بسمه تعالی

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تحویل ۲۴ آذر روی سامانه درس‌افزار **پاییز ۱۴۰۲**

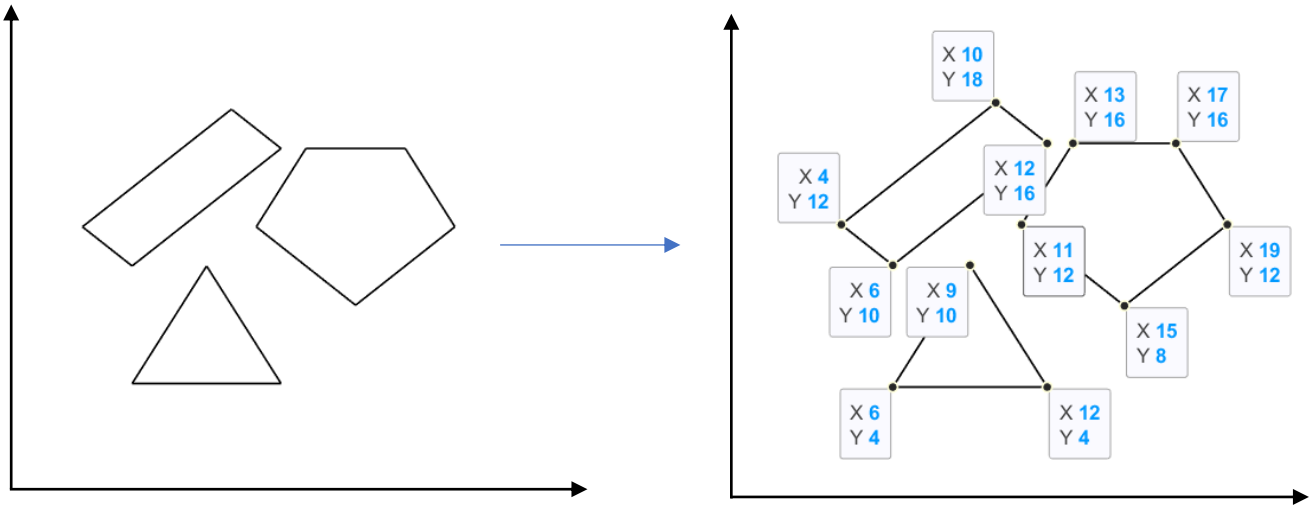
Path generation – Obstacle avoidance

In this assignment, you are supposed to implement the potential field method for the path planning of a point moving on a plane.

1) Write a MATLAB function that generates the via points of the path. The function receives the coordinates of the starting point X_s, final destination X_f, η which is the scaling factor for the attractive field, and matrix B which stores the information of the obstacles. It has a distance of influence with a scaling factor (α) for the obstacle. The function should stop generating via points when the moving point's distance from X_f is less than 0.1. It should then Return matrix P which has the coordinates of the via points starting from X_s and ending by X_f.

```
function P = Path_generator (Xs, Xf, eta, B)
```

2) Test your code for the following example with $\eta = \alpha = 1, \varepsilon = 0.1$ and distance of influence equal to 2 for all obstacles. The coordinates of the obstacles' end points are shown in the following figure. Plot the obstacles as well as your generated path in a MATLAB figure and submit a detailed report and your results along with your MATLAB code. *Xs =(1,10) , Xf=(22,12)*



3) Add a line between points (17.5,10) and (17.5,8). Try to generate a path again. Where does the path get stuck?

4) (20% Bonus Marks) Implement a random walk algorithm and see if it can solve the local minima problem of Question3. The random walk algorithm starts when the potential field algorithm (PFA) is stuck in a local minima. It makes the robot take a random jump with a maximum length of a (let a be 6 in this example), at a random angle providing that the jump doesn't interfere with any obstacle. You can

propose a different method to determine the angle of jump to increase the chance of escape. Then it runs the PFA from the new position to see if it can reach the target destination. Submit a detailed report for this question.