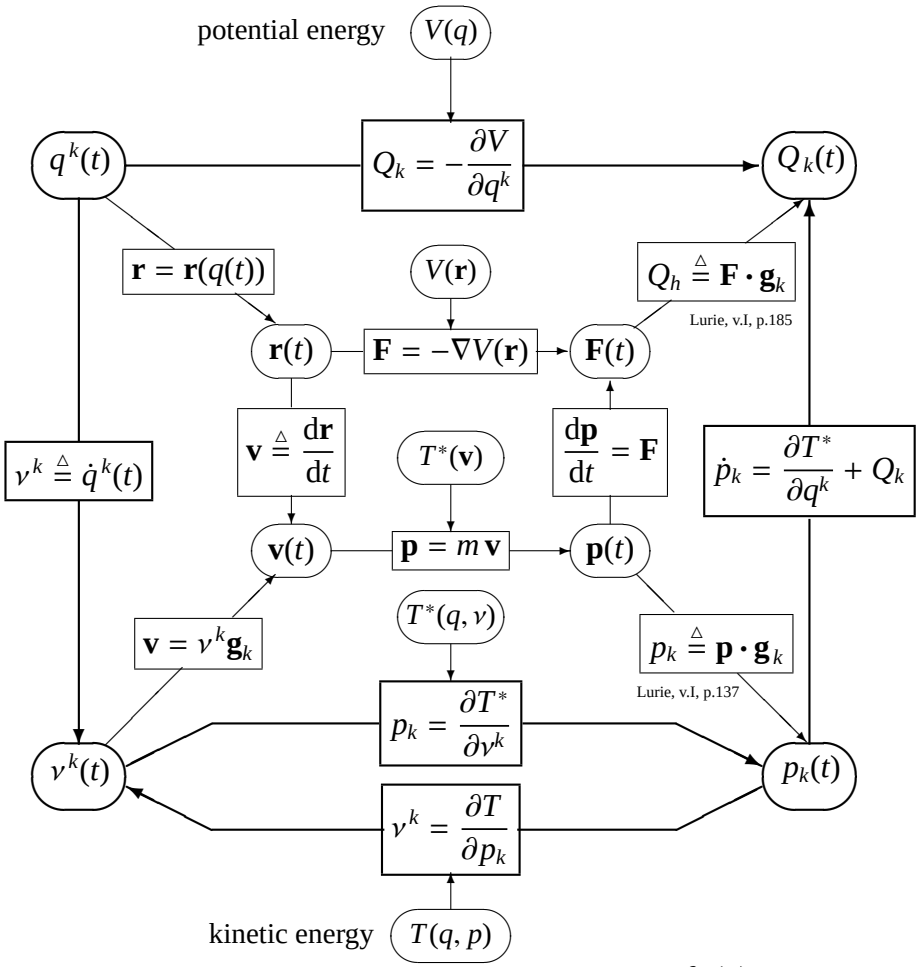
Analitical mechanics of a particle



$$\mathbf{g}_k(q) \triangleq \frac{\partial \mathbf{r}(q)}{\partial q^k} \quad \text{base vectors}$$

$$T(q, p) \triangleq \int_0^P \mathbf{v} \cdot \mathrm{d}\mathbf{p} = \frac{1}{2\,m}\mathbf{p} \cdot \mathbf{p} = \frac{1}{2m} g^{hk}(q)\, p_h\, p_k \qquad \nu^k = \frac{\partial T(q, p)}{\partial p_k}$$

$$T^*(q, \nu) \triangleq \int_0^v \mathbf{p} \cdot \mathrm{d}\mathbf{v} = \frac{1}{2} m\, \mathbf{v} \cdot \mathbf{v} = \frac{1}{2} m\, g_{hk}(q)\, \nu^h\, \nu^k \qquad p_k = \frac{\partial T^*(q, \nu)}{\partial \nu^k}$$

AMd7-10; http://www.dica.units.it/perspage/discretephysics