$$J = \frac{1}{2}\sum_{i=1}^{n} \alpha \underbrace{\left(\left(x_i - x_i^{'}\right)^2 + \left(y_i - y_i^{'}\right)^2\right)}_{\text{original path}} + (1-\alpha) \underbrace{\left(\left(x_i^{'} - x_{i+1}^{'}\right)^2 + \left(y_i^{'} - y_{i+1}^{'}\right)^2\right)}_{\text{shortened smooth path}}$$