DYNAMIC SYSTEMS AND SOME OF THEIR APPLICATIONS

Karshiyev Begzod Boykhanovich
Karshi Institute of Engineering Economics,
Uzbekistan, Kashkadarya, Karshi city.
Phone +998913118176;
Email: qarshiyevb@inbox.ru
https://doi.org/10.5281/zenodo.7939563

Annotation: The canonical form of the cubic stochastic operator is a relatively new concept of mathematical analysis that plays an important role in the application of mathematics to practice.

Key words: Dynamical systems. Arithmetic progression. differs slightly

Аннотация: Каноническая форма кубического стохастического оператора относительно новое понятие математического анализа, имеющее большое значение в приложениях математики.

Ключевые слова: Динамические системы. Арифметическая прогрессия. немного отличается.

Annotatsiya: Kubik stoxastik operatorining kanonik koʻrinishi matematik analizning nisbatan yangi tushunchasi boʻ*lib, bu matematikaning amaliyotga tatbiq etilishida muhim ahamiyat kasb etadi.*

Kalit so'zlar: *Dinamik tizimlar. Arifmetik progressiya. biroz farq qiladi.*

First, we need to answer the question of what is a dynamic system. The answer to this question is very simple: take a scientific calculator and enter an arbitrary number. Then let's start repeatedly pressing one of the function keys. This iterative process is an example of a discrete dynamical system. Let's take the exponential function as an example and repeat the same experiment as above. Given an initial value of $.x_0 \geq 0$, the following levels of e^x increase:

$$x, e^x, e^{e^x}, \ldots,$$

Let's look at another example, the $f(x) = \sin x$ function. In this case, given an initial value x_0, the iteration sequence of this function tends to zero.

Dynamical systems are studied in 2 types: continuous and discrete-time dynamical systems [1].

Let X be an arbitrary set. A dynamic system is formed by the reflection, which corresponds to each of its elements according to the rules. Let us denote this reflection by ff. A $f : X \to X$ reflection is said to transfer X to itself. It should be noted that reflections are one of the main concepts found in all areas of mathematics. The main task of dynamic systems is to learn what happens when we repeatedly apply reflection.

Since $f(x)$ corresponds to the element $x \in X$, since it is again an element of the set X, one can ask what f corresponds to. It is known that $f(x)$ corresponds to $f(f(x))$. For the

IBAST | Volume 3, Issue 5, May

sake of brevity, we accept to write it in the following form, as in algebra: $f^2(x)$ As a result of continuing the same process.

$$x, f(x), f^2(x), f^3(x), \ldots$$

a sequence is formed. This sequence is called the trajectory of element x and is usually denoted as $O(x)$. Thus, a trajectory is the result of successively applying a reflection to an element of the set X. If we say $x_n = f^n(x)$, then the $\{x_n\}$ trajectory is a generated sequence. This is a sequence

$$x_n = f(x_n)$$

$$x_0 = x$$

satisfies the condition. The first of these conditions is called the equation of the dynamic system, and the second is called the initial condition. All $\{x_n\}$ sequences satisfying a discrete equation are called its general solution.

Now let's consider the above in examples [1].

Arithmetic progression was considered the simplest example of dynamical systems. In this case, the set X can be the set of all real numbers, the set of rational numbers, or the set of integers, or even the set of natural numbers under certain conditions. In this $f(x)$ reflection

$$f(x) = x + d$$

is given by the formula. In this case, the progression difference d, like x_0, should also belong to the set X under consideration. If we write the equation of this dynamic system,

$$x_{n+1} = x_n + d$$

will appear. all solutions of the equation are given by the formula $x_n = x + nd$ (where x is an arbitrary number). It differs slightly from the $x_n = x + (n-1)d$ formula for the n-term of the arithmetic progression given in school mathematics: in the next formula, the progression starts from the x_1-term, and we start the dynamic system from the x_0-term.

References:

1.S. N. Bernstein, The solution of a mathematical problem related to the theory of heredity, Uchen. ZapiskiNauchno-Issled. Kafedry Ukr. Otd. Matem. 1, 83 (1924).
2.R. L. Devaney, An introduction to chaotic dynamical system (Westviev Press, 2003).
3.Ibragimov-Dots, S., Xudoyqulov-Ass, J., & Boboxonov-Ass, S. (2022). DIRIXLE PROBLEM FOR A (z)-HARMONIC FUNCTION. Web of Scientist: International Scientific Research Journal, 3(9), 124-126.
4.Ibragimov, S. L., Xudoyqulov, J. X., & Boboxonov, S. S. (2022). INTEGRATION BY SUBSTITUTION. Current Issues of Bio Economics and Digitalization in the Sustainable Development of Regions, 381-385.
5.Xudoyqulov, J., & Boboxonov, S. (2022). GOLIZIN-KRYLOV METHOD FOR-ANALYTIC FUNCTION.

6.Eshmatov, B. E., Boboxonov, S., & Omonova, N. (2022). On the solvability of problems with an oblique derivative for a mixed parabolic-hyperbolic equation. Web of Scientist: International Scientific Research Journal, 3(3), 536-538.
7.Tufliyev, E., & Boboxonov, S. (2023). PROOF OF CAUCHY'S THEOREM IN GENERAL. CONCEPT OF HOMOTOPY PATH. Евразийский журнал академических исследований, 3(3 Part 2), 48-51.
8.Bobokhonov, S. .S., & Hamrayev , S. (2023). Cauchy's integral formula. Academic International Conference on Multi-Disciplinary Studies and Education, 1(5), 87–89. Retrieved from
9.Bobokhonov, S. .S., & Namozov , D. (2023). A generalization of Cauchy's theorem. International Conference on Science, Engineering & Technology, 1(1), 88–89. Retrieved from
10.Uralovich, B. D. (2022). CHIZIQLI ALGEBRAIK TENGLAMALAR SISTEMALARIGA OID MASALALAR. Science and innovation, 1(A2), 163-171.
11.Bozarov D. U. IKKI O 'ZGARUVCHILI FUNKSIYANING EKSTREMUMIDAN FOYDALANIB, TEKISLIKDAGI IKKITA FIGURA ORASIDAGI MASOFANI TOPISH //Oriental renaissance: Innovative, educational, natural and social sciences. – 2022. – Т. 2. – №. 11. – С. 292-301.
12.Maxmudovna, G. M., Olimovich, T. E., & Uralovich, B. D. (2021). Types and uses of mathematical expressions. ACADEMICIA: An International Multidisciplinary Research Journal, 11(3), 746-749.
13.Allamova, M., & Bozarov, D. (2023). TRIGONOMETRIK TENGSIZLIKLAR YECHIMLARINING INNOVATSION QO 'LLANILISHI. Eurasian Journal of Mathematical Theory and Computer Sciences, 3(1), 75-78.
14.Dilmurod, B., & Islom, A. (2023). PARALLEL IKKITA TO'G'RI CHIZIQ ORASIDAGI MASOFA. Innovations in Technology and Science Education, 2(8), 465-478.
15.Ibragimov-Dots, S., Xudoyqulov-Ass, J., & Boboxonov-Ass, S. (2022). DIRIXLE PROBLEM FOR A (z)-HARMONIC FUNCTION. Web of Scientist: International Scientific Research Journal, 3(9), 124-126.