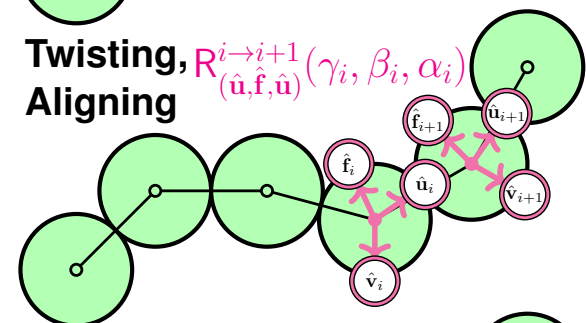


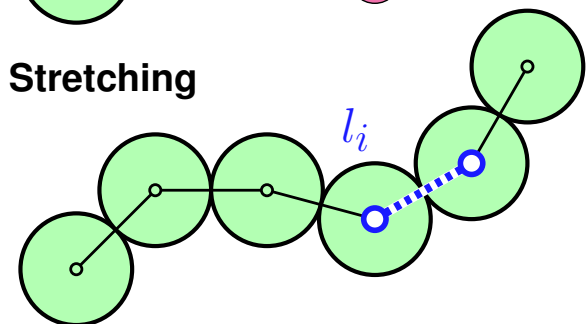
$$U_i^b = \kappa_b [1 - \cos(\pi - \theta_i)]$$



$$U_i^t = \kappa_t [1 - \cos(\alpha_i + \gamma_i)]$$

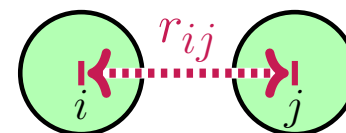
$$U_i^a = \kappa_a [1 - \cos \psi_i],$$

$$\cos \psi_i = \frac{(\mathbf{s}_i \times \hat{\mathbf{v}}_i) \cdot (\mathbf{s}_i \times \hat{\mathbf{v}}_{i+1})}{|\mathbf{s}_i \times \hat{\mathbf{v}}_i| |\mathbf{s}_i \times \hat{\mathbf{v}}_{i+1}|}$$



$$U_i^s = -\frac{\kappa_s L_0^2}{2} \log [1 - (l_i/L_0)^2] + 4\epsilon_s \left[ \left( \frac{\sigma_s}{l_i} \right)^{12} - \left( \frac{\sigma_s}{l_i} \right)^6 \right] \times \Theta(2^{\frac{1}{6}} \sigma_s - l_i)$$

Excluded-Volume  
(DNA-DNA, DNA-ribo, ribo-ribo)



$$U_{ij}^{e.v.} = 4\epsilon_{e.v.} \left[ \left( \frac{\sigma_{e.v.}}{r_{ij}} \right)^{12} - \left( \frac{\sigma_{e.v.}}{r_{ij}} \right)^6 \right] \times \Theta(2^{\frac{1}{6}} \sigma_{e.v.} - r_{ij})$$

