Independent Edges

Wednesday, February 27, 2008
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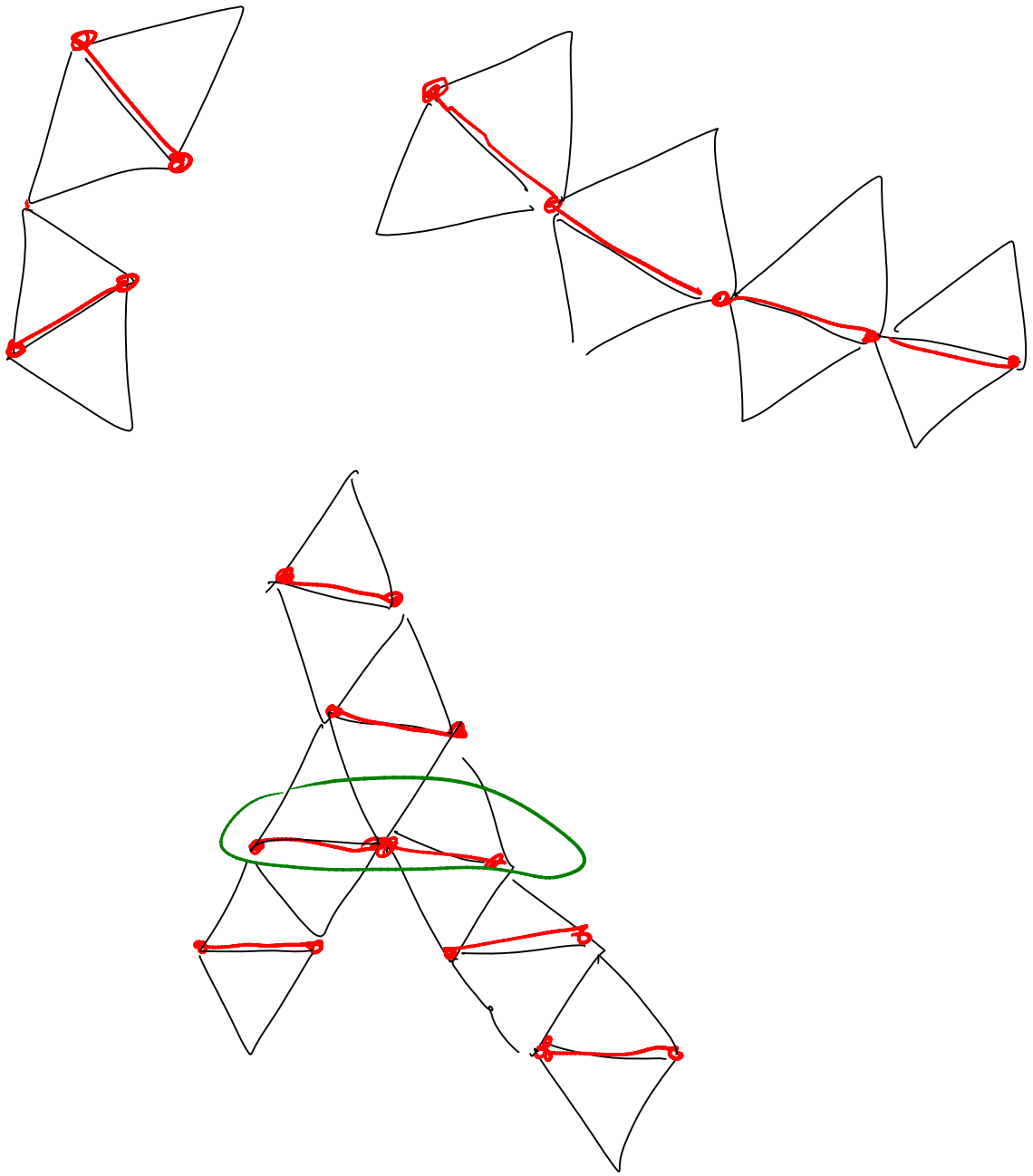
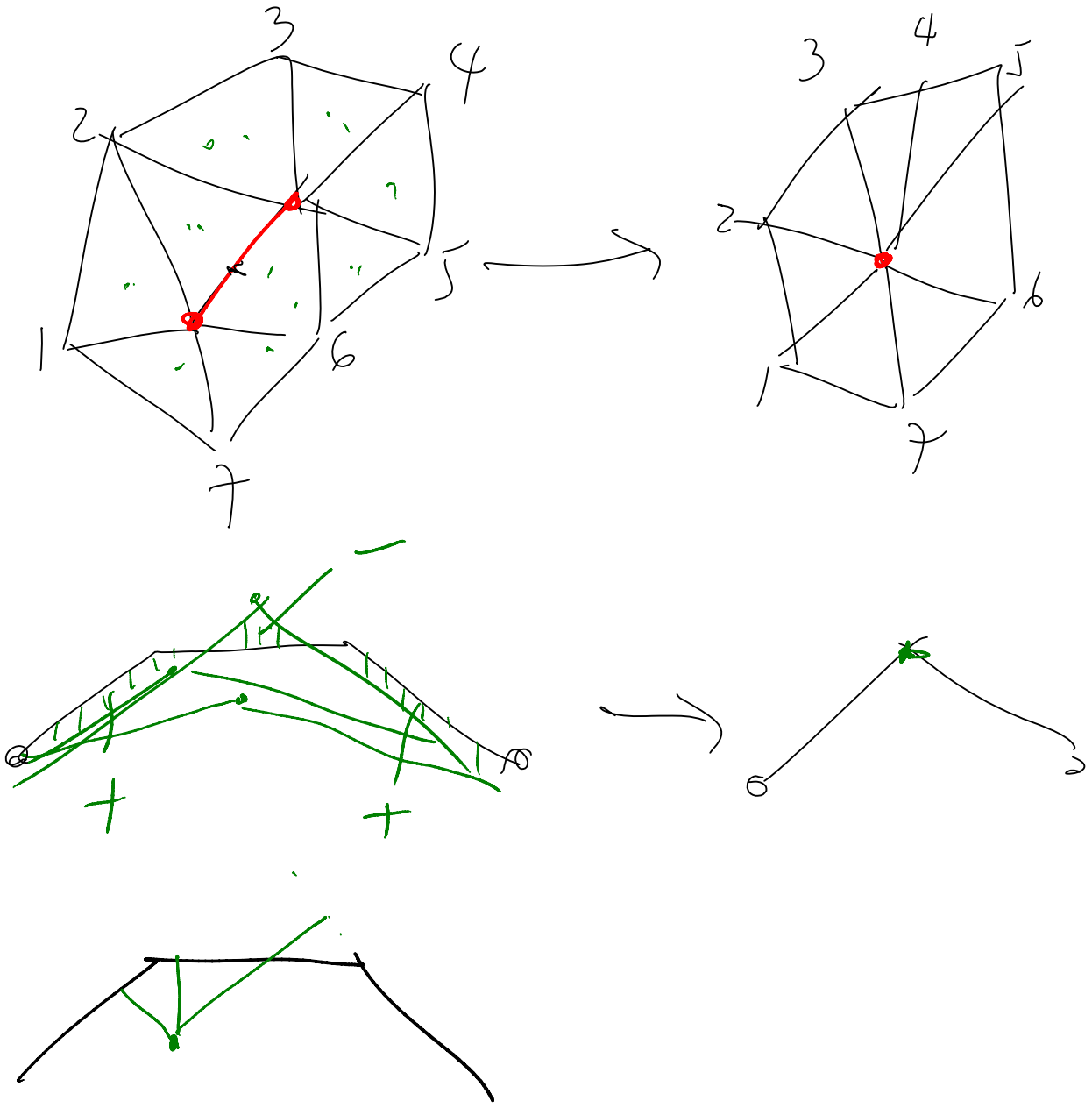


Garland Heckberg

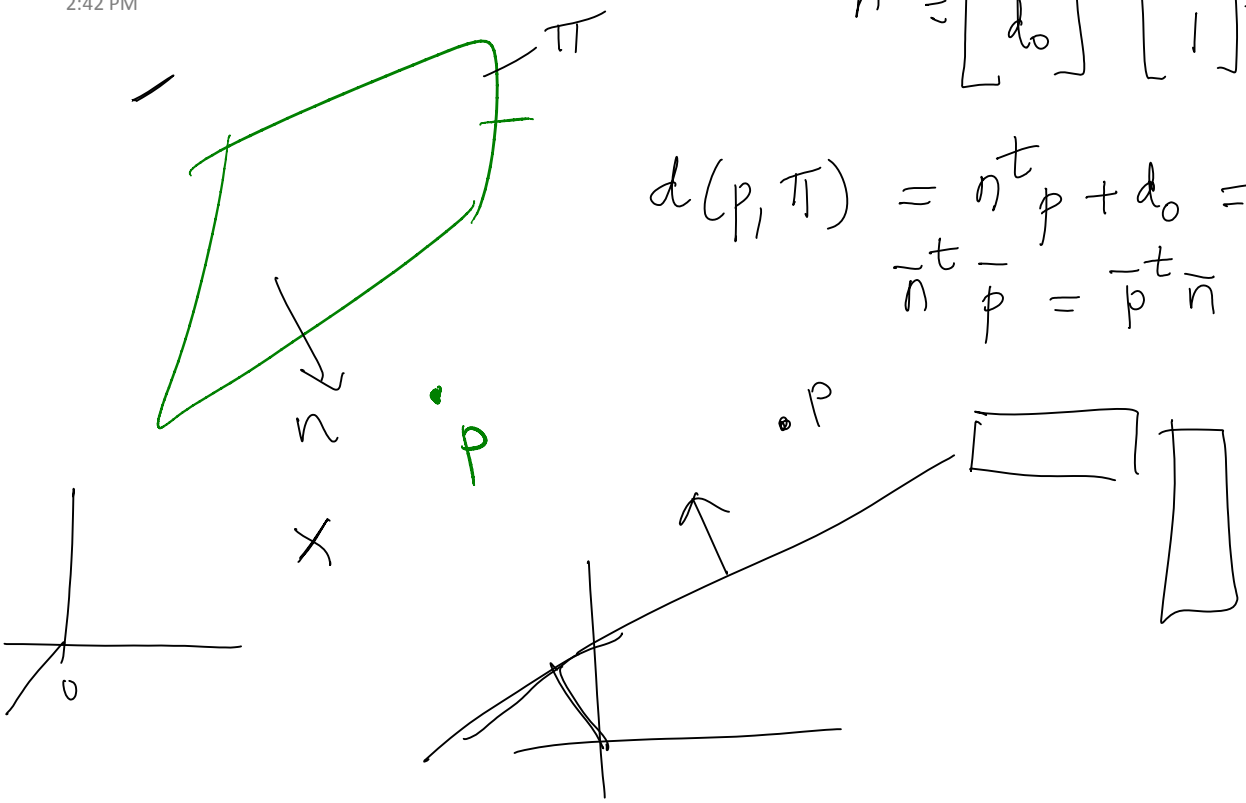
Wednesday, February 27, 2008
2:35 PM



Quadratic error measure

Wednesday, February 27, 2008
2:42 PM

$$\bar{n} = \begin{bmatrix} n \\ d_0 \end{bmatrix} \quad \begin{bmatrix} p \\ 1 \end{bmatrix} = \bar{p}$$



$$d(p,\pi) = n^t p + d_0 = \bar{n}^t \bar{p} = \bar{p}^t \bar{n}$$

$$d(p,\bar{\pi})^2 = (\bar{n}^t \bar{p})^2 = \bar{p}^t [\bar{n}\bar{n}^t] p$$

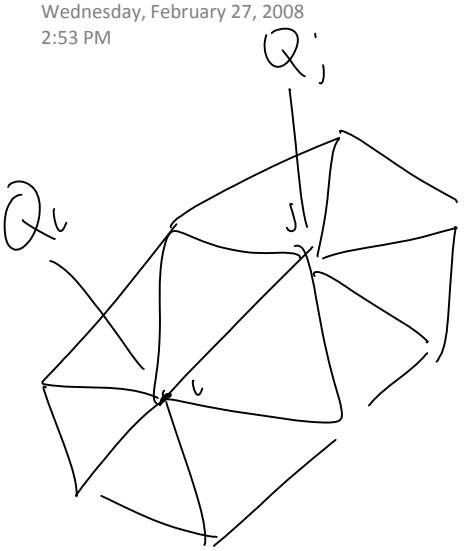
$$\pi_1 \dots \pi_N \qquad \bar{n}_1, \dots, \bar{n}_N$$

$$\sum_{i=1}^{N} d(p,\pi_i)^2 = \sum_{i=1}^{N} \bar{p}^t [\bar{n}_i \bar{n}_i^t] \bar{p} =$$

$$\bar{p}^t \underbrace{\left[\sum_{i=1}^{N} \bar{n}_i \bar{n}_i^t \right]}_{Q_1} \bar{p}$$

Quadratic error measure

Wednesday, February 27, 2008
2:53 PM



$(i,j) \to k$

$$\bar{p} = \begin{pmatrix} p_x \\ p_y \\ p_z \\ 1 \end{pmatrix}$$

$$\bar{p}_k^t \left[\quad \nearrow \quad \right] \bar{p}_k \leftarrow \text{minimize}$$

$$Q_i + Q_j = Q_k$$

$$Q = \left(\begin{array}{c|c} A & b \\ \hline b^t & c \end{array}\right) \qquad \begin{pmatrix} p \\ 1 \end{pmatrix}^t \begin{pmatrix} A & b \\ b & c \end{pmatrix} \begin{pmatrix} p \\ 1 \end{pmatrix} =$$

$$f(p) = p^t A p + 2 b^t p + c$$

$$0 = \frac{1}{2} \nabla f(p) = Ap + b \Rightarrow \hat{p} = -A^{-1} b$$