Ejercicios 25/05

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Link: https://drive.matlab.com/sharing/49eb5fa6-0641-425c-a130-9cf41b2e1058

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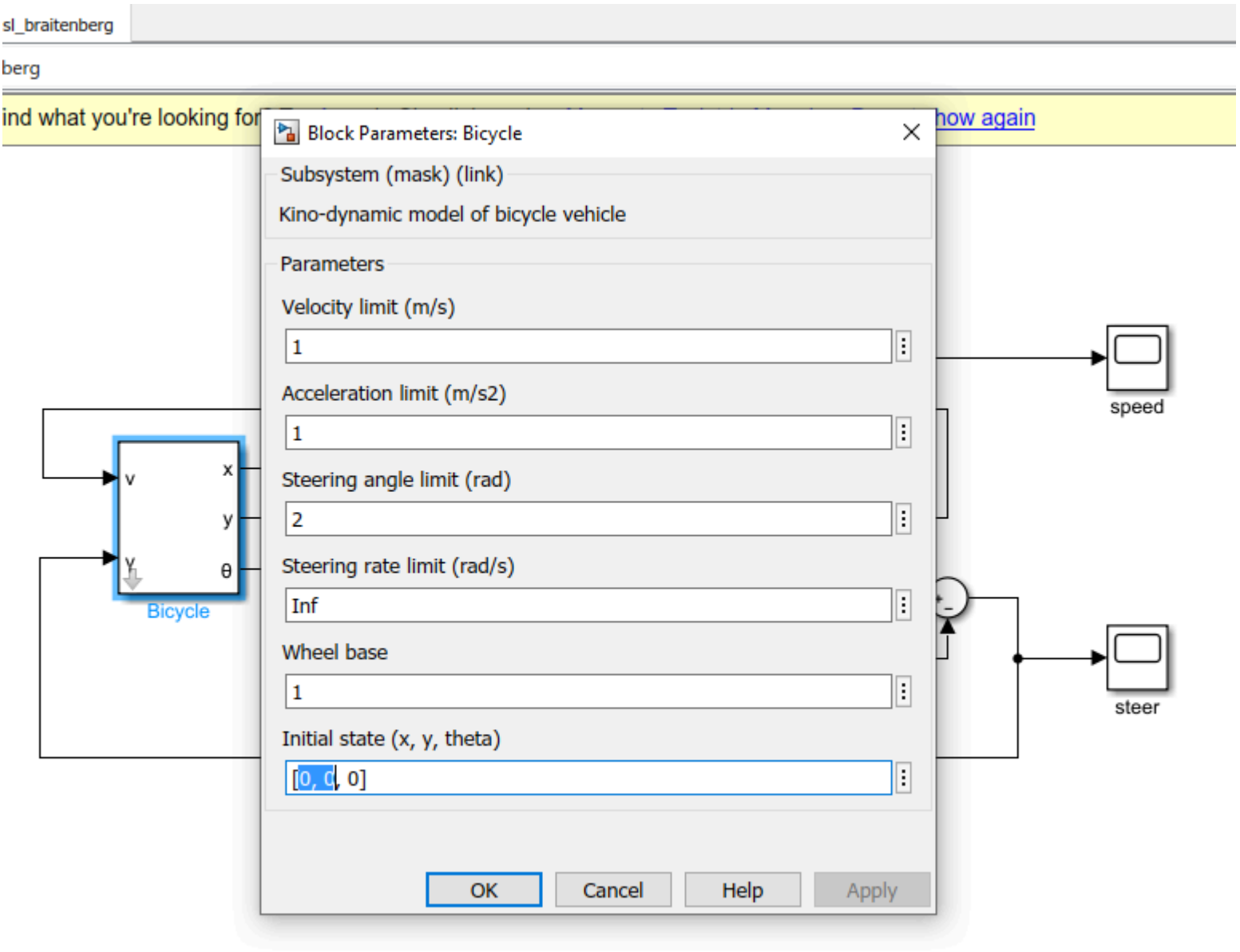
Exercise 1

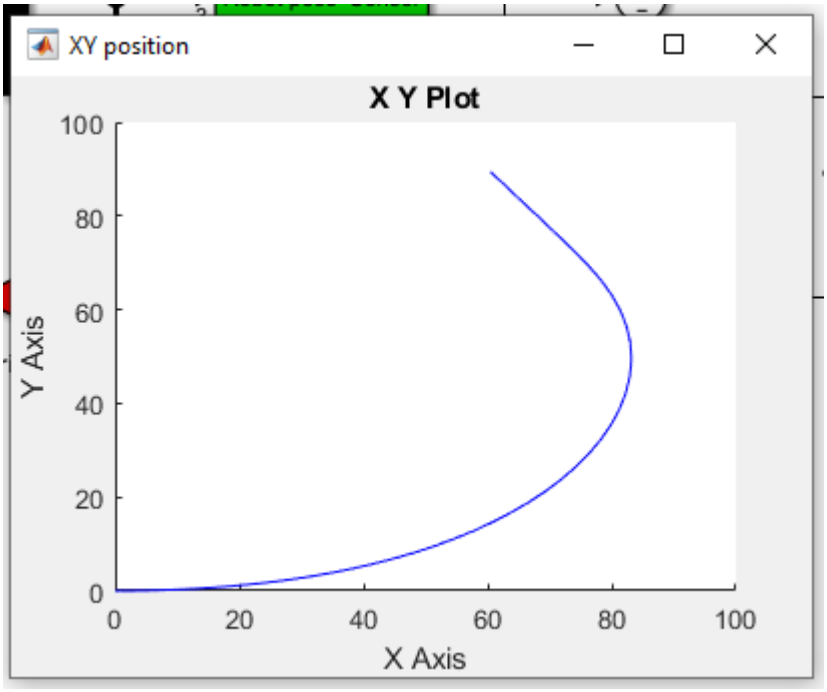
Part A

```
%sl_braitenberg
```

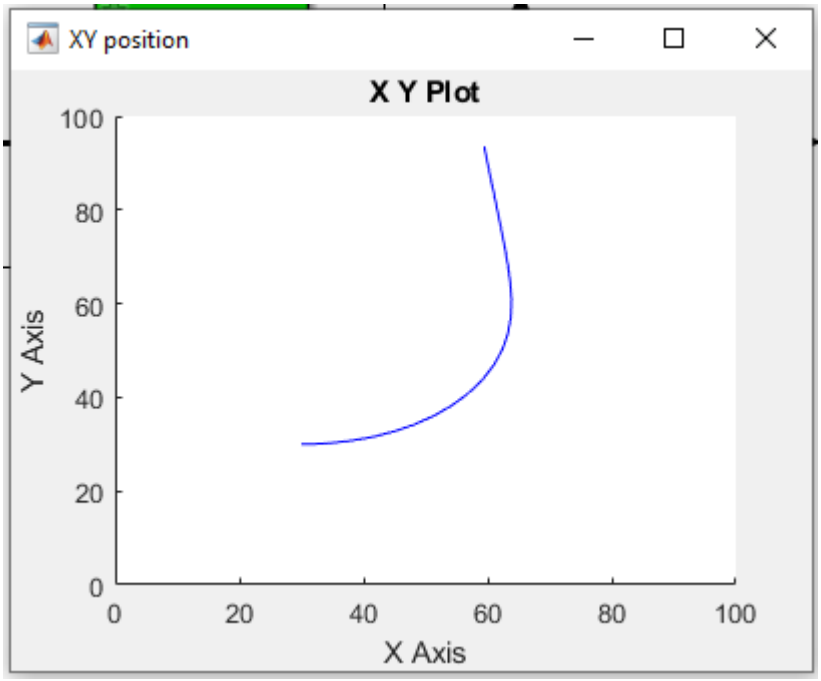
To change the initial position:



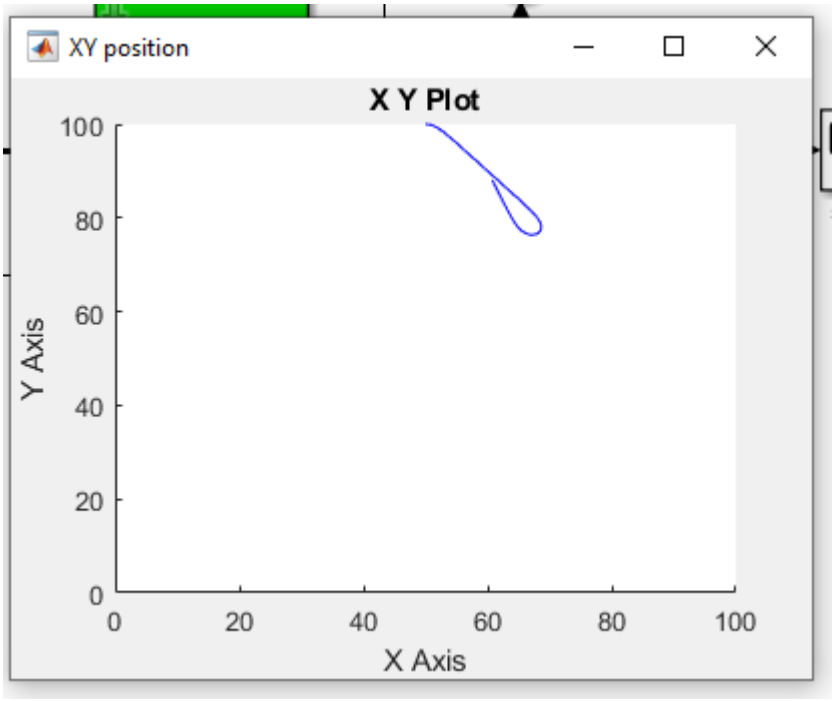
Starting from [0,0] we can see that the robot does a wide steer to achieve the light:



Starting from [30,30] we can see that the robot does a small steer to achieve the light:



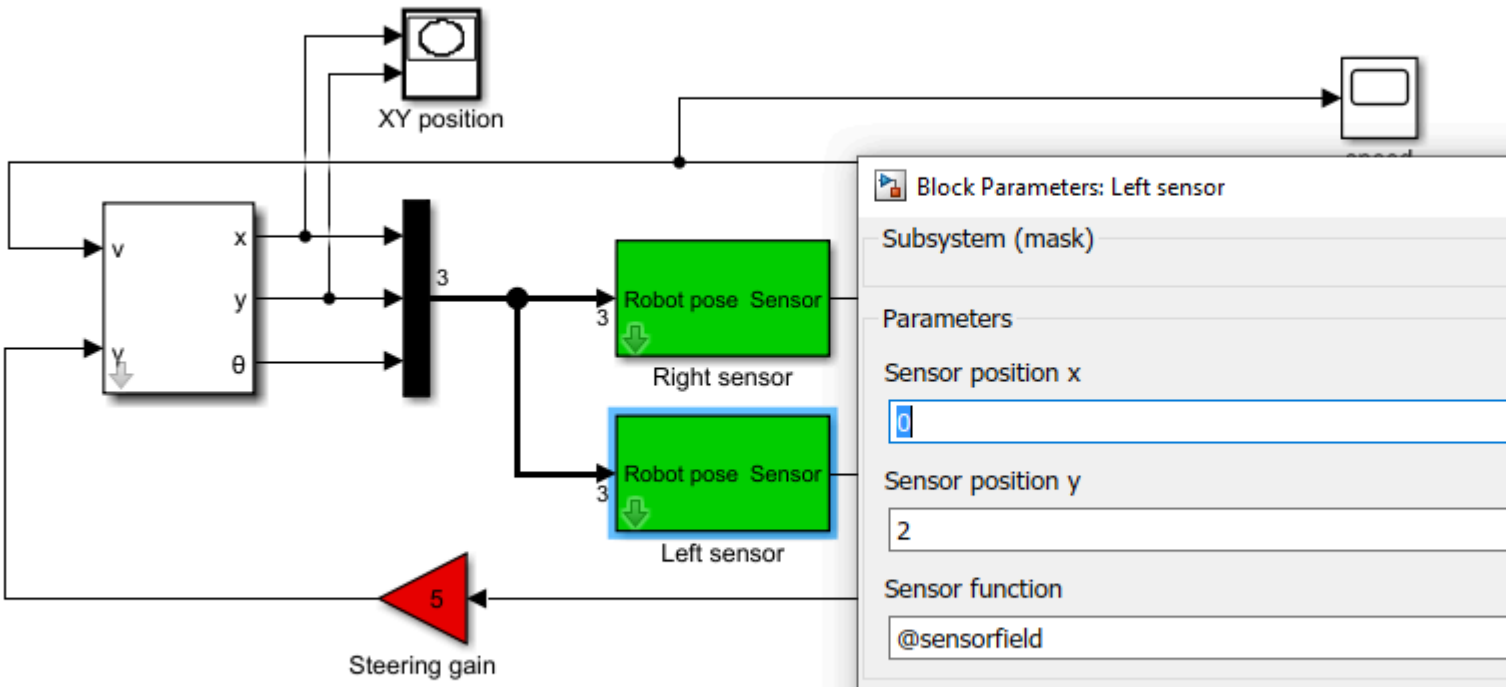
Starting from [50, 100] we can see that the robot starts near the light so it steers around the light:



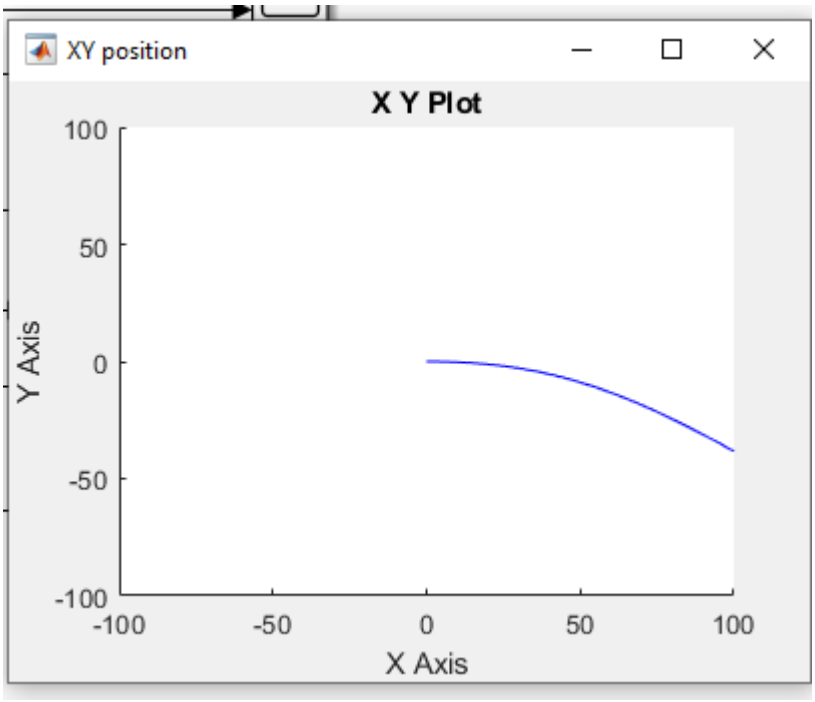
Part B

```
%sl_braitenberg
```

To change the steering we need to change the signals on the Robot Pose sensor. In this case we change from -2 to 2 on the left sensor and viceversa on the right sensor:



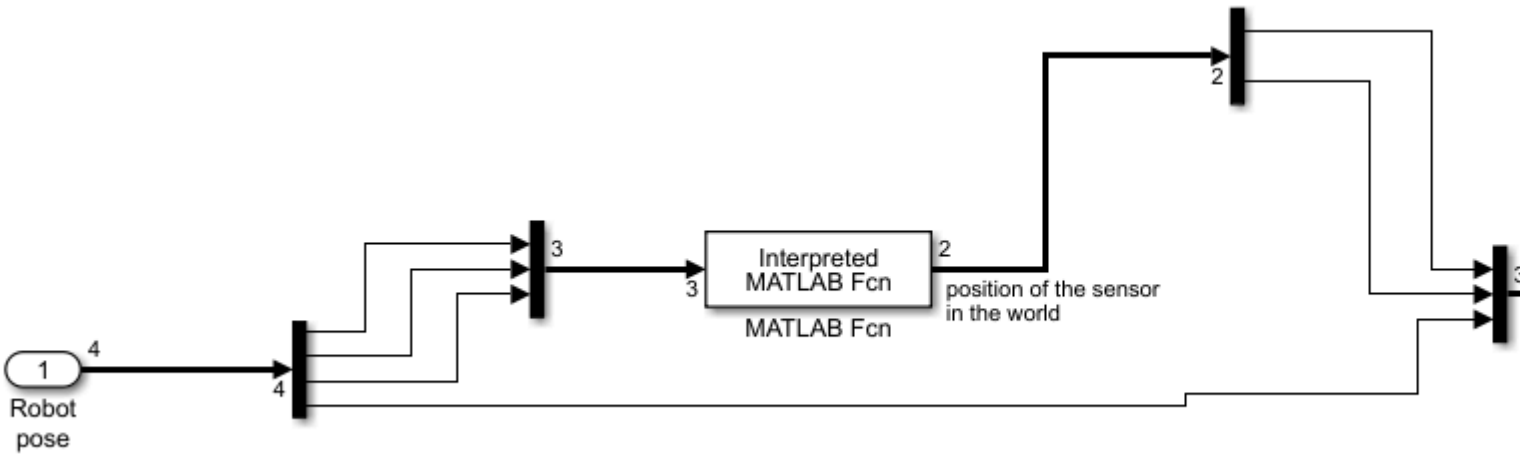
Starting from pos 0,0 and making the grid wider we can see that the robot runs away from the light:



Part C

```
%sl_braitenberg_1c
```

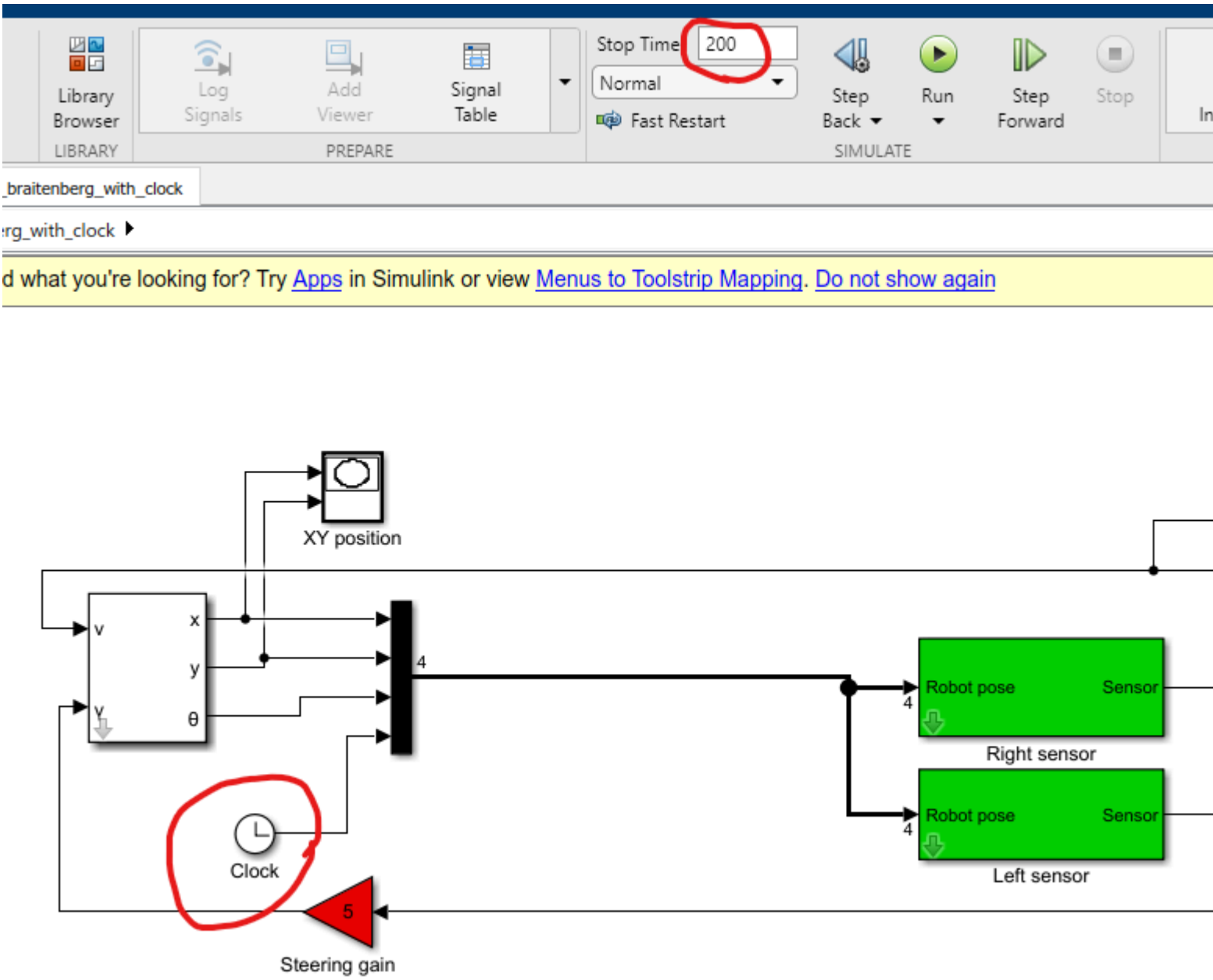
We added a clock to the 4th position of the bus so that the sensorfield function recieves the clock parameter:

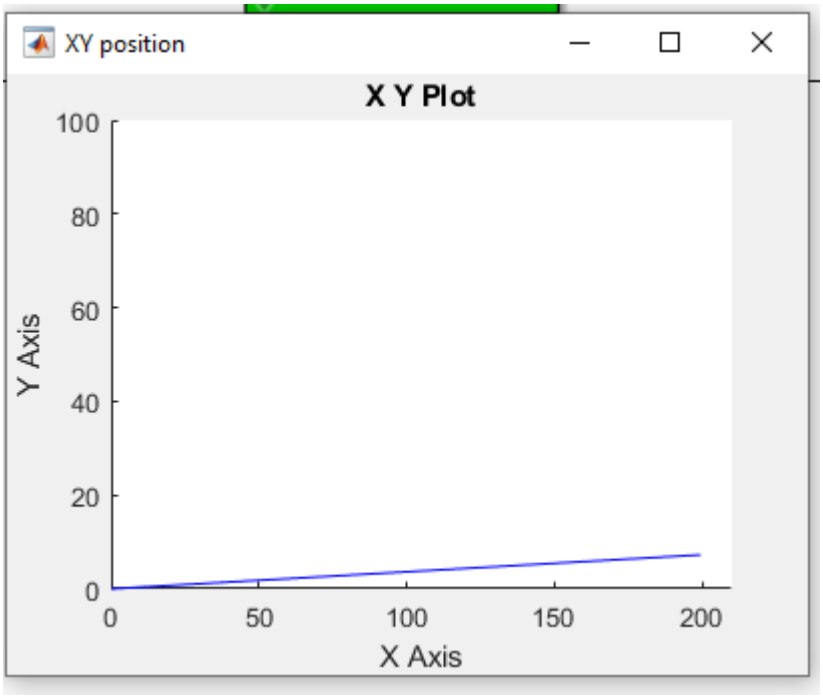


We used the parameter to modify the light position at each iteration:

```
% http://www.petercorke.com
function sensor = sensorfield_with_clock(x, y, clock)

    xc = 60 * clock; yc = 90 * clock;


    sensor = 200 ./ ((x-xc).^2 + (y-yc).^2 + 200);
```

As you can see in the graphics, the robot follows the light without never arriving into it. The execution finishes due to the stop time marked to 200:


Library Browser
LIBRARY
Log Signals
Add Viewer
Signal Table
PREPARE
Stop Time
200
Normal
Fast Restart
Step Back
Run
Step Forward
Stop
SIMULATE
_braitenberg_with_clock
rg_with_clock
d what you're looking for? Try Apps in Simulink or view Menus to Toolstrip Mapping. Do not show again
XY position
v
x
y
θ
v
4
Robot pose
Sensor
4
Right sensor
Robot pose
Sensor
4
Left sensor
Clock
5
Steering gain

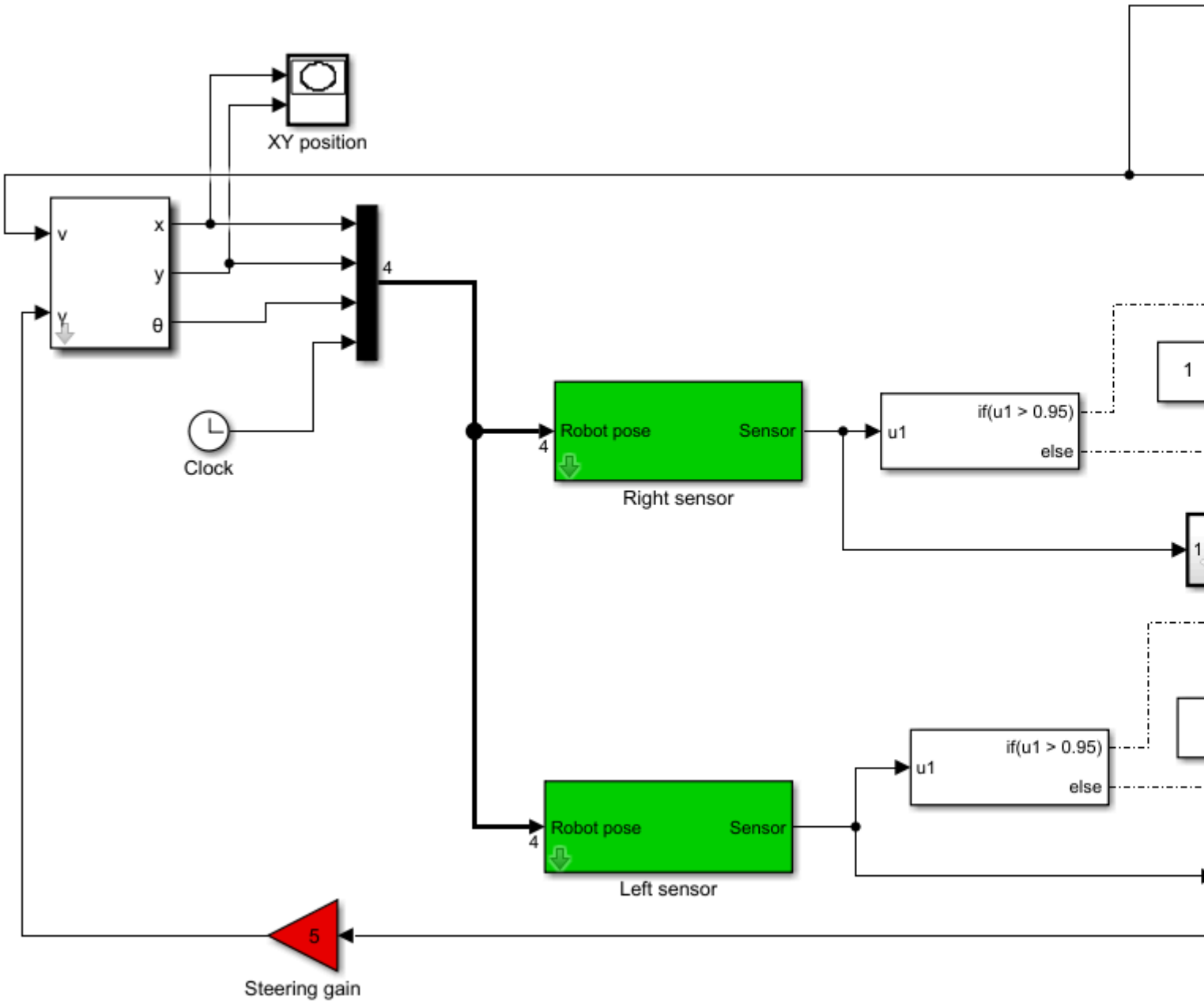


Part D

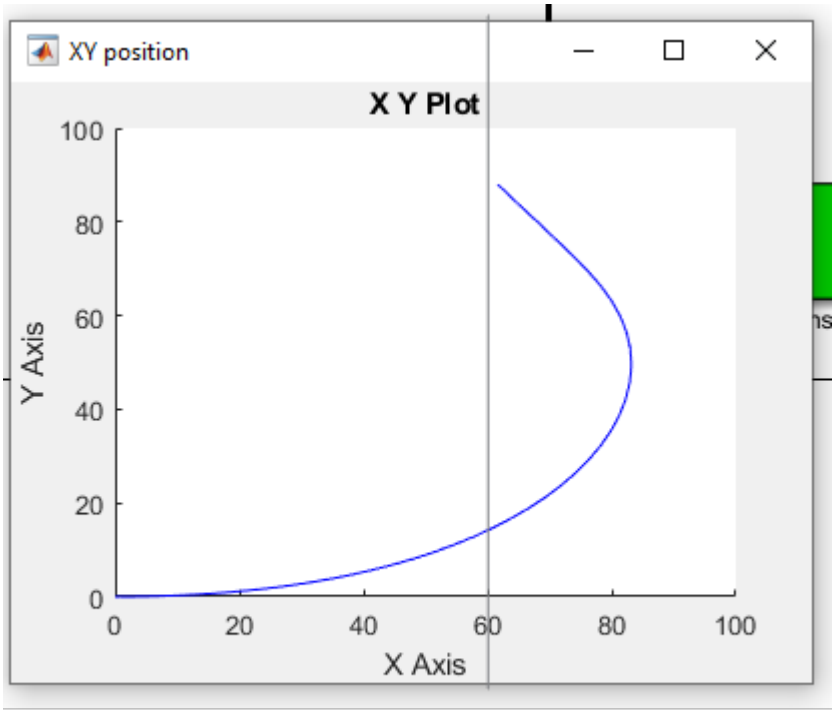
```
%sl_braitenberg_1d
```

Note: We deactivated the clock behaviour for this section.

We added if else statment for every sensor output. If value is over 0.95, the program stops.



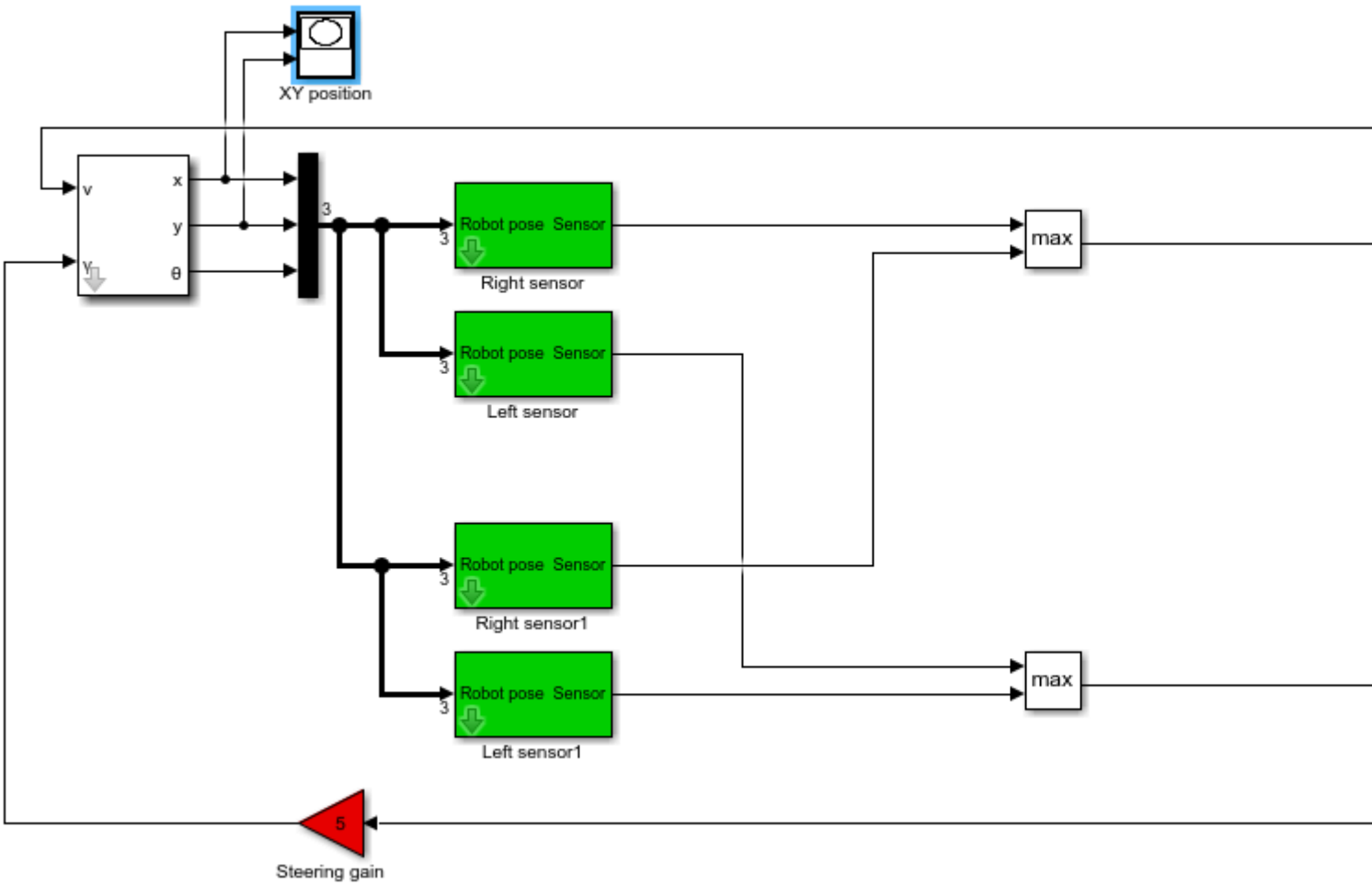
As we can see in the execution, the program stops almost on the light point, but before arriving to it. We added a grey line to observe easily the position difference:



Part E

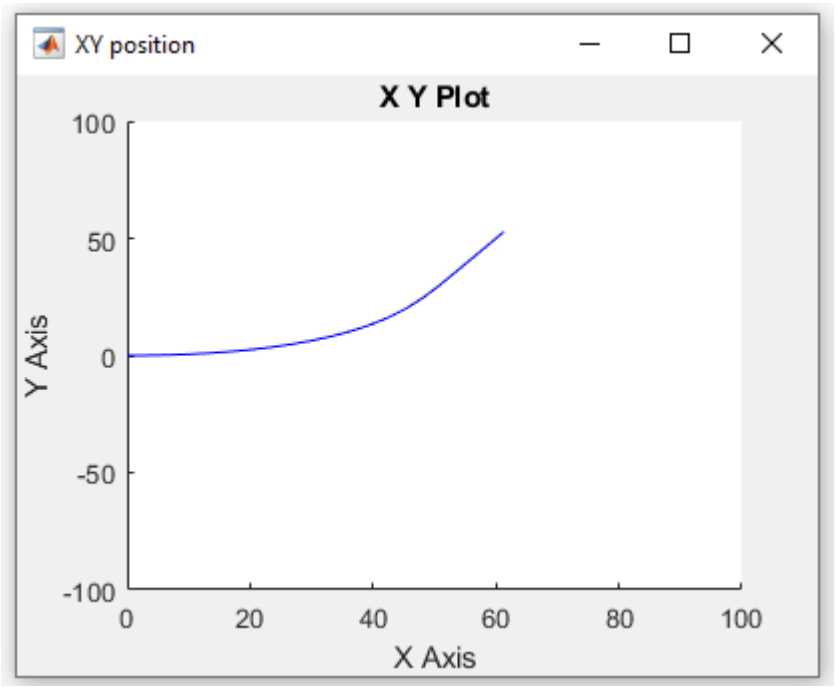
```
%sl_braitenberg_1e
```

We created another sensor calculus for the right and left sensor with a new position. The max sensor output is the one that is being chosen.



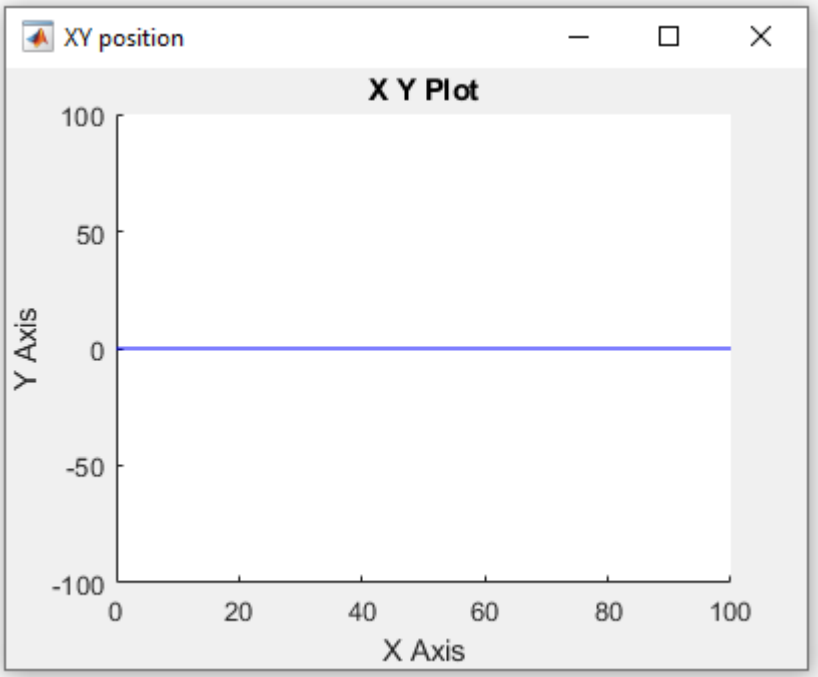
If the second position is [60,50], the robot leans toward this new position since its nearer than the original [60,90]:

```
function sensor = sensorfield_le(x, y)

    xc = 60; yc = 50;

    sensor = 200 ./ ((x-xc).^2 + (y-yc).^2 + 200);
```



To confuse the robot, we can use equidistant positions so that the robot can't choose where to go. We will use [60, -90] as the second position:

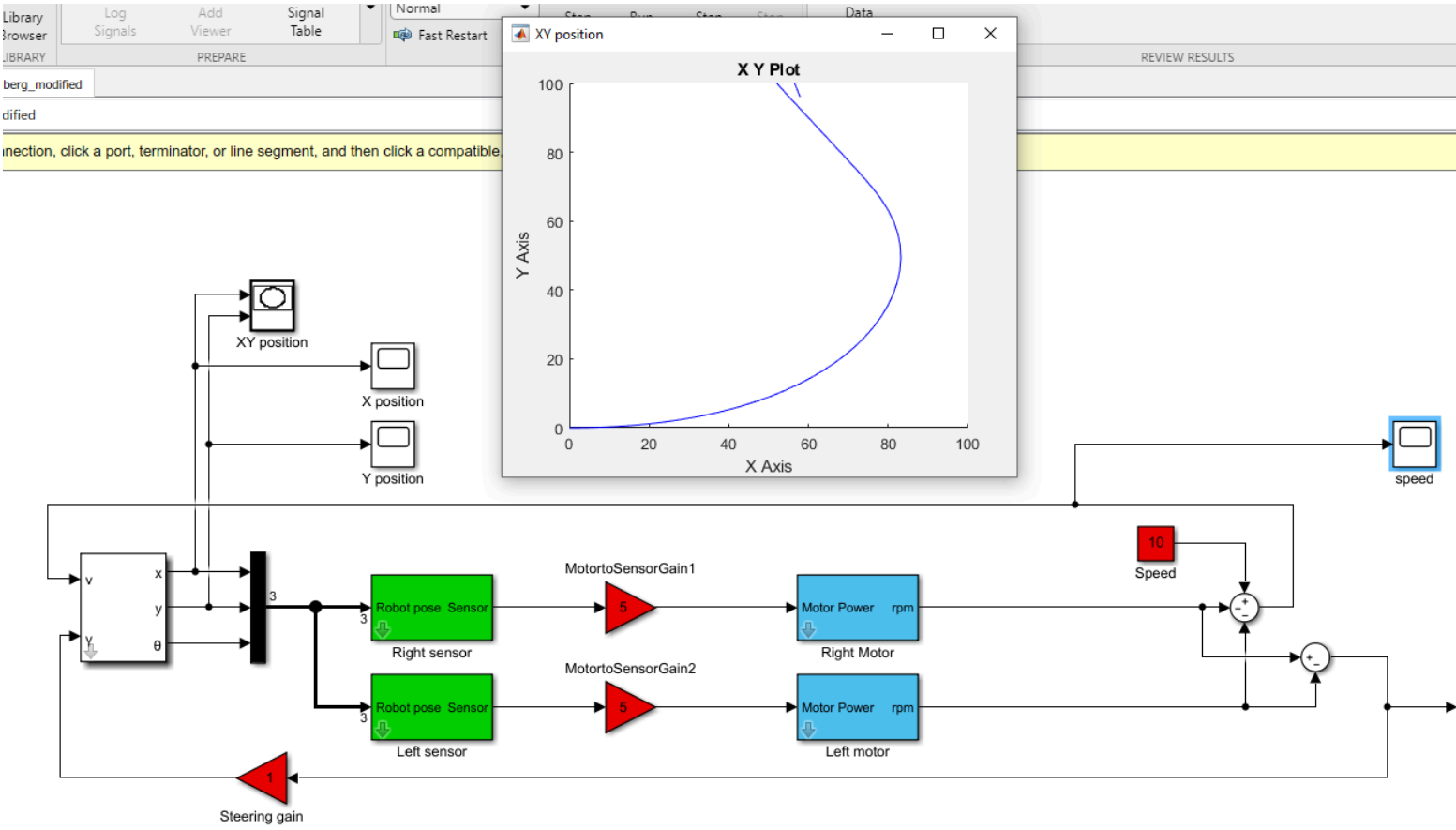
```
function sensor = sensorfield_le(x, y)

    xc = 60; yc = -90;

    sensor = 200 ./ ((x-xc).^2 + (y-yc).^2 + 200);
```



Braitenberg modified

We modified the braitenbergh so that the behaviour can be modified internally:

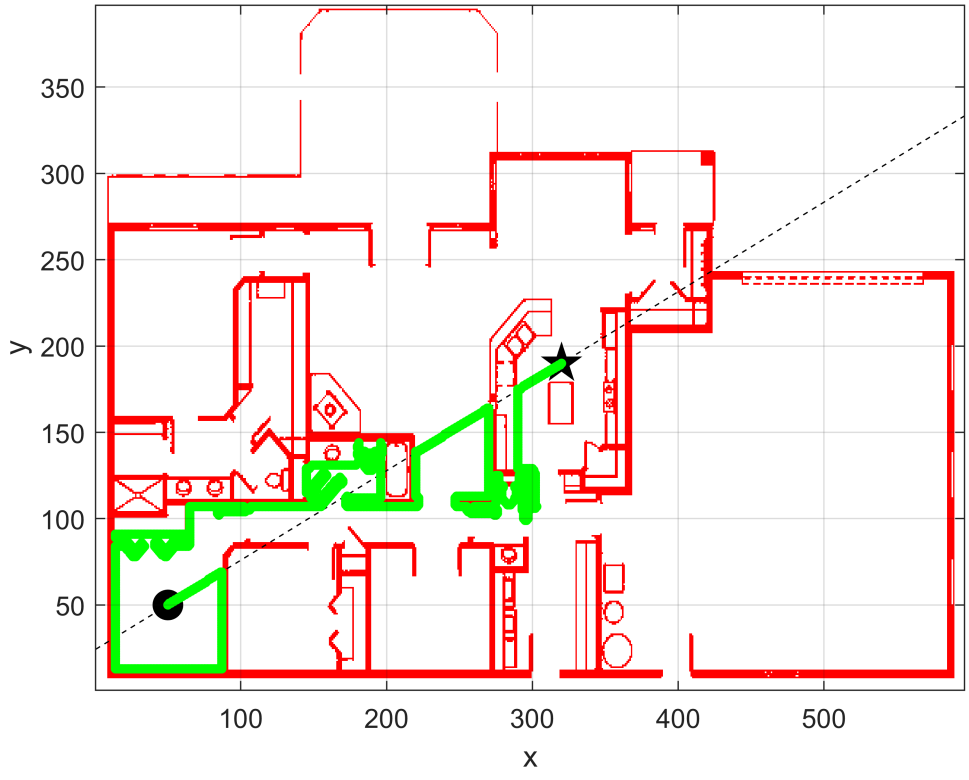
```
%sl_braitenberg_mod
```



Exercise 3

```
load house;

bug = Bug2(house);
bug.plot()
```


```
bug.query(place.br3, place.kitchen, 'animate');
```

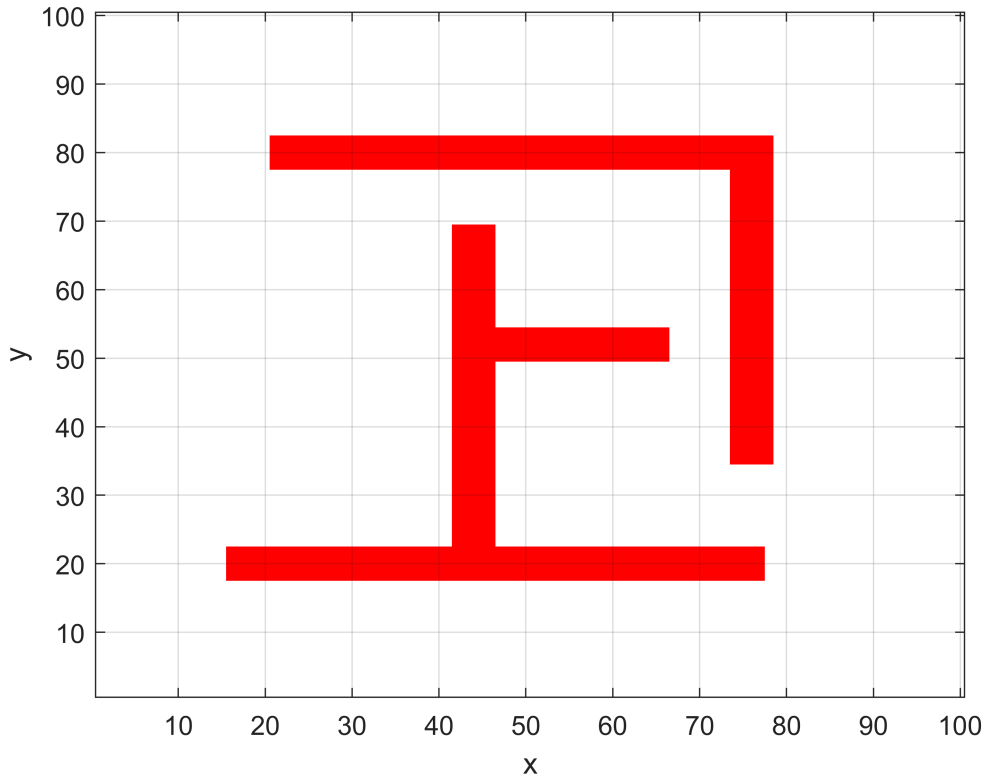


Part A

```
% map = makemap(100);
% save('3A.mat','map');
```

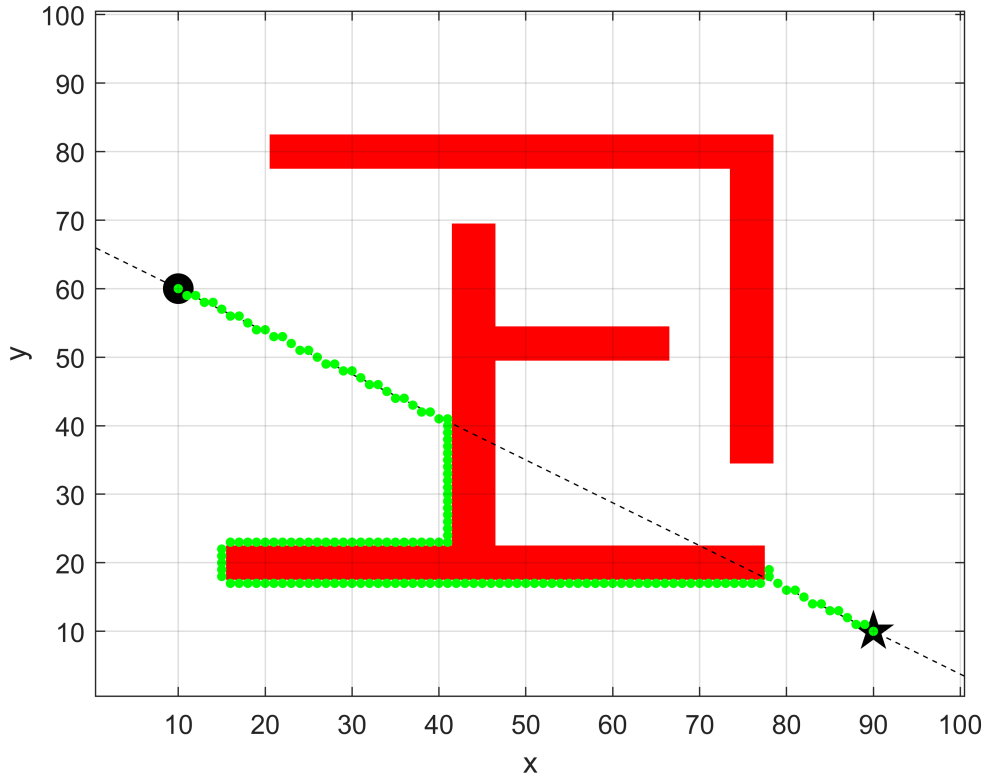
The map is loaded from a presaved .mat file:

```
load('3A.mat');

bug = Bug2(map);
bug.plot()
```

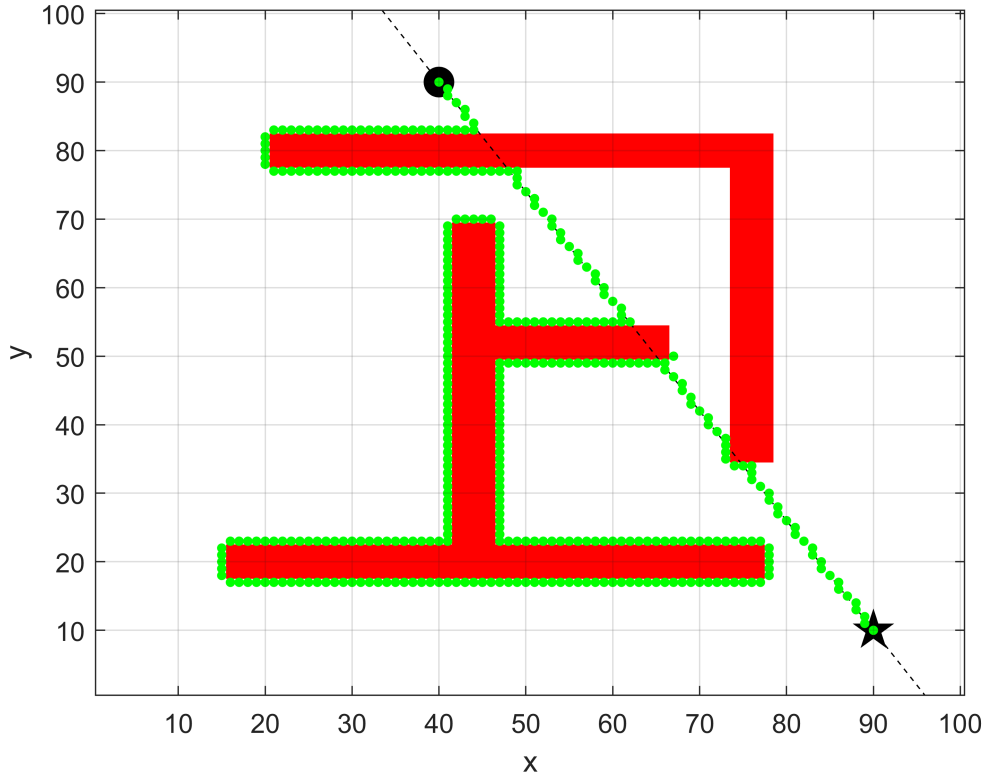


We test the bug with 2 different starting points:

```
bug.query([10;60], [90;10], 'animate');
```




```
bug.query([40;90], [90;10], 'animate');
```

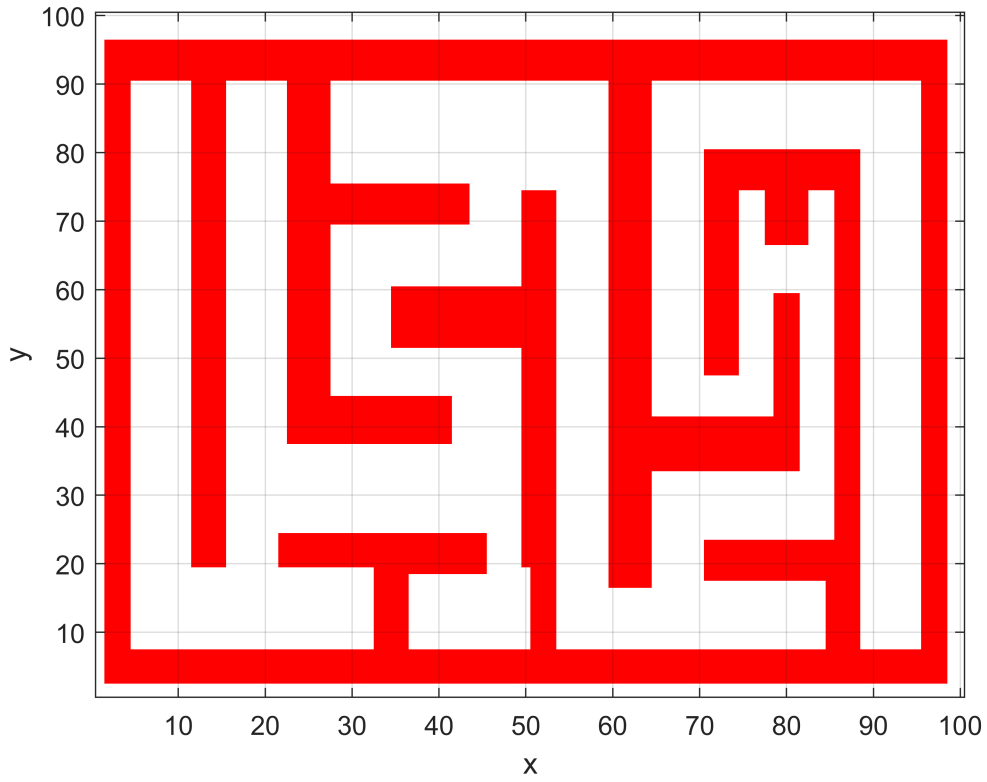


Part B

```
% map = makemap(100);
% save('3B.mat','map');
```

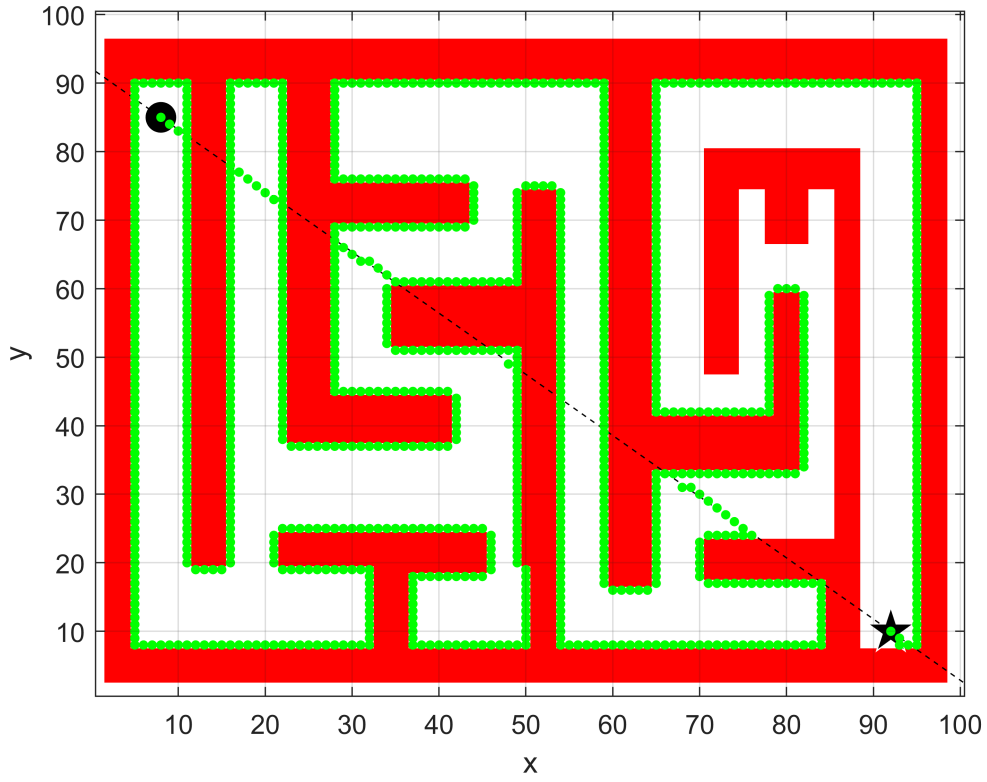
The map is loaded from a presaved .mat file:

```
load('3B.mat');

bug = Bug2(map);
bug.plot()
```



We test the bug through all the maze:

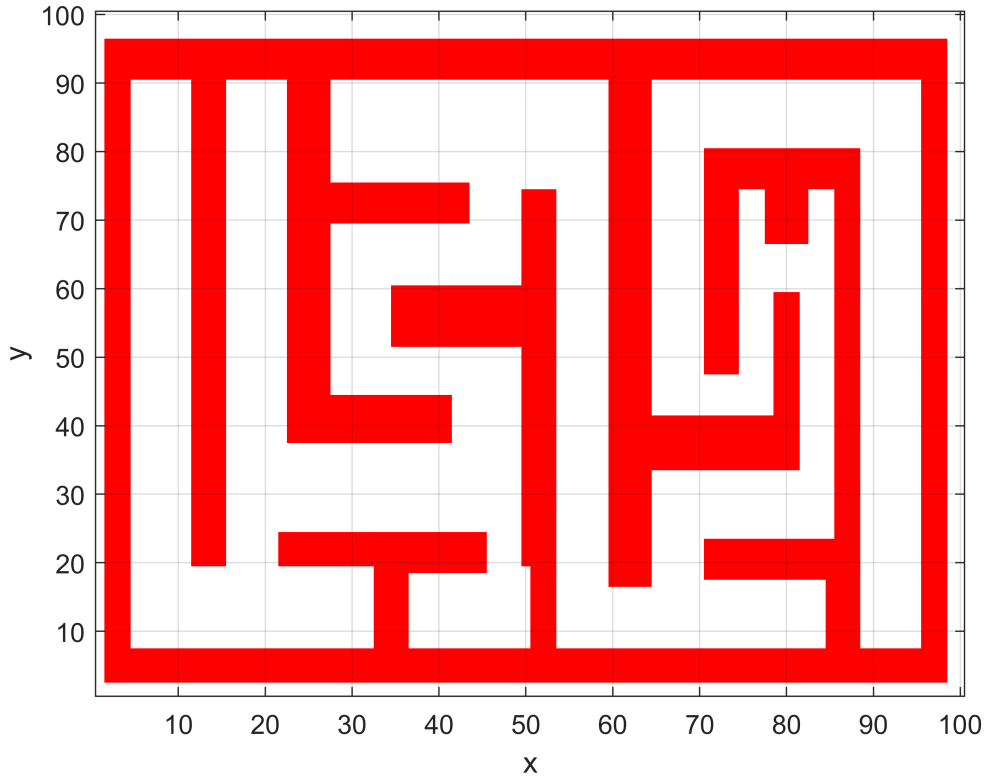
```
bug.query([8;85], [92;10], 'animate');
```



Part C

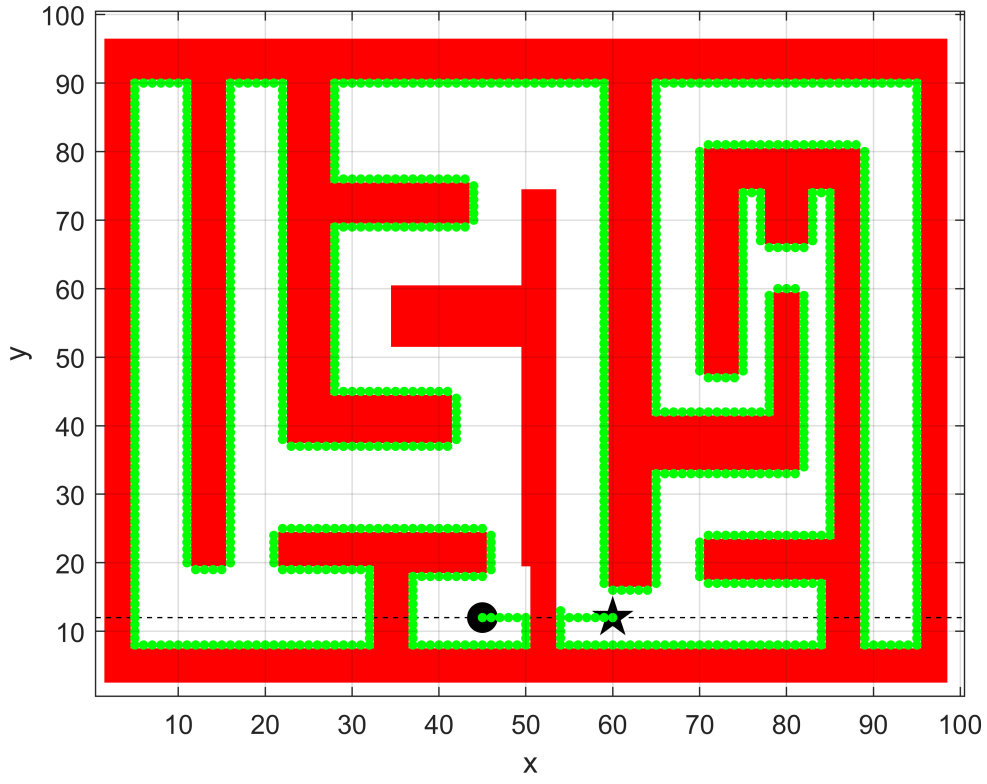
The map is loaded from a presaved .mat file:

```
load('3B.mat');

bug = Bug2(map);
bug.plot()
```

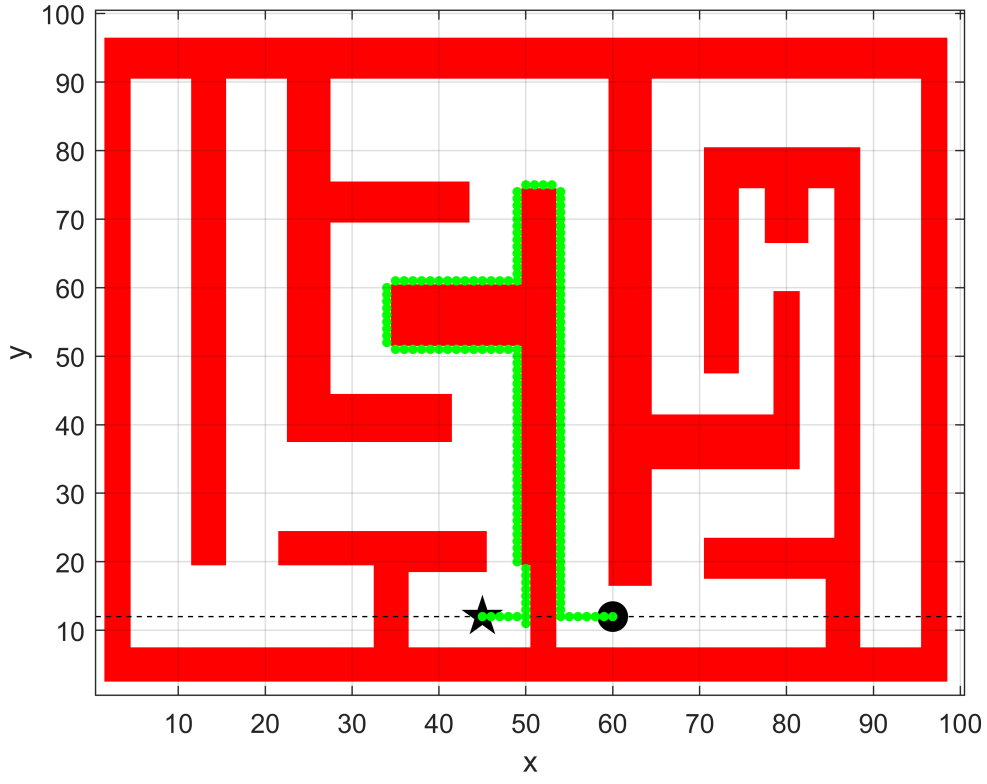


We test the bug with other locations:

```
bug.query([45;12], [60;12], 'animate');
```




```
bug.query([60;12], [45;12], 'animate');
```

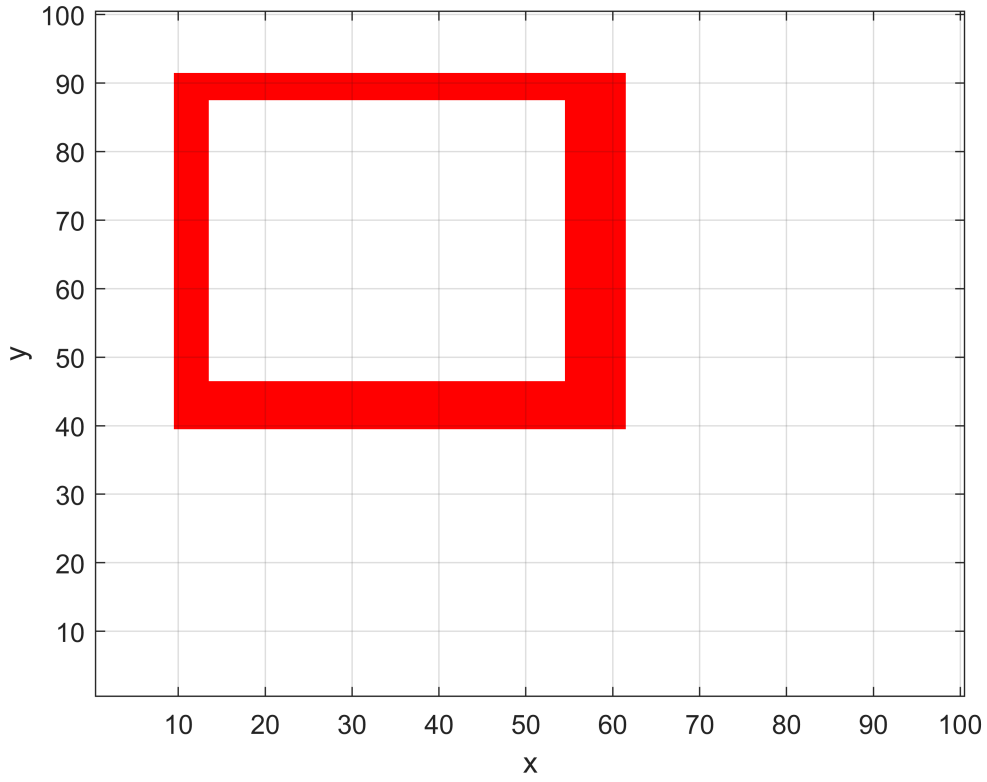


Part D

```
% map = makemap(100);
% save('3D.mat','map');
```

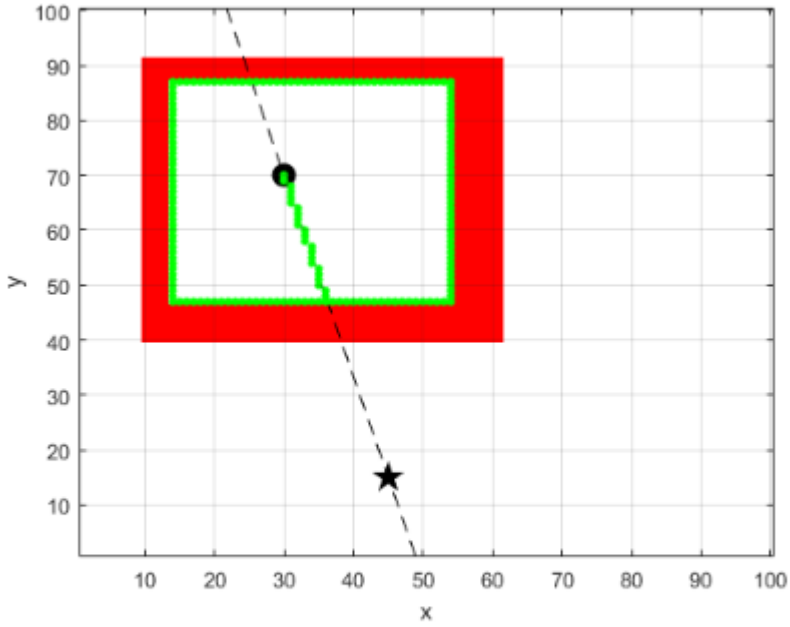
The map is loaded from a presaved .mat file:

```
load('3D.mat');

bug = Bug2(map);
bug.plot()
```



Let's make the bug cry:

```
% bug.query([30;70], [45;15], 'animate');

% Line commented due to the error indicating that it is trapped.
% Uncomment in order to test the same output as the picture below.
```




```
Error using Bug2/next (line 261)
robot is trapped

Error in Bug2/query (line 160)
                robot = bug.next(robot);
```

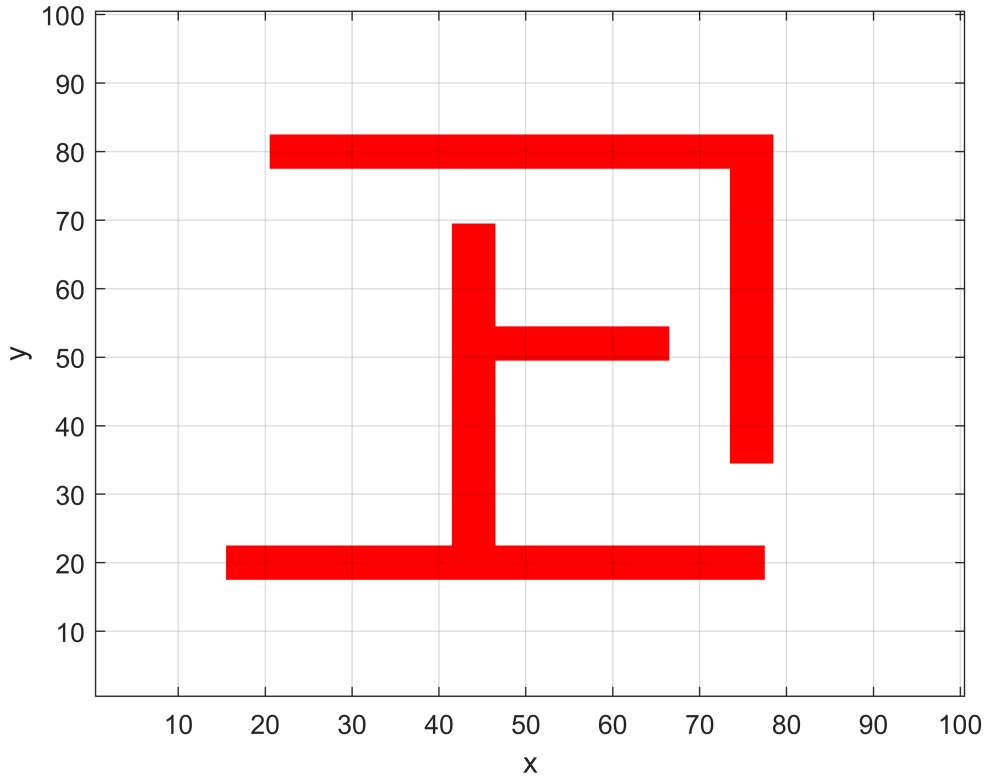
Part E

We modified the Bug2 original code. The difference is that the next() method starts from last k and iterates to the first k available.

```
                    bug.message('(%d,%d) obstacle!', n);
                    bug.H(bug.j,:) = robot; % define hit point
                    bug.step = 2;
                    % get a list of all the points around the obstacle
                    bug.edge = edgelist(bug.occgridnav == 0, robot);
                    bug.k = numcols(bug.edge);  % skip the first edge point, we are alre
                else
                    n = robot + [dx; dy];
                end
            end % step 1

            if bug.step == 2
                % Step 2.  Move around the obstacle until we reach a point
                % on the M-line closer than when we started.
                if colnorm(bug.goal-robot) == 0 % are we there yet?
                    return
                end

                if bug.k > 1
                    n = bug.edge(:,bug.k);  % next edge point
                else
                    % we are at the end of the list of edge points, we
                    % are back where we started.  Step 2.c test.
                    error('RTB:Bug2_mod:noplan', 'robot is trapped')
                    return;
                end

                % are we on the M-line now ?
                if abs( [robot' 1]*bug.mline') <= 0.5
                    bug.message('(%d,%d) moving along the M-line', n);
                    % are closer than when we encountered the obstacle?
                    if colnorm(robot-bug.goal) < colnorm(bug.H(bug.j,:)'-bug.goal)
                        % back to moving along the M-line
                        bug.j = bug.j + 1;
                        bug.step = 1;
                        return;
                    end
                end
                % no, keep going around
                bug.message('(%d,%d) keep moving around obstacle', n)
                bug.k = bug.k-1;
            end % step 2
        end % next
```

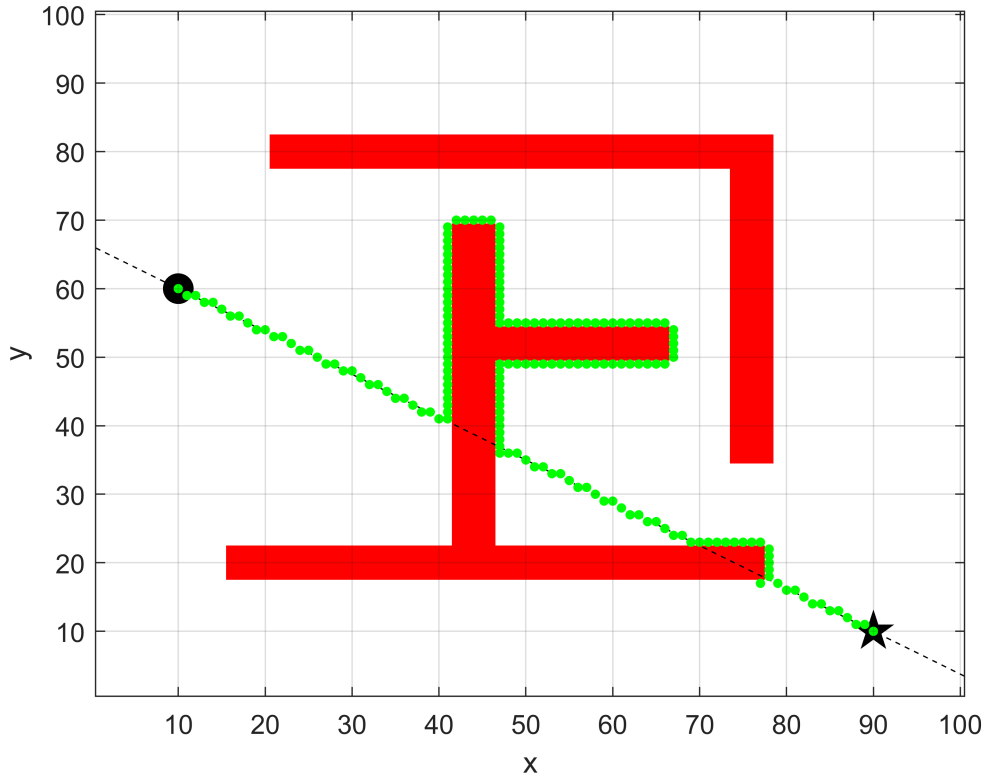
The map is loaded from a presaved .mat file:

```
load('3A.mat');

bug = Bug2_mod(map);
bug.plot()
```



We test the bug with 2 different starting points:

```
bug.query([10;60], [90;10], 'animate');
```




```
bug.query([40;90], [90;10], 'animate');
```