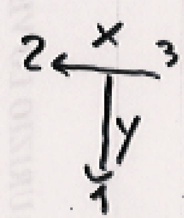
Exemple 1.

In simple valence quark models one often approximates the confining potential by a harmonic oscillator form. Thus for describing hadrons with strangeness S=1 one could consider the two lighter non-strange quarks (u or d) with mass m together with a strange quark of mass M. If we label the non-strange quarks by labels '2' and '3', and assume a flavour independent quark-quark interaction of the form

$$V_{i,j} = \frac{K}{2}(\mathbf{r}_i - \mathbf{r}_j)^2$$

then the non-relativistic hamiltonian for the relative motion is given by *

$$x \equiv \xi_3 \qquad y \equiv \xi_2$$



$$\begin{aligned} H &= -\frac{\hbar^2}{2\mu_x}\nabla^2_{\mathbf{x}} - \frac{\hbar^2}{2\mu_y}\nabla^2_{\mathbf{y}} + \frac{K}{2}\left(\frac{3}{2}x^2 + 2y^2 \right) \\ &= \underbrace{\left[\frac{1}{2\mu_x}p_x^2 + \frac{1}{2}\mu_x\omega_x^2 x^2\right]}_{h_x} + \underbrace{\left[\frac{1}{2\mu_y}p_y^2 + \frac{1}{2}\mu_y\omega_y^2 y^2\right]}_{h_y} \end{aligned}$$

separable!

where

$$\omega_x^2 = K\frac{3}{m} \quad \text{and} \quad \omega_y^2 = K\frac{2m+M}{mM}.$$