ON THE REGULARITY OF WEAK SOLUTIONS TO NONLINEAR ELLIPTIC SYSTEMS OF PARTIAL DIFFERENTIAL EQUATIONS

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A regularity of weak solution for nonlinear elliptic system of partial differential equations is proved for the case of weak solution gradient of the system being unbounded and belonging to Campanato's space $\mathcal{L}^{2,n}$. Existing nonlinear system whose weak solution has its gradient in $\mathcal{L}^{2,n}$ space is also presented.

The considered nonlinear elliptic system whose gradient weak solution locally belongs to $\mathcal{L}^{2,n}$ space is in the form of

$$- D_i((a_{ij}^{rs}(x)D_j u_s) + g_i^r(x,u,Du)) + g^r(x,u,Du) = f^r(x),$$

where $r,s=1,\ldots,N$, $i,j=1,\ldots,n$, $N>1$, $n\geq 3$ are natural numbers, $x\in\Omega$, Ω is bounded, open subset in R^n and $u(x)\in W^{1,2}_{loc}(\Omega,R^N)$ is a weak solution of this system . The functions $a_{ij}^{rs}(x)$, $g_i^r(x,u,p)$, $g^r(x,u,p)$, $f^r(x)$ of the system fulfil certain hypotheses on the smooth and growth conditions in the variables $(u,p)\in R^N \times R^{nN}$.

The major part of the work is devoted to the proof of a new statement describing $C^{1,\alpha}$-regularity for the nonlinear elliptic system in divergent form

$$-D_i a_i^r(x,u,Du) + a^r(x,u,Du) = -D_i f_i^r(x) + f^r(x),$$

where $r = 1,\ldots,N$, $N>1$, $x\in\Omega$, Ω bounded, open subset in R^n and $u(x)\in W^{1,2}_{loc}(\Omega,R^N)$ is a weak solution. The system is further assumed to fulfil Liouville's condition and the gradient of weak solution is assumed to belong to Campanato's space $\mathcal{L}^{2,n}$.

THE CENTRAL LIMIT PROBLEM FOR STRICTLY STATIONARY SEQUENCES

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Let $(X_i : i\in\mathbb{Z})$ be a strictly stationary sequence of random variables. Then there exists a function f and a bijective, bimeasurable and measure preserving transformation T on some probability space $(\Omega,\mathcal{A},\mu)$ such that $(X_i;i\in\mathbb{Z})$ have the same distributions. In this thesis the central limit problem is investigated for strictly stationary sequences $f\circ T^i;i\in\mathbb{Z})$ where $f\in L^2(\mu)$; more exactly, there is investigated the weak convergence of probability measures $\mu s_n^{-1}(f)$ where $s_n(f) = \frac{1}{\sqrt{n}}\sum_{j=1}^{n} f\circ T^j$. As a supporting but relatively independent result, a theory of decompositions of $(f\circ T^i;i\in\mathbb{Z})$ into sums of martingale difference sequences is developed.