algorithm design

GOAL

we want to be able to predict where an object will be at an arbitrary time and intercept that object

the accuracy needs to be high enough for defence level stakes

therefore the target MUST get hit. 1 shot is enough to neutralise the target.

- that means we can do 1 shot really well by directly aiming at the target(Target-As-Target) -

-or-

- we can aim at a cell containing the target and spray multiple shots(Cell-As-Target), all this is to maximise the interception area and subsequently, the probability of hitting the shot.

WARNING: **it is crucial to note that the differences in the algorithms taken, have hardware design consequences. in the event of such consequences, favour superior algorithm and fit hardware design onto the superior algorithm. (superior algorithm > hardware design)**

Mathematical Framework

Philosophical Background

in all our operations, we need to minimise number of processes/compute as our mission here requires that we do a lot of those in a constrained time frame.

We therefore need to think of efficiency and efficiently.

starting with this simple example, suppose at some point in our operations we are going to work with mean averages. There is a more efficient method than the traditional way of

- summing up n elements and dividing by n.

see it below

moving average formula

remember, when calculating a mean average, it is computationally cheaper to use the recursive expression than the batch expression

$$\bar{x}_k = (\frac{k-1}{k})\bar{x}_{k-1} + (\frac{1}{k})x_k$$

this operation has a big(O) gain over the everyday common average formula

to get an appreciation please research this as it is an important precursor for the algorithm we intent to use to predict intercept point (KALMAN FILTERS)