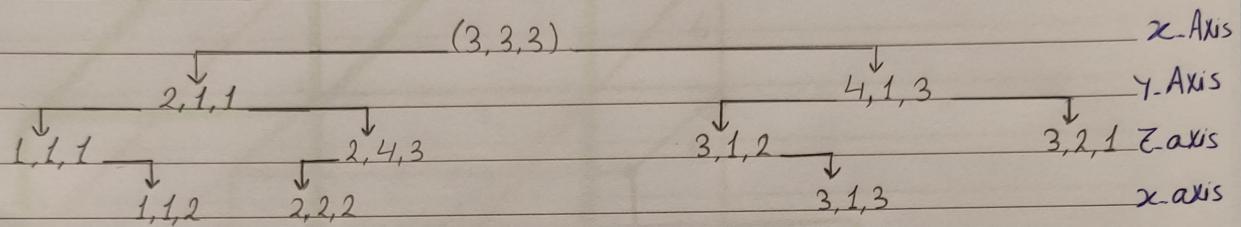


Sheet (2)

Question (1) :-

Point list = $(1,1,1) (1,1,2) (2,1,1) (2,2,2) (3,3,3) (3,2,1)$
 $(3,1,2) (2,4,3) (3,1,3) (4,1,3)$

[1]



→ Every point will produce a half space

so no. of half spaces = $N = 10$

→ x-aligned points = 4

y-aligned points = 2

z-aligned points = 4

[2] Tolerance = 3 , Query point = $(2,4,2)$

→ check $(3,3,3) \rightarrow x\text{-axis } 2 < 3 \rightarrow \text{Search Left, Nearby Point}$

→ check $(2,1,1) \rightarrow y\text{-axis } 4 > 1 \rightarrow \text{Search Right, Far Point}$

→ check $(2,4,3) \rightarrow z\text{-axis } 2 < 3 \rightarrow \text{Search Left, Nearby Point}$

→ check $(2,2,2) \rightarrow \text{distance} = 2 < T \rightarrow \text{Nearby point}$

③ Max cluster size = 4 Points

Tolerance < 2

① Check $(1,1,1)$ → unprocessed point → Add to cluster 1

→ check for neighbor points :-

For $(1,1,2)$ $d = 1$

For $(3,1,2)$ $d = 2.2$

For $(2,1,1)$ $d = 1$

For $(2,4,3)$ $d = 3.7$

For $(2,2,2)$ $d = 1.7$

For $(3,1,3)$ $d = 2.8$

For $(3,3,3)$ $d = 3.4$

For $(4,1,3)$ $d = 3.6$

For $(3,2,1)$ $d = 2.2$

∴ Neighbor points are :- $(1,1,2) (2,1,1) (2,2,2)$

→ check for neighbor for the neighbors :-

↳ For $(1,1,2)$ → None found

↳ For $(2,1,1)$ → $(3,2,1) (3,1,2)$

↳ For $(2,2,2)$ → $(3,3,3) (3,1,3) (3,1,2) (3,1,3)$

→ check for neighbor for the neighbors :-

↳ For $(3,2,1)$ → None found

↳ For $(3,1,2)$ → $(4,1,3)$

↳ For $(3,3,3)$ → $(2,4,3)$ → End of points

They are all processed.

∴ Cluster (1) has all the 10 points

∴ The Max cluster size = 4

∴ Cluster (1) will be rejected.

④ ∴ we don't have accepted clusters

∴ we don't have a boundary box

Question (2) :-

[1] Density = Count / Volume

	Volume	Density
Car 1	5.4	1481.48
Car 2	4.41	1587.30
Road	30	666.67
Traffic light	0.064	12500
Person 1	0.576	3472.22
Person 2	0.357	7002.8
Person 3	0.192	15625

[2] Voxel grid Volume = $(0.1)^3 = 0.001$

as Each voxel grid contains 1 point

so New no. of points = no. of boxes in the object = Object Volume / Voxel grid Volume

→ For Car 1 :- $N_{new} = 5400$

→ For Car 2 :- $N_{new} = 4410$

→ For Road :- $N_{new} = 30000 > N_{old}$ (Not accepted) $N_{new} = N_{old} = 20000$

→ For Traffic light :- $N_{new} = 64$

→ For Person 1 :- $N_{new} = 576$

→ For Person 2 :- $N_{new} = 357$

→ For Person 3 :- $N_{new} = 192$

so New Density = $N_{new} / \text{Object Volume}$

→ For Car 1 :- $D_{new} = 1000$

→ For P1 :- $D_{new} = 1000$

→ For Car 2 :- $D_{new} = 1000$

→ For P2 :- $D_{new} = 1000$

→ For Road :- $D_{new} = 666.67$

→ For P3 :- $D_{new} = 1000$

→ For TL :- $D_{new} = 1000$

[3] The Constant density = Density $\Delta s \cos 2 = 1000$

All objects have the same density except the road.

$$\text{Desired } D_{\text{new}} \Big|_{\text{road}} = 1000$$

$$\begin{aligned} N_{\text{new}} &= D_{\text{new}} \times \text{Object Volume} \\ &= 1000 \times 30 \\ &= 30,000 \text{ point} \end{aligned}$$

[4] The closest object to the sensor is the object that have biggest point density, which is person 3 (15625)