PROOF FOR NUMBER OF FPC CALLS using APD

$Given,$
$Plans\ in\ space = \{P_1, P_2, P_3, \dots, P_n\}$

$Total\ points\ in\ space\ be\ S_{Total} = S_1 + S_2 + S_3 + \cdots\ S_N$

$\#\ FPC\ Calls$ for Plan P_1
$S_2 + S_3 + \cdots + S_N = S_{Total} - S_1$

So,

$$Total\ \#\ FPC\ Calls = \sum_{k=1}^{n} (S_{Total} - S_k)$$

$$= n * S_{Total} + \sum_{k=1}^{n} S_k = (n-1) * S_{Total}$$

$Let, \Delta_{now}\ and\ \Delta_{avg}\ be\ immediate\ \Delta\ , and\ average\ \Delta$

$Contribution\ using\ Simple\ Exponential\ Average$

$\Delta_{avg} = \alpha * \Delta_{now} + (1 - \alpha) * \Delta_{avg}$

$for\ some, 0 < \alpha < 1$

$Let, "\boldsymbol{S}"\ be\ the\ step\ size\ in\ exponential\ jump$

$Then, impact\ of\ \Delta_{now}\ with\ S\ \ size\ step\ is\ as\ follows$

$$\alpha * \Delta_{now} + \ \alpha * (1 - \alpha) * \Delta_{now} + \cdots + \ \alpha * (1 - \alpha)^{\mathrm{S}-1} * \Delta_{now}$$

$$= \left(\alpha * \frac{(1 - (1 - \alpha)^{\mathrm{S}})}{1 - (1 - \alpha)}\right) * \Delta_{\mathrm{now}}\ =\ (1 - (1 - \alpha)^{\mathrm{S}}) * \Delta_{\mathrm{now}}$$

$Contribution\ using\ Adaptive\ Exponential\ Average$

$$\Delta_{avg} = (1 - (1 - \alpha)^{S}) * \Delta_{now} + ((1 - \alpha)^{S}) * \Delta_{avg}$$

$$b = a * r^{n-1}$$

$$1 = \varepsilon * r_{sel}^{(RES-1)}$$

$$r_{cost} \leq \beta_{max} * r_{sel}$$

$$r_{sel} = \frac{1}{\sqrt[(RES-1)]{\varepsilon}}$$

$$\beta_{max} = 1 \rightarrow r_{cost} = r_{sel}$$

$$\eta = (Dim - 1) * (\beta_{max} * r_{sel})^2 - 1$$

$$\eta = (Dim - 1) * (\beta_{max} * r_{sel})^1 - 1$$