

Example: find  $u$  such that  $-\Delta u = 1$  in  $\Omega$  and  $u = 0$  on  $\partial\Omega$

```
int main (int argc, char** argv) {  
    environment rheolef (argc, argv);  
    geo omega (argv[1]);  
    space Xh (omega, argv[2]);  
    Xh.block ("boundary");  
    trial u (Xh); test v (Xh);  
    form a = integrate (dot(grad(u),grad(v)));  
    field lh = integrate (v);  
    field uh (Xh);  
    uh ["boundary"] = 0;  
    solver sa (a.uu());  
    uh.u = sa.solve (lh.u());  
    dout << uh;  
}
```

Let  $\Omega \subset \mathbb{R}^N, N = 1, 2, 3$

$X_h = \{v \in H^1(\Omega); v|_K \in P_k, \forall K \in \mathcal{T}_h\}$

$V_h = X_h \cap H_0^1(\Omega)$

$a(u, v) = \int_{\Omega} \nabla u \cdot \nabla v \, dx$

$l(v) = \int_{\Omega} v \, dx$

$(P) : \text{find } u_h \in V_h \text{ such that}$

$a(u_h, v_h) = l(v_h), \quad \forall v_h \in V_h$