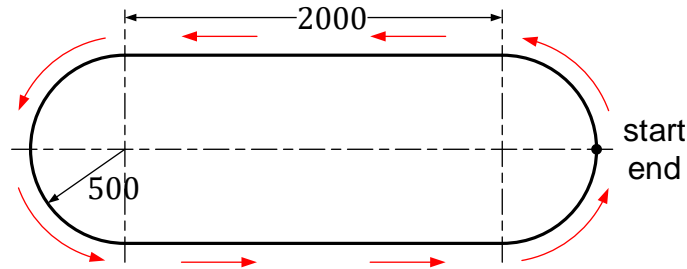


Exercise 1

1. Working Space for mobile robot is in following Figure (2 marks)



Feature needing to watch on robot has diameter 1mm. Chose appropriate Basler Camera and working distance. Assume that the camera is setup above and perpendicular to the working space. Remember to check the result on the basler website.

2. A picture has the matrix as following with STT is the index of the group (3 marks)

STTx10	20	30	STTx10
80	STTx10	100	110
120	160	STTx10	150
220	230	240	250

- Equalize Histogram this picture in range 0-255, using 256 bin
 - Program using opencv lib to equalize histogram this picture and display histogram before and after equalize
 - threshold this picture using Otsu method with random initial guessing, Check again using opencv lib.
3. Find the template in the image using Normalized Cross-Correlation threshold > 0.98 . Then using opencv function to check. (2 marks)

Image

1	2	3	STT	10	11
STT	10	11	16	STT+8	18
16	STT+8	18	22	24	25
23	24	25	25	4	7

Template:

STT	10	11
16	STT+8	18
23	24	25

4. A picture has the matrix as following (3 marks)

9	10	11	10	9	10	11
10	9	$80+STT \times 5$	$80+STT \times 5$	$80+STT \times 5$	10	11
10	$80+STT \times 5$	10	11	10	$80+STT \times 5$	11
10	9	$80+STT \times 5$	$80+STT \times 5$	$80+STT \times 5$	13	11
10	10	10	10	10	13	11

- Calculate manually using Gaussian blur algorithm with kernel 3×3 , $\sigma = STT/10$ and then programing using Gaussian blur function of opencv to check the result (using duplicate border)
- Caculate manually the edge using sobel algorithm (using duplicate border) and then programing using Gaussian blur function of opencv to check the result (using duplicate border)