A.B.C.

The table is given below:

Robot	Start posn	Min score	Max score
A	(3,5)	2.5	5.2
	(7,1)	0	4.7
B	(3,5)	5.6	7.6
	(7,1)	0.7	6.8
C	(3,5)	5.6	7.6
	(7,1)	0.7	6.8

D.

a)Simple Reflex Agent only considers the present percept to choose an action ; so it will behave perfectly rationally if the performance measure that defines criterion of success depends only on the current state of the environment but not on the past for example in case of an agent that detects defentive parts on an assembly line.

b)In case of no tie for the maximum amount of dirt present in the four neighbouring places,the robot behaves deterministically.

In case of a tie,the robot program uses random() function in c to generate a random number to resolve but it uses a pseudo-random number generator algoritm which i am not fully aware of whether it is deterministic .But in case of a hard-robot it may throw an unbiased die or flip an unbiased coin to resolve the tie anyway.

c)If the input matrix has a preferred direction in which very high values of dirt are present an in other neighbours very low value are present ; it is highly unlikely that a good randomized algorithm
generates same successive directions and it will clean lower amount of dirt.eg:
0.1 0.9 0.1
0 0.8 0.1
0.2 0.7 0.2
0 [0.8] 0

d)If a neighbour has dirt d ; then first consider d+20% and d-20% for each neighbours ; if these ranges do not intersect ; select the highest
else maintain exponential moving average inaccuracy using discrepancy between past sensed dirt and actual cleaned dirt(not ignoring + or – sign) and predict next inaccuracy ; add with the actual sensed data of neighbours and decide based on this edited data.Note

that we may have to empirically find a suitable value of alpha for the moving average.

e)From the property of gaussian distribution ; we know that squares have highest chance (almost 1) of being dirty again between 0 to (20+3*10 =) 50 moves .So may be the robot will remember it's starting point and after maybe 50/2=25 moves it may try to retrace back to starting position from current position to clean the cells again thus making a loop.

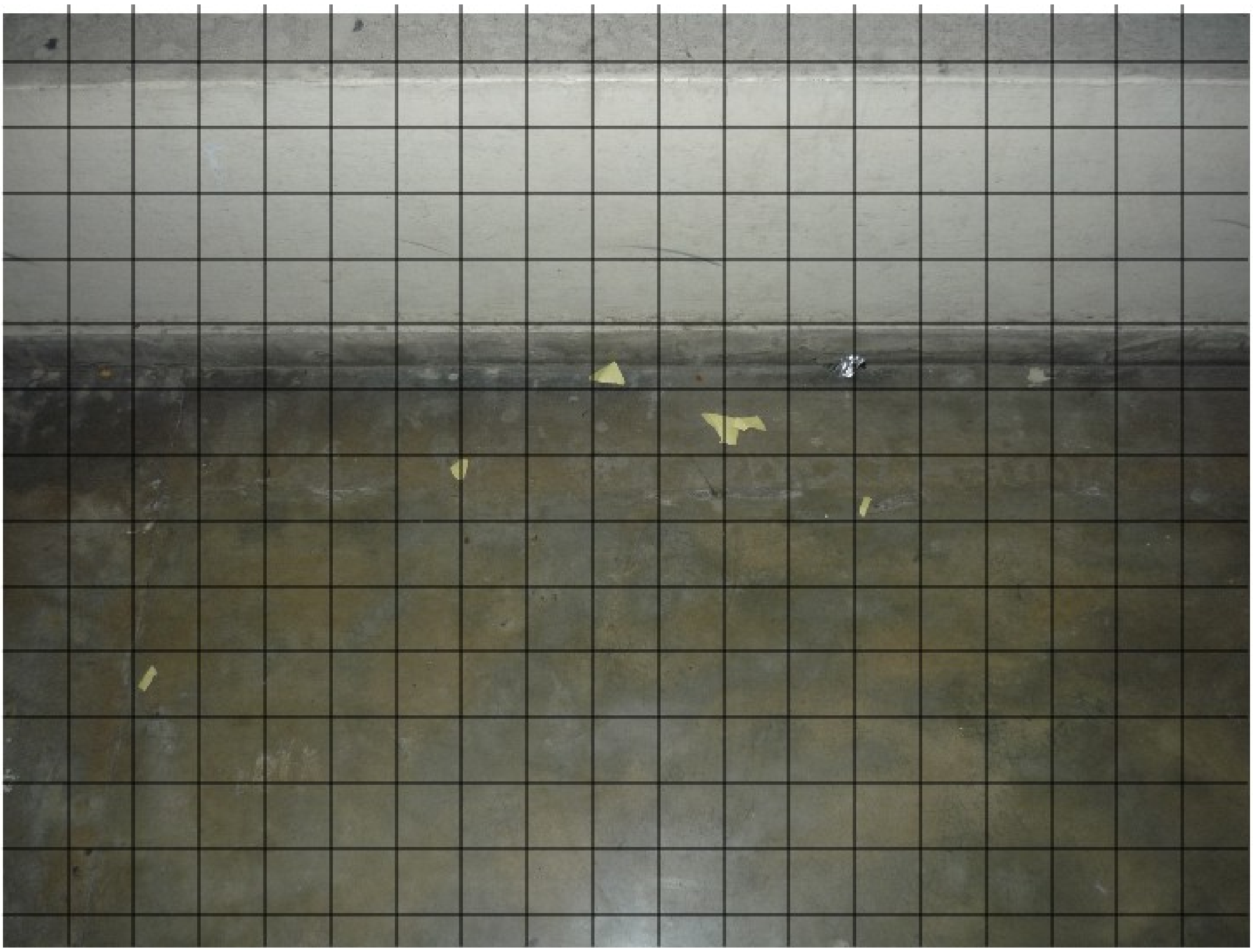
E.

a)We can use Canny Edge Detection algorithm to find an edge from the given figure.
3 Edges can be captured by the following horizontal edge detection algo :

1. convolve the image with derivative of gaussian to obtain R
2. mark edges as peaks in |R|

now it is difficult to say which of these is the floor-wall seperating line.But we may make use of the fact that only floor can hold larger and more massive dirts like the torn papers in the peak and the portion of the image containing those between two edges is the floor ; other portion is wall.

b) I found 0.5 m grid size is too much to assign dirt values accordingly ; so i reduced the grid size.Anything of the size of the paper or plastic seen in the pic may be defined as dirt. The topmost row in the grid is quite dirty as can be found out by using it's greyish colour.Thus this row will have 0.8 value of dirt.The floor will have almost 0 dirt value except for the papers which will have 0.7 dirt value.



c) Any fraction between 0 and 1 maybe a good predicate of dirt for the picture as suggested by the answer in part B.But binary dirt predicate is too eroneous.

d)The distance from the wall can be easily found out in terms of the multiples of grid size but the x co-ordinate of the image is a bit difficult to find without any reference in general.Had it been a corner;it would have been easy.But we can use the fact that the glowing central portion of the image is lying just below the camera.Thus using intensity pattern of the image we can find it's y co-ordinate.But anyway in case of an actual robot we can find using advanced sensors like sonar or infra-red camera it's position.