Abstracts of MMA2011, May 25–28, 2011, Sigulda, Latvia

ON SMOOTHING PROBLEMS UNDER ADDITIONAL RESTRICTIONS[1]

SVETLANA ASMUSS[1,3], NATALJA BUDKINA[2,3] and JURIS BREIDAKS[1]

[1]*Department of Mathematics, University of Latvia*
Zeļļu iela 8, Rīga, LV-1002, Latvia
[2]*Riga Technical University*
Meža iela 1/4, Rīga, LV-1048, Latvia
[3]*Institute of Mathematics and Computer Science of University of Latvia*
Raiņa bulvāris 29, Rīga, LV-1459, Latvia
E-mail: svetlana.asmuss@lu.lv, budkinanat@gmail.com, juris.breidaks@csb.gov.lv

Let X, Y be Hilbert spaces and assume that linear operator $T\colon X \to Y$, linear functionals $l_j\colon X \to \mathbb{R}$, $j = 1,\dots,m$, and $k_i\colon X \to \mathbb{R}$, $i = 1,\dots,n$, are continuous, functionals $l_1,\dots,l_{m-q},k_1,\dots,k_n$ are linear independent and

$$l_{m-q+j} = \sum_{i=1}^{n} \phi_{ji} k_i,\ \ j = 1,\dots,q.$$

For given vectors $u = (u_1,\dots,u_{m-q})$ and $v = (v_1,\dots,v_n)$, parameters $\varepsilon_i > 0, \omega_i > 0, i = 1,\dots,n$, and matrices $\Omega = diag(\omega_i)_{i=1,\dots,n}$, $\Phi = (\phi_{ji})_{j=1,\dots,q;i=1,\dots,n}$ we consider two following conditional minimization problems:

Problem 1. (*the smoothing problem with obstacles*)

$$\|Tx\| \longrightarrow \min_{\substack{x\in X,\\ A_1x=(u,\Phi v),\\ |(A_2x)_i - v_i| \le \varepsilon_i,\ \ i=1,\dots,n,}}$$

Problem 2. (*the smoothing problem with weights*)

$$\|Tx\|^2 + \|\Omega^{-1}(A_2x - v)\|^2 \longrightarrow \min_{\substack{x\in X,\\ A_1x=(u,\Phi v).}}$$

Here the restrictions given by $A_1 = (l_1,\dots,l_m)$ describe the interpolating conditions and the restrictions given by $A_2 = (k_1,\dots,k_n)$ describe the smoothing conditions. This talk is devoted to the analysis of Problem 1 and Problem 2 in the case when some of functionals $l_j,\ j = 1,\dots,m$, depend on k_i, $i = 1,\dots,n$.

[1]This work is partially supported by the projects 2009/0223/1DP/1.1.1.2.0/09/APIA/VIAA/008 and 2009/0138/1DP/1.1.2.1.2/09/IPIA/VIAA/004 of the European Social Fund and by the grant 09.1570 of the Latvian Council of Science.