TRANSACTIONS

of
Kazakh-American University

II-бөлім
Техникалық ғылымдар сериясы
Part II
Series of engineering sciences
Раздел II
Серия технических наук

III-бөлім
Экономикалық және жаратылыстану ғылымдарының сериясы
Part III
Series of economic and natural sciences
Раздел III
Серия экономических и естественных наук

в) Характеристическое уравнение имеет комплексные корни ($\lambda = -1 \pm 2i$), поэтому при $\alpha = -1$, $\beta = 2$) общее решение дифференциального уравнения имеет вид:

$$y = C_1 e^{-x} \sin 2x + C_2 e^{-x} \cos 2x$$

Литература:

1. *Тюреходжаев А.Н., Касабеков С. И. Метод исследования термоупругих напряжений в неоднородных круглых пластинах, сплошных и полых цилиндрах, оболочках вращения //Тез. докл. междунар. науч. конф. «Современные проблемы механики горных пород». – Алматы, 1998. – С. 127-128.*
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3. *Тюреходжаев А.Н., Кырыкбаев Б.Ж. Осесимметричный изгиб круглой гибкой пластины с жестко заделанным краем под действием распределенной нагрузки по окружности. – Алматы: КазНТУ им. К.И. Сатпаева, 2004. – С. 87-91.*
4. *Кремер Н.Ш. Высшая математика для экономистов: Практикум для студентов вузов, обучающихся по экономическим специальностям / (Серия «Золотой фонд российских учебников»). – М.: ЮНИТИ, 2010.*
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SOLUTION OF THE KAZBAY BI'S GENERATION PROBLEMS WITH UNKNOWN INPUTS DATES ON THE BASE G. H. MEALY'S AUTOMATION

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E.O. Omarov for the first time presented mathematical models in form automations in 1927 by investigation of phonetics of the Kazakh language with Arabic font. These models can described a whole cascade of finite state of automations with input and output alphabets, forming a strongly structured, file dates. In this paper considered calculation Kazbay bi's generation problem with unknown inputs dates. This problem solved on the base G. H. Mealy's automation with three proven theorems concerning the states and output maps.

Е.О. Омаров впервые представил математические модели в 1927 году в виде автоматов для исследования фонетики казахского языка с арабским шрифтом. Эти модели позволяют описать целый каскад конечных автоматов с входными и выходными алфавитами, образующих строго упорядоченную, файловую структуры данных. В данной работе рассмотрена проблема расчета династии Казбай-би с неопределенными входными данными. Эта проблема решена на основе представления автомата Мили и с тремя доказанными теоремами относительно состояний и выходных отображений.

Е.О. Омаров тұңғыш рет 1927 жылы араб қарпіндегі қазақ тілінің фонетикасын зерттеу үшін автомат түріндегі математикалық моделді ұсынған. Бұл модельдер кіріс және шығыс алфавиттері бар, қатаң тәртіптегі файл деректер құрылымын тудыратын ақырғы автоматтардың бүтіндей каскадын сипаттауға мүмкіндік береді. Аталмыш жұмыста белгісіз кіріс мәліметтері туралы Қазнай-би әулетінің есептеу проблемасы қарастырылған. Бұл проблема Мили автоматын ұсыну, сондай-ақ жағдайына және шығыс бейнелерге қатысты үш дәлелденген теорема негізінде шешімін тапқан.

E.O. Omarov [1, 2] for the first time presented mathematical models in form automations in 1927 by investigation of phonetics of the Kazakh language with Arabic font. These models can described a whole cascade of finite state of automations with input and output alphabets, forming a strongly structured, file dates. In this paper considered calculation Kazbay bi's generation problem with unknown inputs dates. This problem will be soled on the base G. H. Mealy's automation.

Accordingly G. H. Mealy's paper [3] we can introduce by following definition.

Definition1. Mealy's Automation is called set

$$M = \{A, Q, V\}, \qquad (1)$$

where

$Q = \{q_1, ..., q_n\}$,

$A = \{a_1, ..., a_n\}$,

$V = \{v_1, ..., v_m\}$, $\qquad (2)$

Map - δ: $Q \times A \rightarrow Q$.

Map - λ: $Q \times A \rightarrow V$, $\qquad (3)$

Q — Set of States,

A — Input alphabet,

V — Output alphabet.

Definition 2. Cartesians multiplication is defined, as

$Q \times A = \{(q_1, a_1), (q_1, a_2), (q_2, a_1), ..., (q_n, a_n)\}$.

Definition 3. Expression $\alpha = a_1, ..., a_n$ is called chain (N. Chomsky, 1957).

Definition 4. Set of the all chains is called Language.

Definition 5. Expression (αa_i) is called word.

Then, using maps from definition 1, we have

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$$\delta(q_i, \alpha a_j) = \delta(\delta(q_i, \alpha), a_j)$$
$$\lambda(q_1, \alpha a_j) = \lambda(\delta(q_i, \alpha), a_j)$$

Definition 6. Map S is called Automatics Map, if:
$$S(q_i, a_j) = \lambda(q_i, a_j)$$
$$S(q_i, \alpha a_j) = \lambda(q_i, \alpha)\lambda(\delta(q_i, \alpha), a_j).$$

Consider custom example. Kazbay Bi was born in the 1772. Kazbay Bi married in forth times on the beautiful Toygan in the 1832. Koyshibay was born in 1833. Šhuakay was born from Koyshibay. Bermukhamed and Kosmukhamed were born from Shuakay. Asat was born from Bermukhamed.

Note of the Inputs - names:

a_1 – Kazbay Bi;

a_2 – Koyshibay;

a_3 – Shuakay;

a_4 – Bermukhamed;

a_5 – Asat.

Note of the states:

q_1 - State (event when was born) of the Kazbay Bi;

q_2 - State (event when was born) of the Koyshibay;

q_3 - State (event when was born) of the Shuakay;

q_4 - State (event when was born) of the Bermukhamed;

q_5 - State (event when was born) of the Asat.

Note of the Outputs:

V_1 - Year of birth of the Kazbay Bi;

V_2 - Year of birth of the Koyshibay;

V_3 - Year of birth of the Šhuakay;

V_4 - Year of birth of the Bermukhamed;

V_5 - Year of birth of the Asat.

According to the mentioned designations, we can construct of the transition table by the following form.

Table 1.

	a_1	a_2	a_3	a_4	a_5
q_1	q_1, V_1	q_2, V_2	$q_3\ V_3$	q_4, V_4	q_5, V_5
q_2	q_1, V_1	q_2, V_2	q_3, V_3	q_4, V_4	q_5, V_5
q_3	q_1, V_1	q_2, V_2	q_3, V_3	q_4, V_4	q_5, V_5
q_4	q_1, V_1	q_2, V_2	q_3, V_3	q_4, V_4	q_5, V_5

q_5	q_1, V_1	q_2, V_2	q_3, V_3	q_4, V_4	q_5, V_5

Theorem 1. On the base dates of the table 1, we can calculate state, as a result of the application of navigation function or Input Map to word or chains

$a_j a_k a_l a_m a_n,$

by following formula

$\delta(q_i, a_j a_k a_l a_m^* a_n) = q_n,$

where

$i = 1, 2, \ldots 5,$

$n \neq j \neq k \neq l \neq m,$

$m, n, j, k, l = 1, 2, \ldots 5.$

Proof.

Theorem is proved by direct calculation of Map of the all kinds of chains.

On the base dates of the table 7 and formula (2), we can write

$\delta(q_1, a_1 a_2 a_3 a_4 a_5) = q_5.$

$\delta(q_2, a_1 a_2 a_3 a_4 a_5) = q_5.$

$\delta(q_3, a_1 a_2 a_3 a_4 a_5) = q_5.$

$\delta(q_4, a_1 a_2 a_3 a_4 a_5) = q_5.$

$\delta(q_5, a_1 a_2 a_3 a_4 a_5) = q_5.$

i.e.

$\delta(q_i, a_1 a_2 a_3 a_4 a_5) = q_5.$

for any

$i = 1, 2, \ldots 5.$

Analogically, we have

$\delta(q_1, a_5 a_4 a_3 a_2 a_1) = q_1.$

$\delta(q_2, a_5 a_4 a_3 a_2 a_1) = q_1.$

$\delta(q_3, a_5 a_4 a_3 a_2 a_1) = q_1.$

$\delta(q_4, a_5 a_4 a_3 a_2 a_1) = q_1.$

$\delta(q_5, a_5 a_4 a_3 a_2 a_1) = q_1.$

i.e.

$\delta(q_i, a_5 a_4 a_3 a_2 a_1) = q_1.$

for any

$i = 1, 2, \ldots 5.$

Continue of our calculation process, we receive proof of the theorem 1, when state in result applying of navigation function or Input Map to word

$a_j a_k a_l a_m a_n,$

is defined by last symbol of our chain.

It is very impotent property is called reachability of states.

Theorem 2. On the base dates of the table 7, we can calculate state, as a result of the application of the Output Map to word chains

$a_j a_k a_l a_m a_n,$

by following formulas

$$\lambda(q_i, a_j a_k a_l a_m a_n) = V_n.$$

where

$i = 1,2,\ldots 5,$

$n \neq j \neq k \neq l \neq m,$

$m,n,j,k,l = 1,2,\ldots 5.$

Proof.

Theorem is proved by direct calculation of Map of the all kinds of chains.

On the base dates of the table 7 and formula (3), we can write

$$\lambda(q_1, a_1 a_2 a_3 a_4 a_5) = V_5,$$

$$\lambda(q_2, a_1 a_2 a_3 a_4 a_5) = V_5,$$

$$\lambda(q_3, a_1 a_2 a_3 a_4 a_5) = V_5,$$

$$\lambda(q_4, a_1 a_2 a_3 a_4 a_5) = V_5,$$

$$\lambda(q_5, a_1 a_2 a_3 a_4 a_5) = V_5,$$

i.e.

$$\lambda(q_i, a_1 a_2 a_3 a_4 a_5) = V_5,$$

for any

$i = 1,2,\ldots 5.$

Analogically, we have

$$\lambda(q_1, a_5 a_4 a_3 a_2 a_1) = V_1,$$

$$\lambda(q_2, a_5 a_4 a_3 a_2 a_1) = V_1,$$

$$\lambda(q_3, a_5 a_4 a_3 a_2 a_1) = V_1,$$

$$\lambda(q_4, a_5 a_4 a_3 a_2 a_1) = V_1,$$

$$\lambda(q_5, a_5 a_4 a_3 a_2 a_1) = V_1,$$

i.e.

$$\lambda(q_i, a_5 a_4 a_3 a_2 a_1) = V_1,$$

for any

$i = 1,2,\ldots 5.$

Continue of our calculation process, we receive proof of the theorem 2, when Output alphabet in result applying of Output Map to word or chains

$a_j a_k a_l a_m a_n,$

is defined by last symbol of our chains.

Theorem 3. On the base dates of the table 7, we can calculate state, as a result application of the Output Automation Map to word or chains

$a_j a_k a_l a_m a_n,$

by following formulas

$$S(q_i, a_j a_k a_l a_m a_n) = V_j V_k V_l V_m V_n,$$

where

$i = 1,2,\ldots 5,$

$i \neq j \neq k \neq l \neq m,$

$i, j, k, l = 1, 2, ..., 5.$

Proof.

Theorem is proved by direct calculation of Map of the all kinds of chains.

Using dates from the table 7 and definition 6, we can calculate Automatics Maps S we receive

$$S(q_1, a_1, a_2) = S(q_1, a_1)\lambda(\delta((q_1, a_1), a_2) = V_1V_2.$$

Analogically, we have

$$S(q_1, a_1a_2a_3) = V_1V_2V_3,$$

$$S_1(q_2, a_1a_2a_3) = V_1V_2V_3,$$

$$S(q_3, a_1a_2a_3) = V_1V_2V_3,$$

$$S(q_2, a_3a_2a_1) = V_3V_2V_1,$$

$$S(q_3, a_3a_2a_1) = V_3V_2V_1.$$

Continue of our calculation process, we receive proof of the theorem 3, when Output alphabet in result applying of Output Automation Map to word

$$a_j a_k a_l a_m a_n,$$

is defined by strictly ordered sequence of symbols of our chain.

Example . Check the accuracy of the following formulas

$$\delta(q_2, a_3a_2) = \delta(q_2, a_3a_1) = q_2.$$

$$\delta(q_2, a_3a_1a_1) = q_3,$$

$$\lambda(q_2, a_3a_2) = V_3,$$

$$\lambda(q_2, a_3a_1) = V_3,$$

$$\lambda(q_2, a_3a_1a_1) = V_1.$$

State Problem:

It is known that V_1 - year of birth Kazbay Bi-1772, V_2 - year of birth Koyshibay – 1833.

We must find Output alphabet:

V_3 - year of birth Shuakay,

V_4 - year of birth Bermukhamed,

V_5 - year of birth Asat.

Apply apparatus of the theory of numerology. Since the year of birth Kazbay Bi-1772, then adding up the numbers, i.e. 1+7+7+2 = 17, we get the number 17.

Thus, accordingly of the theory of numerology [2], we receive of the cyclic cod of the Kazbay Bi generation. Then , we have that Shuakay was born in 1850 (1833 +17), and Bermukhamed in 1867 (+17 1850) and Asat in 1884 year (1867 +17).

Thus:

$V_3 = 1850$ - year of birth Shuakay

$V_4 = 1867$ - year of birth Bermukhamed

$V_5 = 1884$ - year of birth Asat

Control. Accordingly of the archive dates the year of birth Asat is 1884.

казахского языка с арабским шрифтом. Эти модели могут быть описаны целым каскадом конечных автоматов с входными и выходными алфавитами, образующих строго упорядоченную, файловую структуры данных. Эти автоматы мы можем с успехом применить к латинизации казахского языка. Авторы уверены, что математический подход к латинизации казахского языка был дан еще в 1927 году Е.О. Омаровым.

Kazakhstan history knows many examples of a fierce struggle between the arabists and latinists for the Kazakh language. At that time, thanks to the Communist Party, our script switched to Latin alphabet, that was a serious mistake, because absent the full alphabet of Kazakh-due to lack of some letters and means and sounds.

So a little later in the Era of democratization of our society and the rapid development of computer technology has matured a strategic problem for latinization of Kazakh language formulated by the First President of the Republic of Kazakhstan N.A. Nazarbayev, in order to enhance the information space of our country, we will have to solve in the near future.

For solution of the strategic issues of the First President of the Republic of Kazakhstan N.A. Nazarbayev, about latinization of Kazakh language we use E.O. Omarov's approach. Tentatively, we will review the great achievements in the world, made after the opening of the E.O. Omarov.

Thanks to this discovery in science there was a revolution, because it was one of the great discoveries in the field of discrete mathematics. However, the preconditions for the creation of automata theory took place as early as 30-40 years of the last century. This is due to the great scientific discoveries that took place earlier at the same time in the three fields of science, obtained independently. The following areas of science: Mathematics (Turing A.M. (1936) [1], Electrical engineering (Claude Shonnon (1948) [2], Biology (model of a neuron McCulloch and Pitz) [3].

As well as known the development of the theory of automata it began in the 40-50-ies of the last century in the United States. However, this theory for the first time in the world was discovered and proved mathematically in 1955 by the American mathematician G. H. Mealy. Mealy's Automation is one of the Great discovers in the world of the XX century. Therefore, learning of the Mealy's Automation is one of the important Educational problems for students in the world, today. Accordingly G. H. Mealy's paper «Method for Synthesizing Sequential Circuits», which was published in Bell System (Tech J.34, p. p.1045 – 1079, September 1955 [4]).

All of the above discoveries were mathematically described in the language of the theory of automata. G. H. Mealy. For example, the use of the machine in mathematics has been proved as a main unit in a Turing machine working as part of the algorithm. The electrical machine has been presented as the realization of real devices with memory, and biology - as a model of a neuron.

In the USSR the American results became known only in 1956, thanks to the publication of the collection «Automata», ed. McCarthy and Shannon.

This work [5] presents the mathematical models that are opened in 1927 by E.O. Omarov for the investigation of the phonetics of the Kazakh language with Arabic

fonts. These models allow describing a cascade of finite automata with input and c putting alphabets, forming strictly ordered file data structure formal grammar phor ics of the Kazakh language was built, based on the tables of systematization sounds of E.O. Omarov.

These automations are endowed with property of automaton mappings (Am can mathematician Miles introduced in 1957), which by E.O. Omarov seems l converting, when each letter of every Kazakh font uniquely corresponds to only c sound.

This method of constructing a mathematical linguistic automata allowed to scribe strictly all studies of Kazakh scientists, up to 1927, as well as to prove the l of regressive assimilation, and also can be successfully applied to the study of p netics of any language in the world.

All the scientific discoveries of Akhmed Baytursynov, which consisted in the troduction of new and effective alphabet based on Arabic font and grammar to cre a modern Kazakh language, even better than the Tatars at that time, highly noted a praised them. Therefore, thanks to the scientific contribution of A.Baitursynov to native language, our people got a new, unified writing system of their langua which led to a closer union of the writing form and spoken form, which always v ahead of the writing form.

E.O. Omarov in the article «The Arabic font» [5] proves the reasons why trar tion to Latin wasn't well-founded during that time. One of these reasons was that i that, the state which invented Latin was once powerful in the world doesn't exist day. Why Azerbaijan changed their writing system to Latin, because they never c not have their alphabet and the law on a combination of sounds, commensurable creation of words and sentences.

In the work «The Arabic font»" [5] Eldes Omarov for the first time offers to L in supporters to move immediately to Cyrillic. The development of our language la showed the validity and correctness of his ideas, because the process of Latinizati of the Kazakh language failed miserably in Kazakhstan. Therefore, in 1940, we h to pass to the Cyrillic alphabet, which probably was painless, because textbooks the Kazakh language in the Cyrillic were produced before the revolution by Ilminsl Ibray Altynsarin, P.M. Melioransky and others, using the «depravity» of our writt with Arabic script before A.B. Baytursunov. Consequences of a latinization of t Kazakh language sadly affected our writing in general and spheres of culture and si ence, having rejected them on many years ago.

In linguistics are known global research based on mathematical models. For e ample, studies on the use of the frequency of the Kazan school of sounds at the end the XIX century and professor Bekbayev. In our time when it is calculated how ma words, vowels and consonants in a sentence. These results have already dealt with a application of physics and vehicle sounds of Mathematical Statistics in linguistics. I came to the opinion that in view of the strong limitations of studies on the app tion of mathematics and physics apparatus in linguistics problem of misunderstand of the work «About combination of the sounds of the Kazakh language» as a math

matician does not know the basics of linguistics and especially linguist – not knows mathematics.

We lack of understanding of his ideas has resulted only in the assumption that the E. O. Omarov managed to open some new mechanism of the modern algorithm by anyone in the world of the unknown, which directly connects the description of the laws of phonetics of the Kazakh language with Arabic script by a new mathematical apparatus, in particular through its groups of elements. In the early period of our research we proposed that E. O.Omarov used new computer technologies.

Returning to the analysis of the article E. O. Omarov «About combination of the sounds of the Kazakh language» [6], we note of our early mistake, because we wrote, that he used in his work the idea of American descriptive method. However, we have now come to another opinion. Accordingly to materials of the «History of Kazakhstan in the documents and materials», in a report Latinist Abdrahman Baidaliev said, that to him in the morning came member of the Arabian school, who invited him to the American method. The mention of the American method we found in earlier work, E. G. Omarov «Arabic font». It should be noted that the American method (descriptive method) was born in the 20 years of XX century, and it was entirely aimed at the union of the languages of all the tribes of American Indians and lasted exactly 40 years until it was established a common language. In this article, we shall prove that E. O. Omarov had not used descriptive method in your investigations.

And now we proceed to the analysis of the article of E. O Omarov «A combination of sounds of Kazakh language», published in the reports of Kazakh pedagogical Institute in 1927. This article is devoted to the study of phonetics of the Kazakh language. By reading this work, I was astonished and amazed, that all discoveries on the phonetics of the Kazakh language, previously made by scientists, E.O. Omarov combined and presented them as a single structure consisting of the compact mathematical formulas that describes of the phonetic processes.

E.O. Omarov firstly systematized classification of sounds that was established at the beginning by A.B. Baytursynov with the standard classification of general phonetics and presented it in the form:

Systematization table №1

Vowels:		sonority:		noisy:	
extensive	narrow	smooth	nasal	ringing	deaf
а,о,э: a,о).	у,ы: u, ı	л,р: l, r	м,н,ң: m, n, ń	б,з,ж,д,г,ғ: b,z,j,d,g,ğ	п,с,ш,т, к,қ: p,s,ş,t,k,q

In place of articulation sounds can be broken down further into the following groups:

Systematization table №2

lip:	Dental and prepalatal:	Average not palatal:	velar
Smooth – y: u	р,л,и: r,l,y		
Nasal – м: m	н: n		н: ń
Calls - б: b	з,ж,д: z,j,d	г: g	ғ: ğ
Deaf - п: p	с,ш,т: s, ş,t	к: k	қ: q

The whole school grammar of the Kazakh language is based on this clas⸱⸱ tion: the general conclusions about the laws of combinations of sounds of K⸱ language can be made on the basis of this classification. All the rules of grammar of endings, the initials of which vary according to the last sound of th⸱ (or base), can be represented by the following table:

Systematization table №3

The initial sounds suffixes.	Vowels: а,о,ұ,е,ы: a,o,w,e, ı	Smooth: у,р,и,л: u,r,n,l	Nasal: м,н,ң: m,n, ń	Calls: б,з,ж,д,г,ғ: b,z,j,d,g, ğ	Deaf: п,с,ш,т,к p,s, ş,t,k,⸱
	л:l	л:l	д:d	д:d	т:t
	м:m	м:m	н м:n,m	н:n	б:b
	н:n	д:d	д,н:d,n	д:d	т:t
	д:d	д:d	д,н: d,n	д:d	т:t
	ғ: ğ	ч:ç	ч: ç	ч: ç	қ:q
	г:g		г,g	г:g	к:k

Note: The suffixes starting with L at the confluence with the main L ending go into a shape corresponding to a group of nasals (the first sound of the suff⸱ moves to d).

Tables 1-3 are remarkable in that they allow us to build the best simply clearly see the partitioning of all the sounds of the Kazakh language in the var⸱ sets (arrays). E.O. Omarov instead of today's mathematical and computer-langua⸱ the set (array) introduces the concept of a group of sounds. Basically, it's the sam⸱ whatever name we may give to them, they will be composed of the same sounds. more in tune with linguistics, of course, the group. On the other side of the table in his original works are presented in Arabic font and analysis of the work we conducting for a new generation with their transfer to the Cyrillic alphabet, which lows us to confirm the correctness of the ideas E.O. Omarov Kazakh language ⸱ already suggests a systematic analysis of the combination of sounds the Kazakh l⸱ guage, which he does this. All this will direct us to the convenience for the devel⸱ ment of an integrated system of treatment (facet) of the Kazakh language phonet⸱ sounds of E.O. Omarov in the future. We can use tables 1-3 for latinization of ⸱ Kazakh language.

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ИНТЕГРИРОВАННЫЙ ПАКЕТ МАТЕМАТИЧЕСКОГО МОДЕЛИРОВАНИЯ MATHLAB

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В статье рассмотрено использование пакета прикладных программ MATLAB для компьютерного моделирования по техническим дисциплинам. Приведены основные возможности и преимущества программы, ее отличие от других подобных программ, наиболее распространенных и применяемых в инженерной практике.

Бұл мақалада техникалық пәндерде компьютерлік модельдеу үшін MATLAB бағдарламалық пакетін пайдалану жолдары түсіндіріледі. Бағдарламаның негізгі ерекшеліктері мен артықшылықтары, басқа да осыған ұқсас ең көп тараған және инженерлік тәжірибеде қолданылатын бағдарламалардан ерекшелігі талқыланады.

The article describes the use of the MATLAB software package for computer modeling in technical disciplines. Given main features and advantages of the program, its difference from other similar programs of the most widespread and applied in engineering practice.

Для преподавания дисциплин по специальности «Радиотехника, электроника и телекоммуникации» требуется универсальная программа моделирования