

O‘ZBEKISTON RESPUBLIKASI OLIY TA’LIM, FAN VA INNOVATSIYALAR
VAZIRLIGI

TERMIZ DAVLAT UNIVERSITETI

O‘ZBEKISTON RESPUBLIKASI FANLAR AKADEMIYASI

V.I.ROMANOVSKIY NOMIDAGI MATEMATIKA INSTITUTI

**ALGEBRA VA ANALIZNING
DOLZARB MASALALARI**

mavzusidagi Xalqaro ilmiy-amaliy anjumani

MATERIALLARI TO‘PLAMI

Termiz, 2025-yil, 20-21- oktabr

МИНИСТЕРСТВО ВЫСШЕГО ОБРАЗОВАНИЯ, НАУКИ И ИННОВАЦИЙ
РЕСПУБЛИКИ УЗБЕКИСТАН

ТЕРМЕЗСКИЙ ГОСУДАРСТВЕННЫЙ УНИВЕРСИТЕТ

ИНСТИТУТ МАТЕМАТИКИ ИМЕНИ В.И.РОМАНОВСКОГО

АКАДЕМИИ НАУК РЕСПУБЛИКИ УЗБЕКИСТАН

СБОРНИК МАТЕРИАЛОВ

Международной научно-практической конференция по

**АКТУАЛЬНЫМ ПРОБЛЕМАМ
АЛГЕБРЫ И АНАЛИЗА**

Термез, 20–21 октября 2025 года

MINISTRY OF HIGHER EDUCATION, SCIENCE AND INNOVATIONS OF
THE REPUBLIC OF UZBEKISTAN

TERMEZ STATE UNIVERSITY

INSTITUTE OF MATHEMATICS NAMED AFTER V.I. ROMANOVSKIY

ACADEMY OF SCIENCES OF THE REPUBLIC OF UZBEKISTAN

COLLECTION OF MATERIALS

International Scientific-Practical Conference on

**CURRENT PROBLEMS OF
ALGEBRA AND ANALYSIS**

Termez, October 20–21, 2025

весом в коротких интервалах и короткие тригонометрические суммы с простыми числами	50
Рахмонов Ф. З. Сумма модулей коротких тригонометрических сумм с простыми числами и ее приложение в вопросе равномерного распределения дробных частей $\{\alpha p^n\}$	54
Сеттарова Э.С. Нахождение элементов выпуклой оболочки множества точек n -мерного пространства	58
Хайруллохзода Ш.А. Об оценке специальных кратных тригонометрических сумм и их применении в задачах аналитической теории чисел	60
Чилин В.И., Закирова Г.Б. Линейные изометрии в L_p пространствах Банаха-Канторовича над кольцом измеримых функций	61
Эргашев В.Э., Буриев Т.Э. Приложения последовательности Сомоса k эллиптическим кривым	62

2 – SHO‘BA. MATEMATIK TAHLIL MASALALARI VA ULARNING TADBIQLARI

СЕКЦИЯ 2. ЗАДАЧИ МАТЕМАТИЧЕСКОГО АНАЛИЗА И ИХ ПРИМЕНЕНИЯ

Bozorov J. T., To‘rayev T. A., Bo‘riyeva I. Ikkinchi tur matritsaviy polikrugda golomorf davom ettirish masalasi	65
Bozorov J. T., To‘rayev T. A., Bobonazarova M. O. Ikkinchi tur matritsaviy poliyedrdra Veyl integral formulasi	67
Eshboltaev S. Applications of the Lobachevsky metric in the H - upper half-plane	69
Eshkabilov Y. Kh., Boboyarova Z. D. On dynamics of a separable quadratic stochastic operators	70
Hakimova M. A. Analysis of $G_4^{(2)}$ -periodic ground states for the Chui-Weeks model	71
Jumayev J. N., To‘rayev A. U., Nuraliyev A. Sh. On the iteration of a cubic map defined by a non-stochastic matrix on a two-dimensional simplex	73
Kulturayev D. J. Ko‘p o‘lchamli diskret Shredinger operatorining muhim spektrining yuqorisida joylashgan xos qiymatlari cheksizligi haqida	75
Maxkamov E. M., To‘rayev T. A. Umumlashgan matritsaviy poliedrda Bishop integral formulasining bir ko‘rinishi	77
Norov A. Z., Khamrayev A. Yu., Najimov O. I. Dynamics of a predator-prey system with equal dominance	79
Rahmatullaev M. M., Burxonova Z. A. New Non-Translation-Invariant Gibbs Measures for the Ising Model on a Cayley Tree of Order Three	81
Rasulova M. A. The four-state Potts-SOS model on the Cayley tree: Translation-invariant ground states	82
Soleev A., Soleeva N. Positional function of robotics mechanisms and its asymptotic solution near the singularities	83
Sulaymonova S. S. Convergence analysis of a modified proximal point algorithm for a nearly asymptotically quasi-nonexpansive mapping	84
Sulaymonova S. S. Modified proximal point algorithm for dealing with fixed point problems and convex minimization problems in $CAT(0)$ Space	85
Shaimkulov B. A., Rasulova M. K. Smooth boundary points of the matrix ball	86
Tagaymurotov A. O. Representation of the set of idempotent probability measures	

1. **Bruno, A.D., Soleev, A.** *SClassification of singularities of the position's function of mechanisms. J. Machinery Manufacture and Reliability №1, 1994.102-108.*
2. **Soleev A., Soleeva N.** *Power geometry and algebraic equations. AIP Conference Proceedings, 1557, 85. 2013*

UDC 517.988.2

Convergence analysis of a modified proximal point algorithm for a nearly asymptotically quasi-nonexpansive mapping

Sulaymonova S.S.

Academic lyceum of Bukhara Medical Institute, Bukhara, Uzbekistan;
sulaymonovasitora91@gmail.com

Let $\mathcal{C}$ be a nonempty closed convex subset of complete CAT(0) space and $\mathcal{T} : \mathcal{C} \rightarrow \mathcal{C}$ be a mapping. Let $x_1 \in \mathcal{T}$ be arbitrary and the sequence generated iteratively by

$$\begin{aligned} c_n &= \mathcal{T}^n((1 - \rho_n)x_n \oplus \rho_n \mathcal{T}^n x_n), \\ b_n &= \mathcal{T}^n(\mathcal{T}^n c_n), \\ a_n &= \mathcal{T}^n(\mathcal{T}^n b_n), \\ x_{n+1} &= \mathcal{T}^n a_n, \quad n \geq 1. \end{aligned} \tag{1}$$

Let $(\mathcal{X}, d)$ be a metric space and $f : \mathcal{X} \rightarrow (\infty, \infty]$ be a proper and convex function. One of the major problems in optimization is to find $x \in \mathcal{X}$ such that

$$f(x) = \min_{y \in \mathcal{X}} f(y). \tag{2}$$

The set of minimizers of f is denoted by $\arg \min_{y \in \mathcal{X}} f(y)$.

We provide the following modified proximal point approach for nearly asymptotically quasi-nonexpansive mappings in CAT(0) spaces utilising the iteration process defined by Asifa et al. :

$$\begin{aligned} x_1 &\in \mathcal{C} \\ v_n &= \arg \min_{c \in \mathcal{C}} \left(\mathcal{L}(c) + \frac{1}{2\lambda_n} d^2(c, x_n) \right), \\ u_n &= \arg \min_{b \in \mathcal{C}} \left(\mathcal{G}(b) + \frac{1}{2\varphi_n} d^2(b, v_n) \right), \\ c_n &= ((1 - \rho_n)x_n \oplus \rho_n \mathcal{T}^n u_n), \\ b_n &= \mathcal{T}^n(\mathcal{T}^n c_n), \\ a_n &= \mathcal{T}^n(\mathcal{T}^n b_n), \\ x_{n+1} &= \mathcal{T}^n a_n, \quad n \geq 1. \end{aligned} \tag{3}$$

The proposed problem is illustrate convergence outcomes of the proposed process under several moderate conditions based on previous work.

REFERENCES

1.A. Tassaddiq, W. Ahmed, S. Zaman, A. Raza, U. Islam and K. Nantomah *A Modified Iterative Approach for Fixed Point Problem in Hadamard Spaces*. Journal of Function Spaces, 2024(2024) 10

2.B. Martinet. *Régularisation d'inéquations variationnelles par approximations successives*. Rev. Fr. Inform. Rech. Oper. 4 (1970)154-158,

UDC 519.853.3

Modified proximal point algorithm for dealing with fixed point problems and convex minimization problems in CAT(0) Space

Sulaymonova S.S.,

Academic lyceum of Bukhara Medical Institute, Bukhara, Uzbekistan;
sulaymonovator91@gmail.com

Lemma. Assume that a complete CAT(0) space $\mathcal{Z}$ has a nonempty closed and convex subset $\mathcal{D}$. The single-valued nonexpansive mappings are denoted by $\mathfrak{T}_i : \mathcal{D} \rightarrow \mathcal{D}$; the multi-valued nonexpansive mappings are denoted by $\mathcal{S}_i : \mathcal{D} \rightarrow CB(\mathcal{D})$ for $i = 1 : 3$ and $\mathfrak{G}, h : \mathcal{D} \rightarrow (-\infty, \infty]$ are two proper convex and lower semi-continuous functions. Suppose that

$$\Omega = \mathfrak{U}(\mathfrak{T}_1) \cap \mathfrak{U}(\mathfrak{T}_2) \cap \mathfrak{U}(\mathfrak{T}_3) \cap \mathfrak{U}(\mathcal{S}_1) \cap \mathfrak{U}(\mathcal{S}_2) \cap \mathfrak{U}(\mathcal{S}_3) \cap \arg \min_{y \in \mathcal{D}} \mathfrak{G}(y) \cap \arg \min_{\zeta \in \mathcal{D}} h(\zeta) \neq \emptyset$$

and $\mathcal{S}_i q = \{q\}$, $i = 1 : 3$ for $q \in \Omega$. For $u_1 \in \mathcal{D}$, let the sequence $\{u_k\}$ is generated in the following manner:

$$\begin{cases} s_k = \arg \min_{y \in \mathcal{D}} [\mathfrak{G}(y) + \frac{1}{2\lambda_k} d^2(y, u_k)], \\ v_k = \arg \min_{\zeta \in \mathcal{D}} [h(\zeta) + \frac{1}{2\sigma_k} d^2(\zeta, s_k)], \\ \varphi_k = \varrho_k u_k \oplus \varsigma_k v'_k \oplus \gamma_k v''_k, \\ \Psi_k = \psi_k u_k \oplus \kappa_k v'''_k \oplus \phi_k \mathfrak{T}_1 u_k, \\ u_{k+1} = \delta_k u_k \oplus \eta_k \mathfrak{T}_2 u_k \oplus \xi_k \mathfrak{T}_3 \Psi_k, \end{cases} \text{ for all } k \in \mathbb{N}. \quad (1)$$

where $\{\varrho_k\}$, $\{\varsigma_k\}$, $\{\gamma_k\}$, $\{\psi_k\}$, $\{\kappa_k\}$, $\{\phi_k\}$, $\{\delta_k\}$, $\{\eta_k\}$ and $\{\xi_k\}$ are sequences in $(0, 1)$ such that

$$0 < a \leq \{\varrho_k\}, \{\varsigma_k\}, \{\gamma_k\}, \{\psi_k\}, \{\kappa_k\}, \{\phi_k\}, \{\delta_k\}, \{\eta_k\}, \{\xi_k\} \leq b < 1,$$

$$\varrho_k + \varsigma_k + \gamma_k = 1, \psi_k + \kappa_k + \phi_k = 1, \delta_k + \eta_k + \xi_k = 1, \quad (2)$$

for all $k \in \mathbb{N}$ and $\{\lambda_k\}$ is a sequence such that $\lambda_k \geq \lambda > 0$ for all $k \in \mathbb{N}$ and some λ . Then, the subsequent claims are true:

- (i) $\lim_{k \rightarrow \infty} d(u_k, q)$ exists for all $q \in \Omega$;
- (ii) $\lim_{k \rightarrow \infty} d(u_k, s_k) = 0$; $\lim_{k \rightarrow \infty} d(s_k, v_k) = 0$;
- (iii) $\lim_{k \rightarrow \infty} \text{dist}(u_k, \mathcal{S}_i u_k) = 0, i = 1, 2, 3$;
- (iv) $\lim_{k \rightarrow \infty} d(u_k, \mathfrak{T}_i u_k) = 0, i = 1, 2, 3$;
- (v) $\lim_{k \rightarrow \infty} d(u_k, J_\lambda u_k) = 0, \lim_{k \rightarrow \infty} d(u_k, J_\sigma u_k) = 0$.

Theorem. assume that a complete CAT(0) space $\mathcal{Z}$ has a nonempty closed and convex subset $\mathcal{D}$. The single-valued nonexpansive mappings are denoted by $\mathfrak{T}_i : \mathcal{D} \rightarrow \mathcal{D}$; the multi-valued nonexpansive mappings are denoted by $\mathcal{S}_i : \mathcal{D} \rightarrow CB(\mathcal{D})$ for $i = 1 : 3$ and $\mathfrak{G}, h : \mathcal{D} \rightarrow (-\infty, \infty]$ are two proper convex and lower semi-continuous functions. Consider that

$$\Omega = \mathfrak{U}(\mathfrak{T}_1) \cap \mathfrak{U}(\mathfrak{T}_2) \cap \mathfrak{U}(\mathfrak{T}_3) \cap \mathfrak{U}(\mathcal{S}_1) \cap \mathfrak{U}(\mathcal{S}_2) \cap \mathfrak{U}(\mathcal{S}_3) \cap \arg \min_{y \in \mathcal{D}} \mathfrak{G}(y) \cap \arg \min_{\zeta \in \mathcal{D}} h(\zeta) \neq \emptyset$$