Corrected Exam Topic: Detection and Tracking of Moving Objects

Question 1: Laser Scanner's Field of View at T=1 and T=2

The laser scanner's field of view is 13° with a resolution of one degree. The measured distances are presented in the tables for each angle. Here are the distances recorded at T=1 and T=2 in the first time interval:

T=1: 8, 8, 8, 4, 4, 4, 4, 6, 8, 6, 9, 12, 12

T=2: 8, 7, 8, 4, 4, 4, 4, 7, 8, 6, 9, 12, 12

The field of view can be represented by plotting the angles (-6° to +6°) with their corresponding distances. Variations in distances allow the localization of objects and their movements.

Question 2: Detecting Moving Objects

To detect moving objects, we observe the changes in distances measured by the scanner over time. A significant change in distance at one or more angles indicates the presence of a moving object. For example, in Table 1, the distance at angle -6° changes from 8 cm (T=1) to 3 cm (T=3), corresponding to the movement of an object.

Question 3: Tracking a Moving Object from Table 1

	-6°	-5°	-4°	-3°	-2°	-1°	0°	+1°	+2°	+3°	+4°	+5°	+6°
T = 1	8	8	8	4	4	4	4	6	8	6	9	12	12
T = 2	8	7	8	4	4	4	4	7	8	6	9	12	12
T = 3	3	8	8	4	4	4	4	6	8	5	9	12	12
T = 4	8	8	3	4	4	4	4	6	8	6	9	11	12
T = 5	8	8	8	4	3	4	4	7	8	6	9	12	12
T = 6	8	8	8	4	4	4	3	7	8	6	9	12	12
T = 7	8	8	8	4	4	4	4	7	3	5	9	11	12
T = 8	8	8	8	4	4	4	4	7	8	6	3	12	12
T = 9	8	8	8	4	4	4	4	7	8	6	9	12	3
T = 10	8	8	8	4	4	4	4	6	8	6	9	12	12

Motion Estimation: The object's motion is approximately constant from left to right. Between two consecutive instants, a displacement of +2 degrees is observed along with a variation in distance due to approach or retreat of the object.

Question 4: Tracking Two Moving Objects from Table 2

	-6°	-5°	-4°	-3°	-2°	-1°	0°	+1°	+2°	+3°	+4°	+5°	+6°
T = 1	8	8	8	4	4	4	4	6	8	6	9	12	12
T = 2	5	8	8	4	4	4	4	7	8	6	9	12	12
T = 3	4	7	5	4	4	4	4	6	8	5	9	12	12
T = 4	8	8	4	4	4	4	4	6	8	6	9	11	12
T = 5	8	8	8	4	4	4	4	7	8	6	9	12	12
T = 6	8	8	8	4	4	4	4	4	8	5	9	12	12
T = 7	8	8	8	4	4	4	4	7	8	6	4	11	12
T = 8	8	8	8	4	4	4	4	7	8	6	6	12	5
T = 9	8	8	8	4	4	4	4	7	8	6	9	12	12
T = 10	8	8	8	4	4	4	4	7	8	6	9	12	12

Motion Estimation: The objects's motion is approximately constant from left to right. Between two consecutive instants, a displacement of +2 degrees is observed along with a variation in distance due to approach or retreat of the object.