a p-adic solenoid and denoted by Σ_p (see [1]). As a set with a measure $\Sigma_p \cong [0,1) \times \mathbb{Z}_p$. It is a compact group and has a natural measure $dx \cdot d_p u$. Pontryagin's dual group of the p-adic solenoid is $\widehat{\Sigma_p} = \mathbb{Q}^{(p)} = \bigcup_{n=0}^{\infty} p^{-n}\mathbb{Z}$. That means any $f \in L_2(\Sigma_p)$ can be expanded into a Fourier series

$$f(x,u) = \sum_{\alpha\in\mathbb{Q}^{(p)}} \widehat{f}(\alpha)\chi_\alpha(x,u),$$

where $\chi_\alpha(x,u) = \exp(2\pi i\alpha\, x)\exp(-2\pi i\{\alpha\, u\}_p)$ are characters of Σ_p, $\{\cdot\}_p$ is a fractional part of a p-adic number $\{\cdot\}_p$ and

$$\widehat{f}(\alpha) = \int\limits_0^1 \int\limits_{\mathbb{Z}_p} f(x,u)\overline{\chi_\alpha(x,u)}\, dx d_p u$$

are Fourier coefficients. Hence Dirichlet kernels for Σ_p are

$$D_{m,n}(x,u) = \sum_{\alpha\in(-m,\ m)\cap p^{-n}\mathbb{Z}} \chi_\alpha(x,u), \quad m,n \in \mathbb{N}_0.$$

We proved in [2] that the Lebesgue constants have the asymptotics

$$L_{m,n} := \|D_{m,n}\|_{L_1(\Sigma_p)} = \int\limits_0^1 \int\limits_{\mathbb{Z}_p} |D_{m,n}(x,u)| dx d_p u \sim \frac{2}{\pi^2}\ln(m^2 p^n),$$

when $m \to +\infty$, $n \to +\infty$. Consequently the Fourier series is divergent in $L_1(\Sigma_p)$ and it is reasonable to consider Fejer kernels

$$F_{m,n}(x,u) = \sum_{\alpha\in(-m,\ m)\cap p^{-n}\mathbb{Z}} \left(1 - \frac{|\alpha|}{m}\right)\chi_\alpha(x,u), \quad m,n \in \mathbb{N}_0$$

that will be discussed in our talk and I will prove

Theorem 1. *For all nonnegative integers n, m* $\|F_{m,n}\|_{L_1(\Sigma_p)} = 1$.

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SOLVING MATRIX DISCRETE THE FIRST ORDER EQUATIONS BY MEANS OF ALGEBRAIC MATRICIANT

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Let $K_0^{m\times m}$ be an algebra of matrix sequences with multiplication in the form of Laplace convolution. For matrix $X = [x^{ij}]_{i,j=1}^m$ denote $\widetilde{m}_n(X) = \max\limits_{1\leqslant i,j\leqslant m} \left|x_n^{ij}\right|$.

Definition 1. The sequence $\widetilde{m}(X) = \{\widetilde{m}_0(X), \widetilde{m}_1(X), \dots, \widetilde{m}_n(X), \dots\}$ is called a majorizing sequence for matrix $X \in K_0^{m\times m}$.

Definition 2. $X \in \ell_p^{m\times m}$, when $\forall i,j=\overline{1,m}$ $x^{ij}\in \ell_p$.

We define a norm of a matrix from $\ell_p^{m\times m}$ by the following way $\|X\|_{\ell_p^{m\times m}} = \|\widetilde{m}(X)\|_{\ell_p}$. $\ell_p^{m\times m}$ is the Banach module under the Banach algebra $\ell_1^{m\times m}$.

Consider matrix algebraic homogeneous differential equation

$$DX = GX, \tag{1}$$

where D is the algebraic derivative operator (see [1]), $G \in \ell_1^{m\times m}$. A solution of the equation (1) is found in $\ell_1^{m\times m}$ with initial condition $X_0 = E$. We use the method of successive approximations for building a solution of (1). The successive approximations are found from recursion relations

$$DX^{(n+1)} = GX^{(n)} \tag{2}$$

with initial approximation $X^{(0)} = X_0 = E$. Integrating (2) obtain successively

$$X^{(0)}=E, \quad X^{(1)}=E+\int G, \quad \ldots, \quad X^{(k)}=E+\int G+\int G\int G+\cdots+\underbrace{\int G\int G\cdots\int G}_{k}, \quad \ldots$$

Definition 3. The limit

$$\Omega^G = \lim_{k\to\infty} X^{(k)} = E + \int G + \int G\int G + \cdots + \int G \int G \cdots \int G + \ldots,$$

when it exists, is called an algebraic matriciant of the equation (1).

Consider difference matrix homogeneous the first order equation

$$(n+1)X_{n+1} + (n\gamma+\delta)X_n = 0, \tag{3}$$

where $\gamma,\delta \in \mathbb{C}^{m\times m}$. A solution of the equation (3) is found in $\ell_1^{m\times m}$ with arbitrary initial condition X_0. The equation (3) is transformed to algebraic differential equation (1), where $G=(E-\gamma h)^{-1}(-\delta)$, $h=\{0,1,0,\ldots,0,\ldots\}$. We obtain conditions for matrix γ under which $\forall X_0$ there is a unique solution $X=\Omega^G X_0$ of the equation (3), where Ω^G is an algebraic matriciant of the equation (1). Corresponding to (3) inhomogeneous equation with arbitrary initial condition is investigated in a similar manner in the Banach module $\ell_p^{m\times m}$. Evaluations for solutions norms are obtained.

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