This example solves the minimization problem

$$\min J(q,u) = \frac{1}{2}\|u-u^d\|^2 + \frac{\alpha}{2}\|q\|^2$$
$$\text{s.t. } (\nabla u, \nabla \phi) = (f,\phi) \;\; \forall\, \phi \in H_0^1(\Omega;\mathbb{R}^2)$$

on the domain $\Omega = [0,1]^2$. In addition we set the dirichlet data of the state on the boundary as follows

$$u_0(0,y) = q_0, \quad u_0(1,y) = q_1, \quad u_0(x,0) = q_2, \quad u_0(x,1) = q_3,$$
$$u_1 = q_4^3.$$

The data is chosen as follows:

$$f = \begin{pmatrix} 20\pi^2 \sin(\pi x)\sin(\pi y) \\ 1 \end{pmatrix}$$
$$u^d = \begin{pmatrix} \sin(\pi x)\sin(\pi y) * x \\ x \end{pmatrix}$$

with $\alpha = 10$.