Journal of Convex Analysis 20 (2013) 545–571

**A. Kałamajska**
Institute of Mathematics, University of Warsaw, ul. Banacha 2, 02–097 Warszawa, Poland
kalamajs@mimuw.edu.pl

# On one Extension of Decomposition Lemma Dealing with Weakly Converging Sequences of Gradients with Application to Nonconvex Variational Problems

We deal with the variant of Decomposition Lemma due to Kinderlehrer and Pedregal asserting that an arbitrary bounded sequence of gradients of Sobolev mappings $\{\nabla u_k\} \subseteq L^p(\Omega, \mathbf{R}^{m\times n})$, where $p > 1$, can be decomposed into a sum of two sequences of gradients of Sobolev mappings: $\{\nabla z_k\}$ and $\{\nabla w_k\}$, where $\{\nabla z_k\}$ is equintegrable and carries the same oscillations, while $\{\nabla w_k\}$ carries the same concentrations as $\{\nabla u_k\}$. We additionally impose the general trace condition "$u_k = u$" on $F$, where $F$ is given closed subset of $\bar{\Omega}$. We show that under this assumption the sequence $\{z_k\}$ in decomposition can be chosen to satisfy also the trace condition $z_k = u$ a.e. on $F$. The result is applied to nonconvex variational problems to regularity results for sequences minimizing functionals. As the main tool we use DiPerna Majda measures.

**Keywords**: Sequences of gradients, DiPerna Majda measures, concentrations, oscillations.

**MSC**: 46E35, 49J45, 35B05