth: 0.5000
             Marker: 'none'
         MarkerSize: 6
    MarkerFaceColor: 'none'
              XData: [0.9000 1.1000]
              YData: [0 0]
              ZData: [1×0 double]
```

Show all properties

```
plot(Robot(1,1), Robot(2,1), '.', 'color', 'yellow')
plot(Robot(1,3), Robot(2,3), '.', 'color', 'green')
plot(Robot(1,2), Robot(2,2), '.', 'color', 'black')

for i=1:504

    delete(hRobot);
    delete(hFront_wheel);
    T_Robot_0 = transl(x(i,1),y(i,1),0)*trotz(o(i,1));
    Robot_Pose = transl(x(i,1),y(i,1), 0) * trotz(o(i,1)) * Robot;
    Front_wheel_Pose = T_Robot_0 * transl(1,0,0) * trotz(g(i,1)) * Front_wheel;
    hRobot = patch(Robot_Pose(1,:), Robot_Pose(2,:), 'b');
    hFront_wheel = line(Front_wheel_Pose(1,:), Front_wheel_Pose(2,:), 'color', 'r');
    plot(Robot_Pose(1,1), Robot_Pose(2,1), '.', 'color', 'yellow');
    plot(Robot_Pose(1,3), Robot_Pose(2,3), '.', 'color', 'green');
    plot(Robot_Pose(1,2), Robot_Pose(2,2), '.', 'color', 'black');
    pause(0.01);
end
```


4
3
2
1
0
-1
-2
-3
1
2
3
4
5
6
7
8
9
10