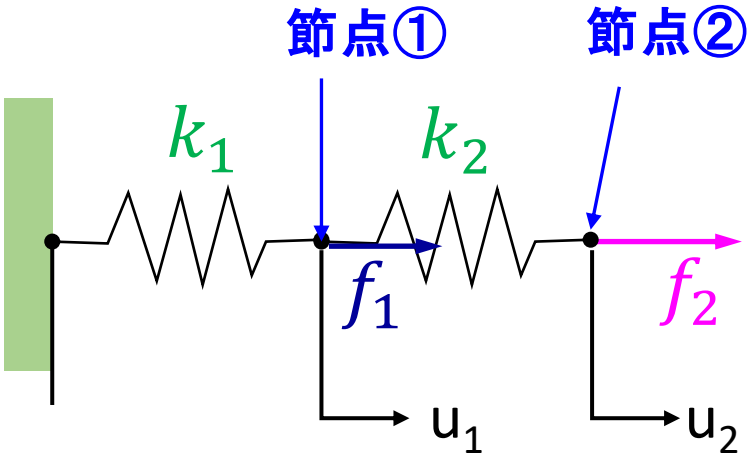
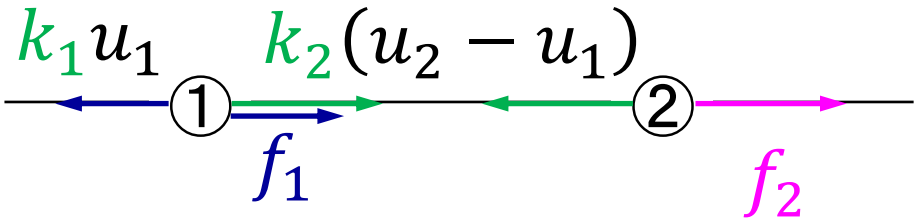


	ばね1	ばね2
伸び量e	$e_1 = u_1$	$e_2 = u_2 - u_1$
ばね力s	$s_1 = k_1 e_1 = k_1 u_1$	$s_2 = k_2 e_2 = k_2(u_2 - u_1)$



節点①では $f_1 = (s_1 - s_2) = (k_1 + k_2)u_1 - k_2 u_2$

節点②では $f_2 = s_2 = k_2(u_2 - u_1) = -k_2 u_1 + k_2 u_2$

$$\{F\} = \begin{Bmatrix} f_1 \\ f_2 \end{Bmatrix} = \begin{bmatrix} k_1 + k_2 & -k_2 \\ -k_2 & k_2 \end{bmatrix} \begin{Bmatrix} u_1 \\ u_2 \end{Bmatrix} = [K]\{U\}$$

$f_1 = (s_1 - s_2)$　　$e_1 = u_1$　　$s_1 = k_1 e_1$

$f_2 = s_2$　　$e_2 = u_2 - u_1$　　$s_2 = k_2 e_2$

①力のつり合い式：　外力$\{F\}$と内力＝ばね力＝$\{S\}$

$$\{F\} = \begin{Bmatrix} f_1 \\ f_2 \end{Bmatrix} = \begin{bmatrix} 1 & -1 \\ 0 & 1 \end{bmatrix} \begin{Bmatrix} s_1 \\ s_2 \end{Bmatrix} = [B]^T \{S\}$$

②適合条件式：　変位＝$\{U\}$と内的な変形＝$\{E\}$

$$\{E\} = \begin{Bmatrix} e_1 \\ e_2 \end{Bmatrix} = \begin{bmatrix} 1 & 0 \\ -1 & 1 \end{bmatrix} \begin{Bmatrix} u_1 \\ u_2 \end{Bmatrix} = [B]\{U\}$$

③ばねの構成式：　ばね力＝$\{S\}$とばねの伸び＝$\{E\}$

$$\{S\} = \begin{Bmatrix} s_1 \\ s_2 \end{Bmatrix} = \begin{bmatrix} k_1 & 0 \\ 0 & k_2 \end{bmatrix} \begin{Bmatrix} e_1 \\ e_2 \end{Bmatrix} = [D]\{E\}$$

$$\{F\} = [B]^T\{S\} = [B]^T[D]\{E\} = [B]^T[D][B]\{U\} = [K]\{U\}$$