YANNIS BÄHNI

Abstract.

Contents

List of Figures

1. The Finite Element Method. We follow [QSS00]. For a domain $U \subseteq \mathbb{R}^n$ and $f : U \to \mathbb{R}$ consider the boundary value problem

$$\begin{cases} Lu = f & \text{in } U, \\ u = 0 & \text{on } \partial U, \end{cases} \tag{1}$$

where L denotes a second-order partial differential operator. The requirement $u = 0$ on ∂U is called *Dirichlet's boundary condition*. We are mainly concerned with the case $n = 1$, $U = (0, 1)$ and the explicit choice

$$Lu = -(\alpha u')'(x) + (\beta u')(x) + (\gamma u)(x) \tag{2}$$

where $\alpha, \beta, \gamma \in C([0, 1])$ and $\alpha > 0$. Define

$$H_0^1(0, 1) := \left\{v \in L^2(0, 1) : v' \in L^2(0, 1), v(0) = v(1) = 0\right\}. \tag{3}$$

We say that $u \in H_0^1(0, 1)$ is a *weak solution* of the boundary value problem (1) with Lu as defined in (2) if

$$\int_0^1 [\alpha u'v' + \beta u'v + \gamma uv] \,\mathrm{d}x = \int_0^1 fv \,\mathrm{d}x \qquad \forall v \in H_0^1(0, 1). \tag{4}$$

(Yannis Bähni) University of Zurich, Rämistrasse 71, 8006 Zurich
E-mail address: yannis.baehni@uzh.ch.