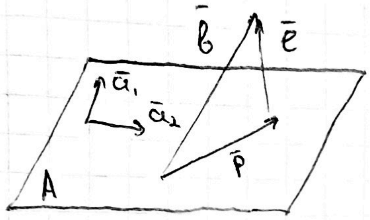

$\bar a_1, \bar a_2$ - базис плоскости A

$\bar p$ - проекция $\bar b$ на A

$\bar p = \bar a_1 x_1 + \bar a_2 x_2 = \hat Q \bar x \qquad \hat Q = \begin{pmatrix} a_1 & a_2 \\ \vdots & \vdots \end{pmatrix}$

$\bar e = \bar b - \bar p = \bar b - \hat Q \bar x$, т.к. $\bar e \perp A \Rightarrow (\bar a_1, \bar e) = a_1^T e = 0$

$(\bar a_2, \bar e) = a_2^T e = 0$

Т.е. $\begin{pmatrix} a_1^T \\ a_2^T \end{pmatrix} (\bar b - \hat Q \bar x) = \begin{pmatrix} 0 \\ 0 \end{pmatrix} \qquad Q^T(\bar b - \hat Q \bar x) = 0$

$\bar x = (Q^T Q)^{-1} Q^T \bar b$

$$\bar p = \underbrace{\hat Q (Q^T Q)^{-1} Q^T}_{\hat P} \bar b$$

$$P^T = (Q(Q^TQ)^{-1}Q^T)^T = Q(Q^TQ)^{-T}Q^T = Q(Q^TQ)^{-1}Q^T = P$$

• $A = I - 2P$ - унитарна

Рассмотрим $P^2 = P \cdot P = \hat Q \underbrace{(Q^TQ)^{-1} Q^T \hat Q}_{E} (Q^TQ)^{-1} Q^T = \hat Q (Q^TQ)^{-1} Q^T = P$

$A \cdot A^T = (I - 2P)(I-2P)^T = (I-2P)(I^T - 2P^T) = (I-2P)(I-2P) = I - 4P + 4P^2 =$

$= I \Rightarrow$

$(I-2P)\alpha = \alpha - 2P\alpha$