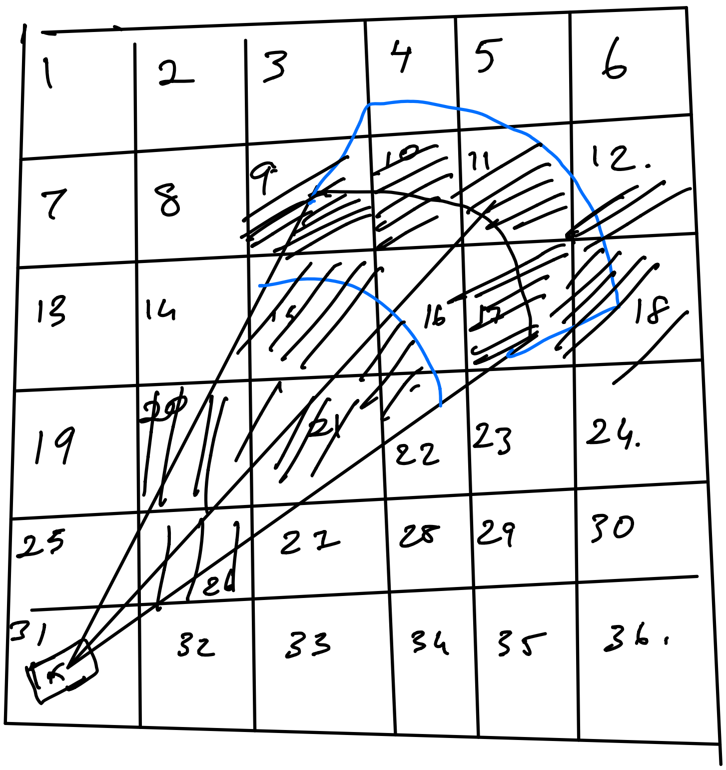
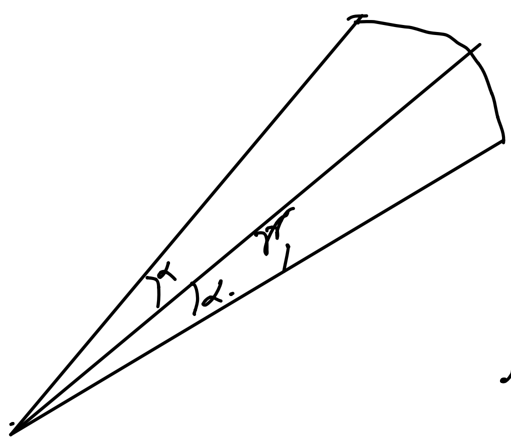
Occupancy Mapping:



Compute the occupancy probability of all cells withi the cone. Let each cell be denoted as C_i $i=\{1,\dots,36\}$.



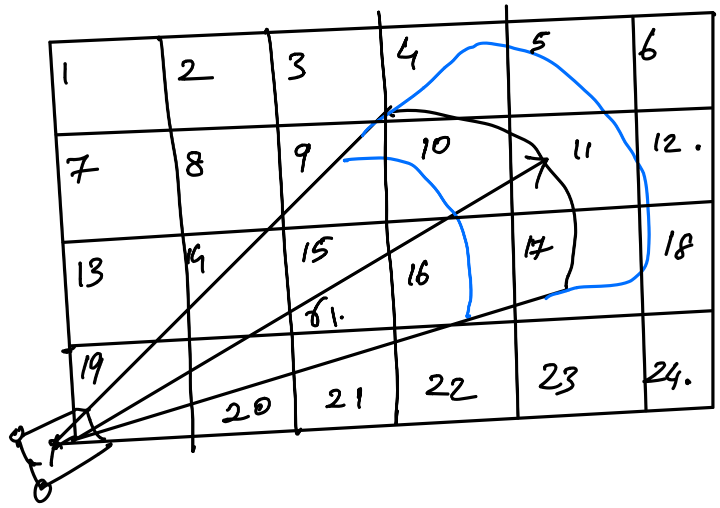
$P(C_i/r_1)$. $\longrightarrow (1)$.

The probability that the cell C_i is occupied given the measurement r_1.

$P(\bar{C_i}/r_1) \longrightarrow (2)$

The probability that the cell C_i is

unoccupied given the measurement $\bar{r}_1$.



From the sensor model $f(r, \alpha)$ which gives high occupancy values to cells 4, 5, 10, 11, 16 and 17 and high non-occupancy values to cells 9, 14, 15, 19, 20, 21. we compute the probability values for the cells.

$P(C_4 | r_1) = 0.8 \quad P(\bar{C}_4 | r_1) = 0.2.$

[These probabilitie come from a sensor model or measurement model].

Normalize the probabilities so that

$$P(C_4 \mid r_1) = \frac{0.8}{0.8+0.4} = \frac{2}{3} \longrightarrow (2)$$

$$P(\overline{C_4} \mid r_1) = \frac{0.4}{0.4+0.8} = \frac{1}{3} \longrightarrow (3).$$

In the same vein compute

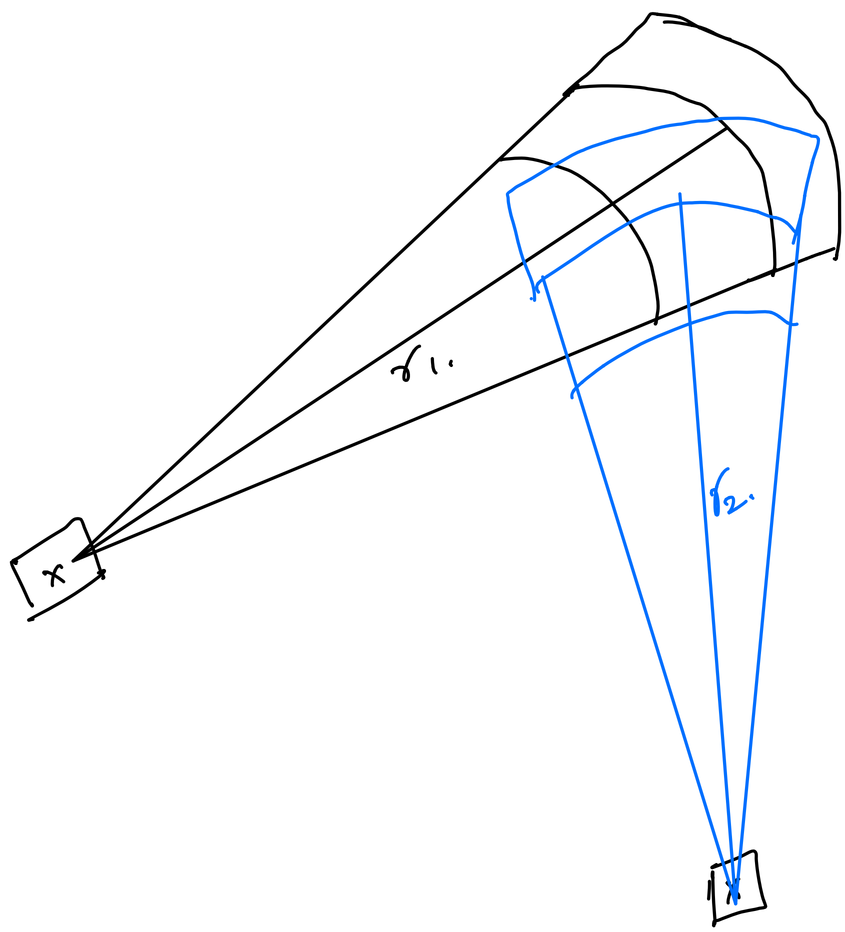
$P(C_5 \mid r_1)$, $P(\overline{C_5} \mid r_1)$ .... $P(C_{17} \mid r_1)$, $P(\overline{C_{17}} \mid r_1)$.

$P(C_{15} \mid r_1) = 0.3$, $P(\overline{C_{15}} \mid r_1) = 0.9$

$$P(C_{15} \mid r_1) = \frac{0.3}{0.3+0.9} = 0.25 \longrightarrow (4).$$

$$P(\overline{C_{15}} \mid r_1) = \frac{0.9}{0.9+0.3} = 0.75 \longrightarrow (5).$$

In the same vein compute for all those cells where the unoccupied probability is high i.e. $P(C_{14} \mid r_1)$, $P(\overline{C_{14}} \mid r_1)$ ... $P(C_{21} \mid r_1)$, $P(\overline{C_{21}} \mid r_1)$



How to fuse the probabilites of the cells that have more than one measurement touching them.

$$P(C_i / r_2, r_1) = P(r_2 / C_i, r_1) . P(C_i / r_1) / P(r_2 / r_1) \quad (6)$$

$$[P(A / B, C) = P(B / A, C) . P(A / C) / P(B / C)].$$

$$= P(r_2 / C_i) . P(C_i / r_1) . / P(r_2 / r_1) \longrightarrow (7).$$

(Markov Assumptions).

$$= \frac{P(C_i/r_2).P(C_i/r_1).P(r_2)}{P(r_2/r_1)\,P(C_i)} \longrightarrow (8)$$

$$= \boxed{\underline{k\,P(C_i/r_2).P(C_i/r_1)}} \longrightarrow (9)$$

In the same vein

$$P(\bar{C}_i/r_2,r_1) = \bar{k}\,P(\bar{C}_i/r_2)P(\bar{C}_i/r_1) \longrightarrow (10)$$

The constants get taken care of in the final normalization.

[Note that $k = \bar{k}$].

Hence $P(C_i/r_2,r_1) = \frac{(9)}{(9)+(10)}$ $\longrightarrow (11)$

$$P(\bar{C}_i/r_2,r_1) = \frac{(10)}{(9)+(10)} \longrightarrow (12)$$