

# Decomposing Breeding values

- For animal  $i$  with parents  $s$  and  $d$ :  
The breeding value  $u_i$  can be decompose as:

$$u_i = \frac{1}{2} u_s + \frac{1}{2} u_d + m_i$$

- For all animals in Pedigree:

$$\begin{pmatrix} u_1 \\ u_2 \\ u_3 \\ u_4 \\ u_5 \end{pmatrix} = \begin{pmatrix} m_1 \\ m_2 \\ m_3 \\ \frac{1}{2} u_1 + \frac{1}{2} u_2 + m_4 \\ \frac{1}{2} u_3 + \frac{1}{2} u_2 + m_5 \end{pmatrix} \quad \text{Matrix-Vector notation}$$

$$\underline{u} = \underline{P} \underline{u} + \underline{m}$$

$$\begin{pmatrix} u_1 \\ u_2 \\ u_3 \\ u_4 \\ u_5 \end{pmatrix} = \begin{pmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ \frac{1}{2} & \frac{1}{2} & 0 & 0 & 0 \\ 0 & \frac{1}{2} & \frac{1}{2} & 0 & 0 \end{pmatrix} \begin{pmatrix} u_1 \\ u_2 \\ u_3 \\ u_4 \\ u_5 \end{pmatrix} + \begin{pmatrix} m_1 \\ m_2 \\ m_3 \\ m_4 \\ m_5 \end{pmatrix}$$