MUHAMMAD AL-XORAZMIY
NOMIDAGI TATU FARG'ONA FILIALI

FERGANA BRANCH OF TUIT
NAMED AFTER MUHAMMAD AL-KHORAZMI

"AL-FARG'ONIY AVLODLARI"

ELEKTRON ILMIY JURNALI | ELECTRONIC SCIENTIFIC JOURNAL

TA'LIMDAGI ILMIY, OMMABOP VA ILMIY TADQIQOT ISHLARI

2-SON 1(6)
2024-YIL

TATU, FARG'ONA
O'ZBEKISTON

ISSN 2181-4252

O‘ZBEKISTON RESPUBLIKASI RAQAMLI TEXNOLOGIYALAR VAZIRLIGI

MUHAMMAD AL-XORAZMIY NOMIDAGI TOSHKENT AXBOROT TEXNOLOGIYALARI UNIVERSITETI FARG‘ONA FILIALI

Muassis: Muhammad al-Xorazmiy nomidagi Toshkent axborot texnologiyalari universiteti Farg‘ona filiali.
Chop etish tili: O‘zbek, ingliz, rus.
Jurnal texnika fanlariga ixtisoslashgan bo‘lib, barcha shu sohadagi matematika, fizika, axborot texnologiyalari yo‘nalishida maqolalar chop etib boradi.

Учредитель: Ферганский филиал Ташкентского университета информационных технологий имени Мухаммада ал-Хоразми.
Язык издания: узбекский, английский, русский.
Журнал специализируется на технических науках и публикует статьи в области математики, физики и информационных технологий.

Founder: Fergana branch of the Tashkent University of Information Technologies named after Muhammad al-Khorazmi.
Language of publication: Uzbek, English, Russian.
The magazine specializes in technical sciences and publishes articles in the field of mathematics, physics, and information technology.

2024 yil, Tom 1, №2
Vol.1, Iss.2, 2024 y

ELEKTRON ILMIY JURNALI **ELECTRONIC SCIENTIFIC JOURNAL**

«Al-Farg‘oniy avlodlari» («The descendants of al-Fargani», «Potomki al-Fergani») O‘zbekiston Respublikasi Prezidenti administratsiyasi huzuridagi Axborot va ommaviy kommunikatsiyalar agentligida 2022-yil 21 dekabrda 054493-son bilan ro‘yxatdan o‘tgan.

Jurnal OAK Rayosatining 2023-yil 30 sentabrdagi 343-sonli qarori bilan Texnika fanlari yo‘nalishida milliy nashrlar ro‘yxatiga kiritilgan.

Tahririyat manzili:
151100, Farg‘ona sh.,
Aeroport ko‘chasi 17-uy,
202A-xona
Tel: (+99899) 998-01-42
e-mail: info@al-fargoniy.uz

Qo‘lyozmalar taqrizlanmaydi va qaytarilmaydi.

FARG’ONA - 2024 YIL

TAHRIR HAY'ATI

Maxkamov Baxtiyor Shuxratovich,
Muhammad al-Xorazmiy nomidagi Toshkent axborot texnologiyalari universiteti rektori, iqtisodiyot fanlari doktori, professor

Muxtarov Farrux Muhammadovich,
Muhammad al-Xorazmiy nomidagi Toshkent axborot texnologiyalari universiteti Farg'ona filiali direktori, texnika fanlari doktori

Arjannikov Andrey Vasilevich,
Rossiya Federatsiyasi Sibir davlat universiteti professori, fizika-matematika fanlari doktori

Satibayev Abdugani Djunusovich,
Qirg'iziston Respublikasi, Osh texnologiyalari universiteti, fizika-matematika fanlari doktori, professor

Rasulov Akbarali Maxamatovich,
Muhammad al-Xorazmiy nomidagi TATU Farg'ona filiali Axborot texnologiyalari kafedrasi professori, fizika-matematika fanlari doktori

Yakubov Maksadxon Sultaniyazovich,
Muhammad al-Xorazmiy nomidagi TATU «Axborot texnologiyalari» kafedrasi professori, t.f.d., professor, xalqaro axborotlashtirish fanlari Akademiyasi akademigi

G'ulomov Sherzod Rajaboyevich,
Muhammad al-Xorazmiy nomidagi TATU Kiberxavfsizlik fakulteti dekani, Ph.D., dotsent

G'aniyev Abduxalil Abdujaliovich,
Muhammad al-Xorazmiy nomidagi TATU Kiberxavfsizlik fakulteti, Axborot xavfsizligi kafedrasi t.f.n., dotsent

Zaynidinov Hakimjon Nasritdinovich,
Muhammad al-Xorazmiy nomidagi TATU Kompyuter injiniringi fakulteti, Sun'iy intellekt kafedrasi texnika fanlari doktori, professor

Bo'taboyev Muhammadjon To'ychiyevich,
Farg'ona politexnika instituti, Iqtisod fanlari doktori, professor

Abdullayev Abdujabbor,
Andijon mashinosozlik instituti, Iqtisod fanlari doktori, professor

Qo'ldashev Abbosjon Hakimovich,
O'zbekiston milliy universiteti huzuridagi Yarimo'tkazgichlar fizikasi va mikroelektronika ilmiy-tadqiqot instituti, texnika fanlari doktori, professor

Ergashev Sirojiddin Fayazovich,
Farg'ona politexnika instituti, elektronika va asbobsozlik kafedrasi professori, texnika fanlari doktori, professor

Polvonov Baxtiyor Zaylobiddinovich,
Muhammad al-Xorazmiy nomidagi TATU Farg'ona filiali Ilmiy ishlar va innovatsiyalar bo'yicha direktor o'rinbosari

Zulunov Ravshanbek Mamatovich,
Muhammad al-Xorazmiy nomidagi TATU Farg'ona filiali Dasturiy injiniring kafedrasi dotsenti, fizika-matematika fanlari nomzodi

Abdullaev Temurbek Marufovich,
Muhammad al-Xorazmiy nomidagi TATU Axborot texnologiyalari kafedra mudiri, texnika fanlar bo'yicha falsafa doktori

Zokirov Sanjar Ikromjon o'g'li,
Muhammad al-Xorazmiy nomidagi TATU Farg'ona filiali Ilmiy tadqiqotlar, innovatsiyalar va ilmiy-pedagogik kadrlar tayyorlash bo'limi boshlig'i, fizika-matematika fanlari bo'yicha falsafa doktori

Jurnal quyidagi bazalarda indekslanadi:

Google Scholar · zenodo · ORCID · CYBERLENINKA · WORLD of JOURNALS · DRJI Directory of Research Journals Indexing

Eslatma! Jurnal materiallari to'plamiga kiritilgan ilmiy maqolalardagi raqamlar, ma'lumotlar haqqoniyligiga va keltirilgan iqtiboslar to'g'riligiga mualliflar shaxsan javobgardirlar.

MUNDARIJA | ОГЛАВЛЕНИЕ | TABLE OF CONTENTS

Sotvoldiyev Xusniddin, Abdurahimova Mubiynaxon Ikrom qizi, Алгоритмы синтеза адаптивных систем управления нестационарными системами при неполной информации	6-12
Лазарева Марина Викторовна, Порубай Оксана Витальевна, Оптимизация режимов работы объектов возобновляемой энергетики для обеспечения энергией сельского хозяйства	13-23
Bozarov Baxromjon Ilxomovich, TRIGONOMETRIK VAZNLI OPTIMAL KVADRATUR FORMULALARNI KOMPYUTER TOMOGRAFIYASI TASVIRLARINI QAYTA TIKLASHGA TATBIQI	24-27
Saidov Mansurjon Inomjonovich, Fisher statistikasida markaziy limit teoremalardan foydalanish	28-34
Saidkulov E.A., ZARAFSHON DARYOSINING FARKTAL XUSUSIYATLI TARMOQLARINI QURISH	35-40
Бозоров Алишер Ганишер угли, Метод диагностики по характеристической частоте АБ(аккумуляторных батарей)	41-45
Daliyev B. S., Sobolevning fazosida Abel umumlashgan integral tenglamasini yechish uchun optimal koeffitsiyentlar va optimal kvadratur formulaning normasi	46-53
Nurjanov Furqatbek Reyimberganovich, SUNIY INTELLEKT USULLARI YORDAMIDA TASVIRDAN SHAXSNING YUZ TASVIRI JOYLASHGAN SOHASINI TOPISH ALGORITMLARI	54-60
Boyquziyev Ilxom Mardanoqulovich, Rahmatullayev Ilhom Raxmatullayevich, Axadova O‘g‘iloy Chorshanbi qizi, RSA shifrlash algoritmining maxfiy kalitini aniqlash algoritmi	61-67
Sharifjanova Nilufar Muratjanovna, Yakubov Maksadhon Sultaniyazovich, Nurilla Ergashvaevich Mahamatov, ALGORITHM FOR LOCAL LOOP OPTIMIZATION OF MULTISTAGE FLOTATION PROCESSES	68-75
Rashidov Akbar Ergash o‘g‘li, Axatov Akmal Rustamovich, Nazarov Fayzullo Maxmadiyarovich, ICHKI TAQSIMLASH MEXANIZMIDA MA’LUMOTLAR OQIMLARINI BOSHQARISH ALGORITMI	76-82
Beglerbekov Rasul Jubatxanovich, Babanazarov Danil Jandullayevich, INFORMATIV BELGILAR FAZOSIDA TIMSOLLARNI TANIB OLISH VA ULARNI SHAKLLANTIRISH ALGORITMI	83-86
Kuvandikov Yokub Tursunbayevich, KULTIVATOR O‘QYOYSIMON PANJALARINING YEYILISHINI O‘RGANISHDA AXBOROT TEXNOLOGIYALARIDAN FOYDALANISH	87-90
Горовик Александр Альфредович, Лазарева Марина Викторовна, Моделирование алгоритмов взаимодействия обучаемого с обучающими курсами	91-100
Yakubov Maqsadxon Sultaniyazovich, Uzakov Barxayotjon Muhammadiyevich, Xoshimov Baxodirjon Muminjonovich, FARG‘ONA NEFTNI QAYTA ISHLASH ZAVODI UCHUN AVTOMATLASHTIRILGAN TIZIMINI MATEMATIK MODELI VA ALGORITMLASH JADVALINI REJALASHTIRISH VAZIFALARI	101-108
Мелиев Фарход Фаттоевич, Мелиев Фатто Мухаммадиевич, Обнаружения объектов на гистологических изображениях на основе сопоставления шаблонов	109-113
Sharibayev Nosirjon Yusubjanovich, Kayumov Ahror Muminjonovich, TRIKOTAJ TO‘QIMALARINING STRUKTURASINI KOMPYUTER KO‘RISH TEXNIKASI ASOSIDA TASNIFLASH	114-118
Mirzakarimov Baxtiyor, Mamadalieva Lola, Xayitov Azizjon, DEVELOPMENT OF A HYBRID ENERGY COMPLEX WITH MICRO-HYDRO AND SOLAR POWER IN UZBEKISTAN	119-123
Turakulov Otabek Xolmirzayevich, Mamaraufov Odil Abdixamitovich, Do’ztmuxammedova Munira Farxodovna, IJTIMOIY MEDIA STRUKTURALANMAGAN MATNLI MA’LUMOTLARINI QAYTA ISHLASHDA TASNIFLASH MASALASI	124-128
Xalilov Muxammadmuso Muxammadyunusovich, Dalibekov Lochinbek Rustamovich, Murodullayeva Rayxona Abduraxmon qizi, OPTIK TOLALARDA SIGNALLARNI YO‘QOLISHINI OLDINI OLISH VA AXBOROT XAVFSIZLIGI TA’MINLASH	129-131
Uzakov Barxayotjon Muhammadiyevich, NEFTNI QAYTA ISHLASH KORXONALARI FAOLIYATI BOSHQARUV TIZIMINI TAKOMILLASHTIRISH	132-139
Umarov Xasan Abdullayevich,INTERPOLYATSIYA MASALALARINI YECHISH VA TAHLIL QILISHDA LAGRANJ USULI	140-142
Abduraxmanov Ravshan Anarbayevich, TASVIR GISTOGRAMMALARINING TAHLILI VA STATISTIK MA’LUMOTLARI	143-145
Логинов Павел Викторович, Акбаров Нодирбек Аскаралиевич, Хамидов Саиджон Собитжон угли, ОПРЕДЕЛЕНИЕ ПАРАМЕТРОВ НЕЛИНЕЙНОГО ДЕФОРМИРОВАНИЕ ГРУНТОВ	146-151
Rayimjonova O. S., Nurdinova R. A., BOSHQARISH VA NAZORAT QILISH SISTEMALARI UCHUN ISSIQLIK O‘ZGARTIRGICHLARNI TADQIQ QILISH	152-157
Asrayev Muhammadmullo Abdullajon o‘g‘li, G‘oipova Xumora Qobiljon qizi, Abdurasulova Dilnoza Botirali qizi, QO‘LYOZMA TASVIR BELGILARINIG NEYRON TARMOQLAR ORQALI TAQQOSLANISHI	158-161
Xoshimov Baxodirjon Muminjonovich INTELLEKTUAL BOSHQARISH TIZIMLARI YORDAMIDA NEFTNI REKTIFIKATSIYA JARAYONINI BOSHQARISH	162-168
Kurbanov Abduraxmon Alishboyevich, INSON TANASI HARAKATLARINI TAHLIL QILISHDA ZAMONAVIY MODELLAR VA ALGORITMLARNI QO‘LLASHNI O‘RGANISH	169-175
Dalibekov Lochinbek Rustambekovich, PAXTANI BIRLAMCHI QAYTA ISHLASH JARAYONIDA KUCHLI ELEKTROSTATIK MAYDONLARNI YARATISH UCHUN MUQOBIL ENERGIYA MANBALARIDAN FOYDALANISH IMKONIYATI	176-180
Mirzayev Jamshid Boymurodovich, KORXONA VA TASHKILOTLARDA AXBOROT XAVFSIZLIGI RISKLARINI BAHOLASH USULLARINI TAHLILI	181-184
Jo‘rayev Mansurbek Mirkomilovich, Nozik sug‘orish tizimlari monitoring qilishda ma’lumotlarni uzatish texnologiyalar tahlili	185-188

MUNDARIJA | ОГЛАВЛЕНИЕ | TABLE OF CONTENTS

Zulunov Ravshanbek Mamatovich, Sattarov Maxammadjon Fozil o‘g‘li, SOG’LIQNI SAQLASHNI AVTOMATLASHTIRISH: BEMOR TAJRIBASINI YAXSHILASH YO’LI	189-195
Husniya Akhmedova, ORGANIZATION OF WORD SEARCH IN UZBEK TEXTS BASED ON BOYER-MOORE-HORSPOOL ALGORITHM	196-201
Shamsiev Kalibek Saribaevich, Oybek Bektoshev Qosimjon ug‘li, SIKLON REJIM KO‘RSATGICHLARINING SAMARADORLIKGA TA’SIRINI O‘RGANISH NATIJALARI	202-205
Otaqulov Oybek Xamdamovich, Nabiyev Iskandar Farxodjon o‘g‘li, Nabiyeva Maysaraxon Shuxratjon qizi, CHIZIQLI VA AFFIN MODELLARI YORDAMIDA SENSORLAR TAHLIL QILISH	206-209
Umurzakova Dilnoza Maxamadjanovna ISSIQLIK ENERGETIKA OBYEKTLARINING TEXNOLOGIK PARAMETRLARINI NORAVSHAN-MANTIQIY BOSHQARISH MODELLARINI ISHLAB CHIQISH	210-219
Якубов Максадхан Султаниязович, Хошимов Баходиржон Муминжонович, Узаков Барҳаётжон Муҳаммадиевич, СОВЕРШЕНСТВОВАНИЕ УПРАВЛЕНИЯ ПРОЦЕССОМ РЕКТИФИКАЦИИ НЕФТИ	220-228
Sattarov Nosirbek Abdulhodi o‘g‘li, Jo‘rayev To‘xtamurod Ixvoljon o‘g‘li, Sadikova Munira Alisherovna, TASVIR KONRASTINI KUCHAYTIRISH ALGORITMLARI	229-231
Исроилов Шаробиддин Махаммадюсуфович, Набиев Искандар Фарходжон ўғли, К ТЕОРЕТИЧЕСКОМУ АНАЛИЗУ ПРОЦЕССА ДИФФУЗИИ КОНТАКТНОЙ ДОРОЖКИ НАГРЕВА АВТОМОБИЛЬНОГО СТЕКЛА	232-236
Садикова Мунира Алишеровна, Зиятдинов Марсель Ринатович, ИССЛЕДОВАНИЕ ПРОБЛЕМЫ РАЗРАБОТКИ ИСКУССТВЕННОГО ИНТЕЛЛЕКТА В ИГРОВОЙ ИНДУСТРИИ	237-241
Okhunov Dilshod Mamatjonovich, Okhunov Mamatjon Xamidovich, Muminov Kamolkhon Ziyodjon ugli, Muhtoriddinov Muhammadyusuf Temirhon ugli, THE CONCEPT OF MARKETING AT IT INDUSTRY ENTERPRISES IN THE CONTEXT OF DIGITALIZATION OF THE ECONOMY	242-248
Камилов Мирзаян Мирзаахмедович, Худайбердиев Мирзаакбар Хаккулмирзаевич, Алимжанова Ойимбуш Собиржон кизи, Процесс моделирования спроса на товары с использованием алгоритмов машинного обучения	249-254
Radjabov Sobirjon Sattorovich, Dadaxanov Musoxon Xoshimxonovich, Mardiyev Azamat Shakar o‘g‘li, QO‘LYOZMA MATNI TASVIRI SIFATINI OSHIRISHNING SAMARALI ALGORITMINI TANLASH	255-260
Yuldasheva Nafisa Salimovna, SHAXSNI OVOZI ASOSIDA IDENTIFIKATSIYALASH TIZIMINING ASOSIY MASALALARI	261-267
Nishanov Akram Xasanovich, Beglerbekov Rasul Jubatxanovich, Babanazarov Danil Jandullayevich, BELGILAR ASOSIDA QOVUN NAVLARINI XUDUDLAR BO‘YICHA TASNIFLASH MASALASI, UNING MATEMATIK IFODALANISHI VA ALGORITMI	268-273
Мирзаева Малика Бахадировна, Сулейманов Анвар Аскарович, К АНАЛИЗУ ФУНКЦИОНИРОВАНИЯ ВЫЧИСЛИТЕЛЬНЫХ СРЕДСТВ АВТОМАТИЗИРОВАННЫХ СЕТЕЙ СВЯЗИ	274-280
Керимов Комил Фикратович, Азизова Зарина Ильдаровна, Анализ трафика сети с применением алгоритмов машинного обучения в автоматизированной информационной системе быстрого реагирования на инциденты информационной безопасности и фильтрации трафика сети	281-285
Отакулов Ойбек Хамдамович, Азамхонов Баходир Саиткамолхонович, Набиев Искандар Фарходжон угли, ТЕОРЕТИЧЕСКИЕ ОСНОВЫ ПРИМЕНЕНИЯ АЛГОРИТМОВ ФИЛЬТРА КАЛМАНА ДЛЯ ОБНАРУЖЕНИЯ ОШИБОК В АВТОМАТИЧЕСКИХ СИСТЕМАХ	286-290
Djabbarov Dilshod Turdikulovich, Asrayev Muhammadmullo Abdullajon o‘g‘li, G‘oipova Xumora Qobiljon qizi, VIDEO TASVIRLARDA INSON KO‘ZLARINI ANIQLASH UCHUN CHUQUR O‘RGANISH ALGORITMLARIDAN FOYDALANISH	291-295
Kabildjanov Aleksandr Sabitovich, Pulatov G‘iyos Gofurjonovich, Pulatova Gulxayo Azamjon qizi, OB-HAVO SHAROITLARINING YURAK-QON TOMIR KASALLIKLARIGA TA’SIRINI ANIQLASHNING ANALITIK TAXLILI	296-300
Tojieva Feruza, Khamdamov Utkir, MACHINE LEARNING ALGORITHMS ANALYSIS FOR NETWORK TRAFFIC CLASSIFICATION	301-305
Nabijonov Ravshanbek Muxammadjon o‘g‘li, Nabiyev Iskandar Farxodjon o‘g‘li, Nabiyeva Maysaraxon Shuhratjon qizi, AQLLI SVETOFOR TIZIMINI LOYIHALASH	306-310
Baxtiyor Mirzakarimov Abdusolomovich, Sidiqov Azizbek Abdullo o’g’li, O’RTA MAXSUS, KASB-HUNAR TA’LIMI TZIMIDAGI TA’LIM MUASSASALARIDA O’QUVCHILAR MA’LUMOTLAR BAZASINI SHAKLLANTIRISH MASALALARI	311-317
Komilov Abdullajon Odiljon o‘g‘li, Nur diodlarining ulanish sxemalari va ishlash rejimlari	318-321
Zulunov Ravshanbek Mamatovich, Samatova Zarnigor Nematovna, KIBER XAVFSIZLIK MUAMMOLARI VA UNI TA’MINLASH USULLARI	322-326
Nabijonov Ravshanbek Muxammadjon o‘g‘li, Nabiyev Iskandar Farxodjon o‘g‘li, Nabiyeva Maysaraxon Shuhratjon qizi, ISHLAB CHIQARISH KORXONALARIDA PAST MALAKALI ISHCHILAR VA ROBOTLAR O‘RTASIDAGI FARQLARNI TAHLIL QILISH	327-329
Soliev Bakhromjon Nabijonovich, Real-Time Moving Object Detection from Video Streams in Python: Techniques and Implementation	330-335
Zulunov Ravshanbek Mamatovich, Soliev Bakhromjon Nabijonovich, Ermatova Zarina Qakhramonovna, Enhancing Clarity with Techniques for Recognizing Blurred Objects in Low Quality Images Using Python	336-340

ORGANIZATION OF WORD SEARCH IN UZBEK TEXTS BASED ON BOYER-MOORE-HORSPOOL ALGORITHM

Husniya Akhmedova
Department of Infocommunication engineering
TUIT named after Muhammad al Khwarizmi, Tashkent, Uzbekistan
khusniya150586@gmail.com

Abstract: The development of modern information and communication technologies has led to an increase in the need for means that express, store, edit, transmit and transform information in the form of text. This article analyzes the methods and algorithms used in the implementation of electronic word processing. Also, the application and features of the Boyer-Moore-Horspool algorithm were studied when searching for a given word in Uzbek texts. On the basis of the experiments, the relevant information and conclusions were obtained on evaluating the effectiveness of the algorithm.

Key words: text, algorithm, text processing, Uzbek language, Boyer-Moore-Horspool algorithm, information search.

Introduction Presentation of data in the form of text is one of the most widely used methods, and text is the most convenient form of information for computer processing. A text is an ordered collection of words that convey a specific meaning. Texts used and processed by computers are called electronic text. A lot of research has been carried out in the world on the organization of word processing and continues today. For example, in the book "125 Problems in Text Algorithms: With Solutions" by Maxime Crochemore, Thierry Lecroq and Wojciech Rytter, about the characteristics of elements that can be found in text files, their classification, approaches used in the organization of preprocessing, models and algorithms detailed information is provided [1]. V.V. Dikovitsky, M.G. Shishaev's research work entitled "Обработка текстов естественного языка в моделях поисковых систем" talks about the computer linguistic model and methods of text preliminary processing and organization of information search [2].

Also, the textbook by E.I. Bolshakova, E.S. Klyshinsky, D.V. Lande et al. naimed (available only in Russian) "Автоматическая обработка текстов на естественном языке и компьютерная лингвистика" covers the main issues of computational linguistics: from the theory of linguistic and mathematical modeling to technological solutions [3]. Classification and clustering of textual information, fundamentals of fractal theory of textual information are considered. The list of such studies can be continued for a long time. The results of conducted and ongoing research can be seen in the capabilities of modern text editors used in computers.

Organization of word search in Uzbek languages texts. Encoding systems are used for electronic representation of text elements in computing machines. Such systems represent the binary code of any symbol that can be found in the electronic text [4,5].

№ tupe	1	2	3	4	5	6
letter	Aa	Bb	Dd	Ee	Ff	Gg
	Hh	Ii	Jj	Kk	Ll	Mm
	Nn	Oo	Pp	Qq	Rr	Ss
	Tt	Uu	Vv	Xx	Yy	Zz
letter+sign	O‘o‘	G‘g‘				
letter+letter	Shsh	Chch	ng			
sign	'					

Table-1. Latin alphabet of the uzbek language

Texts in the Uzbek language are expressed using letters and symbols of Latin graphics. Table 1 below lists the letters of the Latin alphabet.

Electron word processing refers to the input, editing, formatting and printing of text and documents using computers. This process can be complex depending on the creation, design, structure and other technical features of the text. Today, using modern technologies, it is possible to obtain useful information from electronic text, check it and process it accordingly. The basis of such technologies are the methods, models and algorithms used in the organization of text processing.

Researchers such as A.Norov, Sh.Muradov, B.Akmuradov, U.Khamdamov, Dj.Elov, Dj.Sultanov, I.Narzullayev, M.Mukhiddinov have discussed a number of problems of organizing the processing of Uzbek texts and their computer-linguistic solutions in their works [6-10]. However, there are many issues that arise in the implementation of Uzbek word processing and are waiting for their solution. Small texts can be read and analyzed without using special tools. However, it takes a lot of time and resources to extract and analyze the necessary information from a large amount of text.

To solve this problem, algorithms are used that search for a given string of characters in the text. Such algorithms include the traditional one-character sequential search algorithm, the Boyer-Moore-Horspool algorithm [11], which searches for a string based on the values of a character listed in a comparison table, the Rabin-Karp algorithm, which searches for a string based on hashed patterns in the text [12], an example is the Axo-Korasik algorithm [13], which searches for a string using a prefix tree. Each of these types of algorithms has its own capabilities, and it is possible to achieve high efficiency by using one or more of them based on the characteristics of computing machines and given text.

Methods. The Boyer-Moore-Horspool algorithm is an algorithm used to find a sequence of M symbols $0 \leq M \leq N$ from a string of N symbols.

The process of organizing a search for a selected word from a given text can be explained with the following example. From the text below

Let it be necessary to find the word M = "assalom". N = "The given text starts with the word assalam".

The search process is organized in two stages. In the first step, a comparison table d is created:

In this case, the string of characters to be searched for is numbered in ascending order, starting from the last remaining character by deleting one character at a time.

Depending on the structure of the word, there are some additional rules for creating a comparison table. For example, if the selected word is "assalom". The comparison table is formed in the following order.

Step 1. The last character of the word "m" is deleted and the number 1 is assigned to the letter "o" at the end of the remaining characters. This number 1 means that 1 character is deleted.

a	s	s	a	l	o	m
					1	

Step 2. When the second character is removed from the end of the word, the number 2 is given to the letter "l" remaining at the end.

a	s	s	a	l	o	m
				2	1	

Step 3. When the third character is removed from the end of the word, the number 3 is assigned to the letter "a" remaining at the end.

a	s	s	a	l	o	m
			3	2	1	

Step 4. When the fourth character is deleted from the end of the word, the number 4 is given to the letter "s" remaining at the end.

a	s	s	a	l	o	m
		4	3	2	1	

Step 5. According to the rule, when the fifth character is removed from the end of the word, the number 5 must be given to the letter "s" remaining at the end. However, since the letter "s" has already been found among the deleted characters, the number assigned to it is repeated, that is, the number 4 is added.

a	s	s	a	l	o	m

4	4	3	2	1	

Step 6. In accordance with the solution in step 5 discussed above, the letter "a" is given the number 3.

a	s	s	a	l	o	m
3	4	4	3	2	1	

Step 7. If the character at the end of the word occurs only 1 time in the word, its corresponding number is equal to the length of the word. If this character occurs more than once in the word structure, it is marked with the number of the character closest to the end in accordance with the rules discussed above. In the example under consideration, since the letter "m" occurs once in the word, its corresponding number is defined as 7 for the length of the word.

a	s	s	a	l	o	m
3	4	4	3	2	1	7

The comparison table based on the simplification of repetitions is expressed in the form of table 2 below.

Word letters	**s**	**a**	**l**	**o**	**m**
d table values	4	3	2	1	7

Table-2 Comporasion table for the selected word

At the second stage, searching for a string of characters using the values of the comparison table is carried out as follows. :

- the searched word is superimposed on the first word at the beginning of the given text;

- compatibility of characters is checked from the last character of the word forward;

- if the characters match, it is confirmed that the searched word is the same word. If the symbol does not match, the selected word is moved to a step equal to the value of this symbol in the comparison table and the comparison is made again.

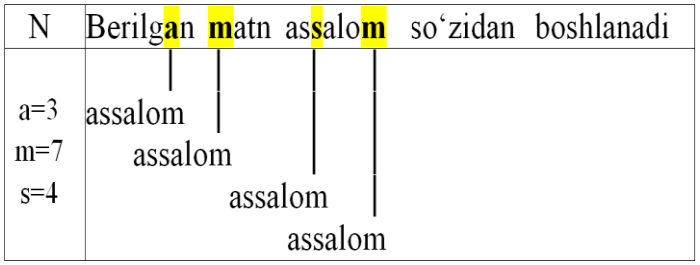

Figure 1. Boyer-Moor-Horspool word search process

If the mismatched symbol is not found in the comparison table, it is moved to a step equal to the length of the word. If part of the word matches, the remaining part does not match, it is moved to a step equal to the value of the last character, and the process continues until the word is found or the text is exhausted.

Software. In most cases, development and testing of software to study and evaluate the general characteristics of the algorithm in question is the optimal solution. In this case, the algorithm can be evaluated in this way.

The first step of the process is to create a comparison table, which is created separately for each search word, and the values of this table differ according to the characteristics of the word. Figure 2 below shows the algorithm for creating a comparison table in the form of a block diagram.

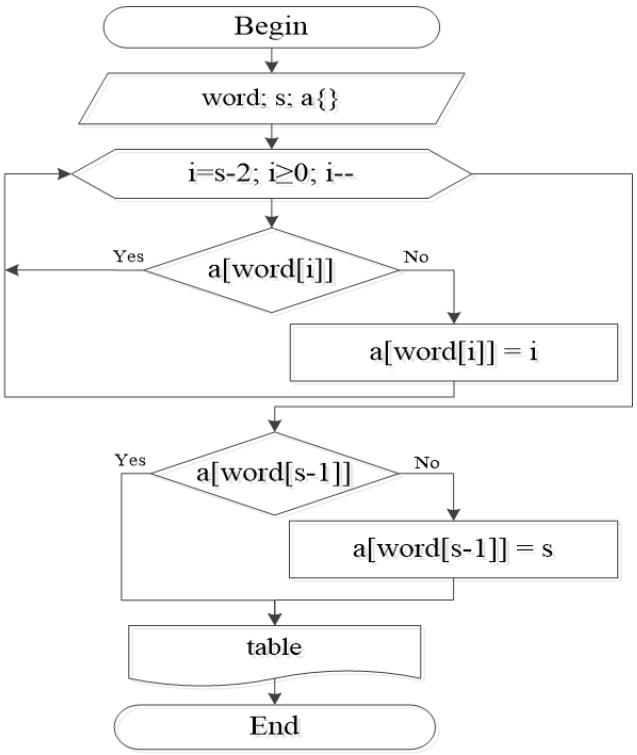

Figure 2. Algorithm block diagram for creating a comparison table for the selected word

Here, word is the searched word, s is the length of the searched word,

a{}-comparison table object.

If we briefly describe the given algorithm,

First, variables are declared;

Appropriate values are given by deleting one character from the end of the word forward. If a symbol occurs more than once in a word, the value of the symbol closest to the end of the word is accepted;

If the end-of-word symbol is repeated in the word structure, it is given the corresponding value of such a symbol. If it is not repeated in the word structure, it is assigned a value equal to the word length. Symbols with the same value are summed to form a comparison table.

At the second stage of the search, using a comparison table, the position of the first character of the word that matches the given pattern is searched for in a large volume of text. The following Figure 3 shows the word search algorithm in the form of a block diagram.

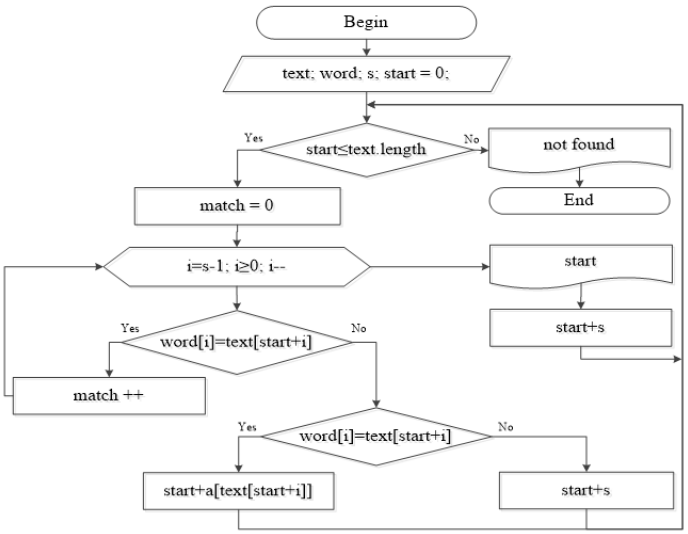

Figure 3. Block diagram of the word search algorithm

Here, the text-search word can be found in a large amount of text; word-searched word; s-searched word length; the cursor position where the search for the word from the start-text begins; the number of characters that match the pattern.

As mentioned above, the given algorithm is used in cases where the length of the searched word is less than the length of the text, otherwise it is declared that such a word does not exist in this text.

The given word is found by moving the template by the values in the comparison table, according to the matching or non-matching of the symbols of the text with the word. The process can be repeated one or more times until the text is finished, taking into account that the searched word can be found more than once in the given text.

Results. Algorithms' complexity is usually measured in terms of execution time or memory used. In both cases, the complexity depends on the size of the input data[14].

The time complexity of the algorithm is determined as a function of the length of the string representing the input data and the running time given the input of the algorithm. The time complexity of an algorithm is usually denoted by a capital "O", where only the highest-order variable is considered. Based on this, the time complexity of the Boyer-Moore-Horspool algorithm is expressed as O(M/|Σ|). Here, Σ

represents the set of characters that can be found in the given text and the searched word. In most cases, the Uzbek language texts use letters of the Latin alphabet, numbers and symbols representing different meanings [15].

The Boyer-Moore-Horspool algorithm is one of the most efficient algorithms because the jump step is determined according to the values in the comparison table. It can be justified by the experiments that this algorithm is several times more efficient than the traditional sequential shift comparison algorithm. Table 3 below shows the time taken to find a word at different points in a 50,000-word text.

№	Position	Time (ms)	
		Simple	BMX
1.	11431	10,2	1,1
2.	12531	10,4	1,3
3.	28392	11	2,1
4.	35425	11,7	2,4

Table 3 Experimental results

The values presented in this table may differ from each other depending on the capabilities of the computers selected for the experiment and the given text sizes. However, the difference in the time spent by the algorithms remains almost unchanged. Even with a sharp increase in the size of the text, a sharp increase in the difference between the times is observed. A graphical representation of the data presented in Table 3 is presented in Figure 4 below.

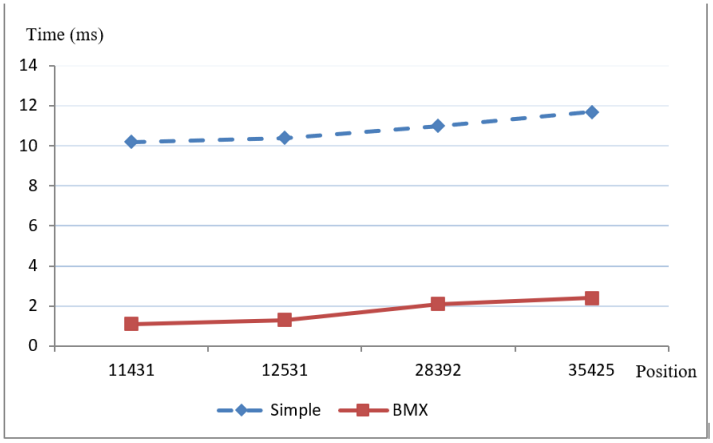

Figure 4. The graph of the position of the word in the text versus the time it took to find it

Conclusions. Today, in many modern text processing and search systems, a hybrid view of a number of algorithms is widely used. Which algorithm to use depends on the type and complexity of the situation that arises in the organization of the process. It should be taken into account that each algorithm has its own advantages, and in some situations it is possible to achieve the highest efficiency based on the simplest algorithm. From the graph obtained as a result of these studies, it can be seen that the considered Boyer-Moore-Horspool algorithm is several times more effective than the traditional search method in organizing a word search from a given Uzbek language text.

References

Maxime Crochemore, Thierry Lecroq and Wojciech Rytter “125 Problems in Text Algorithms: With Solutions” Book, Cambridge university press. 2021 - books.google.com

V.V. Dikoviskiy, M.G. Shishaev “Обработка текстов естественного языка в моделях поисковых систем” Сборник научных трудов 2010.

E.I. Bolshakova, E.S. Klishinskiy, D.V. Lande, A.A. Noskov, O.V. Peskova, Ye.V. Yagunova “ Автоматическая обработка текстов на естественном языке и компьютерная лингвистика” М.: МИЭМ, 2011. – P. 272. ISBN 978–5–94506–294–8

Julie D. Allen, Deborah Anderson, Joe Becker and others “The Unicode Standard Version 7.0 – Core Specification” Includes bibliographical references and index. ISBN 978-1-936213-09-2) (http://www.unicode.org/versions/Unicode7.0.0/)

Ian Waters “ASCII Table” In: PowerShell for Beginners (2021) Apress, Berkeley, CA. https://doi.org/10.1007/978-1-4842-7064-6_13

Akmuradov B., Khamdamov U., Elov Dj., Sultanov Dj., Narzullayev I. Organization of initial text processing in the Uzbek language synthesizer // International Conference on Information Science and Communications Technologies (ICISCT 2021). 4-6 November, Tashkent – 2021. 5p.

Akmuradov B., Khamdamov U., Mukhiddinov M., Zarmasov E., A novel algorithm for dividing uzbek language words into syllables for concatenative text-to-speech synthesizer // International Journal of Advanced Trends in Computer Science and Engineering. Volume 9, No.4, July-August 2020. – P. 4657 – 4664

Akmuradov B.U., Nutq sintezatorining o‘zbek tili lotin alifbosidagi elektron matn elementlarini tahrirlash algoritmi // МУҲАММАД АЛ-ХОРАЗМИЙ АВЛОДЛАРИ Scientific-practical and information-analytical journal. № 1(15), March 2021. –P. 8 – 16

Norov A. The numeral modeling of separating Uzbek words into syllables // «TurkLang-2018». VI International Conference on Computer Processing of Turkic Languages. – Tashkent, October 18-20, 2018. P. 43-48

Norov A.M., Muradov Sh.A. Матн транслитерациясига оид алгоритмларни қуришда компьютер лингвистикасининг зиддиятли масалалари // References: Contemporary Learning Principles and Publication Issues. A collection of articles. Scientific and methodological publication. – Karshi, 2013. -P. 114-119

A.V. Zheludkov, D.V. Makarov, P.V. Fadeev “Исследование алгоритмов точного поиска подстроки в строке” International scientific journal «Символ Науки» №11-3/2016 issn 2410-700x

Harutyunyan E.A., Galstyan D.M. “Анализ алгоритмов поиска строкового шаблона Рабина - Карпа и Кнута - Морриса - Пратта” // Information technology as a basis for progressive scientific research, Collection of international scientific and practical conferences. УФА, 2022

Saima Hasib, Mahak Motwani, Amit Saxena “Importance of Aho-Corasick String Matching Algorithm in Real World Applications” // (IJCSIT) International Journal of Computer Science and Information Technologies, Vol. 4 (3) , 2013, -P.467-469

Deshko I.P., Tsvetkov V.Ya.“Оценка сложности алгоритма” , Journal “Славянский Форум” 3 (33), 2021.-P. 38-49

Akmuradov B., Mukhiddinov M., Sultanov Dj., Narzullayev I. A. methodology of differentiation based on grouping of symbols in the electronic text in uzbek language synthesizer // International Scientific and Practical Conference “Modern Scientific Solutions to Actual Problems” Russia, Rostov-on-Don - 2020. –P. 171-174