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CREATION ON THE BASIS OF SYSTEM TABLES OF CONTINUOUS CASCADE SOUNDS A. BAYTURSYNOV AND E. OMAROV'S SETS FOR COMPUTER RESEARCH OF THE PHONETICS OF THE KAZAKH LANGUAGE IN LATIN ALPHABET

Annotation. This work provides a description of whole cascade sets created on the basis of the developed programming software in the form of system tables of sounds of whole cascade sets by A. Baitursynov and E. Omarov and a package of applied programs for computer research of the phonetics of the Kazakh language with Latin script.

Keywords: system tables, sound, set, programming software, phonetics, Kazakh language, Arabic and Latin fonts.

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СОЗДАНИЕ НА ОСНОВЕ СИСТЕМАТИЧЕСКИХ ТАБЛИЦ СПЛОШНЫХ КАСКАДНЫХ ЗВУКОВ КОМПЛЕКТОВ А. БАЙТУРСЫНОВА И Е. ОМАРОВА ДЛЯ КОМПЬЮТЕРНОГО ИССЛЕДОВАНИЯ ФОНЕТИКИ КАЗАХСКОГО ЯЗЫКА ЛАТИНСКИМ ШРИФТОМ

Аннотация: В этой работе дается описание целостных каскадных множеств, созданных на основе разработанного программного обеспечения программирования в виде таблиц систематизации звуков сплошных каскадных множеств А. Байтурсынова и Е. Омарова и пакета прикладных программ для компьютерных исследований фонетики казахского языка с латинским шрифтом.

Ключевые слова: таблицы систематизации, звук, комплект, программное обеспечение программирования, фонетика, казахский язык, арабский и латинский шрифты.

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ЛАТЫН ҚАРПІНДЕГІ ҚАЗАҚ ТІЛІ ФОНЕТИКАСЫН КОМПЬЮТЕРЛІК ЗЕРТТЕУ ҮШІН А.БАЙТҰРСЫНОВ ПЕН Е.ОМАРОВ ЖИЫНТЫҚТАРЫНЫҢ ТҰТАС КАСКАДТЫ ДЫБЫСТАРЫН ЖҮЙЕЛІК КЕСТЕЛЕР НЕГІЗІНДЕ ЖАСАУ

Аннотация. Бұл жұмыста А.Байтұрсынов пен Е.Омаровтың тұтас каскадты жиынтықтарындағы дыбыстарды жүйелік кестелер түрінде және латын қарпімен белгіленген қазақ тілі фонетикасын компьютерлік зерттеуге арналған қолданбалы бағдарламалар пакеті түрінде өңделген бағдарламалық қамтамасыз ету негізінде құрылған тұтас каскадты жиынтықтар сипатталған.

Тірек сөздер: жүйелеу кестелері, дыбыс, жиынтық, бағдарламалық қамтамасыз ету, фонетика, қазақ тілі, араб және латын қаріптері.

Introduction

In [1], in first time in the world, were presented A.B.Baitursynov's and E.O.Omarov's systematization tables of sounds and mathematical models in the form of the E.O.Omarov's automation (1927) with Input and Output alphabets, forming strictly ordered file structure of data with application of the apparatus of the formal grammar for investigation of the phonetics of the Kazakh language with Arabic fonts. In [2] were investigated E.O.Omarov's (1927) and J.H.Mealy»s [3] (1957) finite deterministic automations.

Our goal of this work are construction on the base A.B. Baitursynov «s and E.O.Omarov's systematization tables of sounds of the whole cascade sets and working out of the programming software in form of the packet of applied programs for computer investigations of the phonetics of the Kazakh language with Latina font.

According to [1] in the Kazakh language there is the whole of 43 sounds: 9 vowels and 34 consonants. From these vowels are described by 5 letters: «а», «о», «э», «у», «ы», so that each of these, except «э», in dependence with presence of the preventive soft sign (and another softening conditions), or absence his, -it is written either softly («а*», «о*», «у*», «и») or firmly («а», «о», «у», «ы»).

For representing of 4 consonants: «к» and back palatal «қ»; «г» and back palatal «ğ», set to one letter for each; others even 30 consonants are described by 15 letters so that each of these is written in the dependence of the presence either absence or of softening conditions or softly or firmly.

By degree of the participation voice sounds of the Kazakh language accordingly to the general phonetic: can be broken by following 5 groups: vowels, liquid, nasal, clear, voiceless, so that in the group of liquid, judging by influence signs of sounds on (following) initial sounds of suffixes, it is necessary take too «w», «j».

Similar classification of the sounds of the Kazakh language firstly was established by A.B. Baitursynov, and later was changed on the Congress of the Kazakh Scientists in 1924; its coordinated with general accepted classification of the common phonetic and it was presented in the following form:

A.B. Baitursynov's systematization table #1

Vowels:		Sonorours :.		noisy:	
wide	narrow	liquid	nasal	clear	voiceless
а,о,э:	у,ы:	w, j,л,р:	м,н,ң:	б,з,ж,д,г,ғ:	п,с,ш,т, к,қ:
a, o, a*	u, y*	w, j,l, r	m ,n ,ń	b, z, j, d, g, ğ	p, s, ş, t, k, q

On the base data of the table #1 we can construct by following fails:

A_1- fail of the wide vowels sounds
A_1{а,о,э}$\rightarrow A_1\{a,o,\hat{a}\}$
A_2- fail of the narrow vowels sounds
A_2 {у,ы}$\rightarrow A_2\{u,\hat{u}\}$
A_3- fail of the liquid sonorous sounds
A_3{л,р}$\rightarrow A_3\{l,r\}$
A_4- fail of the nasal sonorous sounds
A_4 {м,н,ң}$\rightarrow A_4\{m,n,\hat{n}\}$

By means of the formation of consonant sounds we can be broken still by following groups:

E.O.Omarov's systematization table #2

Labial:	Dental forepalatal:	Neuter palatal:	Back palatal
Liquid– у: u	и ,р,л,: i, r, l		
Nasal – м: m	н: n		ң: ń
Clear - б: b	з,ж,д: z, j, d	г: g	ғ: ğ
Voiceless - п: p	с,ш,т : s, ş , t	к : k	қ: q

On the base data of the table 2 we can construct by following fails:

A_5- fail of ringing noisy sounds
A_5{б,з,ж,д,г,ғ}$\rightarrow A_5\{b,z,j,d,g,\hat{g}\}$.
A_6- fail of the ringing noisy sounds
A_6{п,с,ш,т,к,қ}$\rightarrow A_6\{p,s,\hat{s},t,k,q\}$.
A_7- fail of the smooth lip sounds
A_7{у}$\rightarrow A_7\{u\}$
A_8- fail of the nasal lip sounds
A_8{м}$\rightarrow A_8\{m\}$
A_9- fail of the calls lip sounds
A_9{б}$\rightarrow A_9\{b\}$
A_{10}- fail of the deaf lip sounds
A_{10}{п}$\rightarrow A_{10}\{p\}$
A_{11}- fail of the smooth dental and pre palatal sounds
{и,р,л}$\rightarrow A_{11}\{i,r,l\}$
A_{12}- fail of the nasal dental and pre palatal sounds
A_{12}{н}$\rightarrow A_{12}\{n\}$
A_{13}- fail of the nasal dental and pre palatal sounds
A_{13}{з,ж,д}$\rightarrow A_{13}\{z,\hat{z},d\}$
A_{14}- fail of the nasal dental and pre palatal sounds
A_{14}{с,ш,т}$\rightarrow A_{14}\{s,\hat{s},t\}$
A_{15}- fail of the calls average non palatal sounds
A_{15} {г}$\rightarrow A_{15}\{g\}$
A_{16}- fail of the deaf average non palatal sounds
A_{16}{к}$\rightarrow A_{16}\{k\}$
A_{17}- fail of the nasal velar sounds
A_{17}{ң}$\rightarrow A_{17}\{\hat{n}\}$
A_{18}- fail of the calls velar sounds
A_{18}{ғ}$\rightarrow A_{18}\{\hat{g}\}$
A_{19}- fail of the deaf velar sounds
A_{19}{қ}$\rightarrow A_{19}\{k\}$.

On the base of this classification are constructed the whole school grammar of the Kazakh language: on the base of this classification can make also common conclusions about laws of combination sounds of the Kazakh language in generally. All rules of the formal grammar about endings, initials letters are changed in dependence of the last sound of the root (or base), can be represented by the following table:

E.O.Omarov's systematization table #3

	Vowels:	Liquid:	Nasal:	Clear:	Voiceless:
Initial sounds suffixes.	а,о,ұ,е,ы: a, o, w, e, ı	у,р,и,л: u, r, n, l	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
	л: l	л: l	д:d	д:d	т:t
	м: m	м: m	н м: n, m	н:n	п:p
	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	ғ: ğ	ғ: ğ	ғ: ğ	қ:q
	г: g	г: g	г,g	г:g	к:k

On the base data of the table #3 we can construct by following fails:

A_{20}- initial sounds of suffixes

A_{20}*{л, м, н,д, г ,ғ}*$\rightarrow A_{20}${*l, m, n, d, g ,ĝ}*

for vowels sounds

A_{21}{*а, о, ұ, е, ы,}*$\rightarrow A_{21}${*a, o, û, e, ŷ,}*.*

A_{22}- initial sounds of suffixes

A_{22}{*л, м, д, д, ғ, г }*$\rightarrow$, A_{22}{*l, m, d, d, ĝ, g}*,*

for smooth sounds

A_{23}{*у, р, и, л}*$\rightarrow A_{23}${*u, r, e, l}*.*

A_{24} - initial sounds of suffixes

A_{24}{*д, н (м), д (н), д (н), ғ, г}*$\rightarrow A_{24}${*d, n (m), d (n), d (n), ĝ, g}*,*

for nasal sounds

A_{25}{*м,н,ң}*$\rightarrow A_{25}${*m,n,n̂}* .*

A_{26} - initial sounds of suffixes

A_{26}{*д, н, д, д, ғ, г }*$\rightarrow A_{26}${*d, n, d, d, ĝ, g}*,*

for clear sounds

A_{27}{*б, з, ж, д, г, ғ}*$\rightarrow A_{27}${*b, z, j, d, g, ĝ}* .*

A_{28} - initial sounds of suffixes

A_{28}{*т, б, т, т,* қ , г*}*$\rightarrow A_{28}${*t, b, t, t, q, g}*,*

for deaf sounds

A_{29}{*п, с, ш, т, к, қ}*$\rightarrow A_{29}${*p, s, ŝ, t, k, q}*.*

Notation #1: Suffixes beginning with л **(l)** at the blending with main л **(l)** finished on л **(l)**, pass over into form corresponding to the nasal group (first sound of the suffix л **(l)** go to д**-(d).**

E.O.Omarov's notation #1 we can comment by following way.

Resume: In according to construction of table 3 consider the sets

$A_{20,}$ $A_{22,}$$A_{24,}$ $A_{26,}$ $A_{28;}$

These sets are strictly well regulated.

However all sets

$A_{20,}$ $A_{22,}$ $A_{24,}$ $A_{26,}$ $A_{28,}$

consists from 6 elements except $A_{22.}$

Now we consider by following sets:

A_{20}- initial sounds of suffixes

A_{20}{л, м,*н,д, г ,ғ*}$\rightarrow A_{20}${*l, m, n, d, g ,ĝ*}

for vowels sounds

A_{21}{*а,о,ұ,е,ы*}$\rightarrow A_{21}${*a, o, û, e, ŷ*}.

In another hand we consider by following sets

A_{20}. A_{22} and A_{24}.

Note, that the second elements of this sets

A_{20}. A_{22} and A_{24}

are identically (equally m).

Notation #2: Accordingly to construction of sets on the base table 3 we can see that if l - initial sound of suffix for vowels, then obviously that л or **l** belongs to the set

A_{20}{**л**, *м,н,д, г ,ғ*}$\rightarrow A_{20}${*l, m, n, d, g ,ĝ*}

A_{20}{л, м,*н,д, г ,ғ*}$\rightarrow A_{20}${*l, m, n, d, g ,ĝ*} , *i.e.*

then **л (l)** go over into a form corresponding to a group of nasals, i.e.

A_{201} {л, м,*н,д, г ,ғ*}=л $\rightarrow A_{20}${*l, m, n, d, g ,ĝ*} $=l=$ A_{234}{*u, r, e, l*}$\rightarrow A_{241}${*d, n (m), d (n), d (n), ĝ, g*}= *d,*

where **д** or **d** correspondently belongs of this sets

A_{24}{*д, н (м), д (н), д (н), ч, г*}$\rightarrow A_{241}${*d, n (m), d (n), d (n), ĝ, g*}

Consequently, E.O.Omarov already included, speaking by mathematical terminology, concrete Map л → д *or* **l → *d.*** *Father we call this Map as automation Map.*

In his work Eldes Omarov writes:

"Individual letters under each group of sounds (letters – **l, m, n ,d,** ğ, **g** under group of vowels, in this case we consider sets A_{20}- initial sounds of suffixes

A_{20}{л, м,*н,д, г ,ғ*}$\rightarrow A_{20}${*l, m, n, d, g ,ĝ*}

for vowels sounds

A_{21}{*а,о,ұ,е,ы,*}$\rightarrow A_{21}${*a, o, û, e, ŷ,*})

means initial sounds of suffixes and individual particles, of root (or base): such all suffixes, beginning with «**m**"after vowels, retains the same form and for liquid, but for nasal and clear initial sound of the suffix "**m**" go to "**b**" ($A_{202} = A_{222} = A_{242}$=m→ A_{282}=b), for roots ended on the voiceless sound "**b**", in order to transits to «**p**» (for clear sounds

A_{271} *{б,з,ж,д,г,ғ}=б or b =* A_{271} *{b, z, j, d, g, ĝ}* → *p=*A_{291}{*p, s, ŝ, t, k, q*} *i.e.*

b→p.: кем+бе, аз+быз, жаз+ба, кет+пе, көп-іііз, кісі+міз, қара+ма, шал+мыз, көр+ме

(kem+be, az+byz, jaz+ba, ket+pe, köp+piz, kisi+miz, qara+ma, şal+m**yz, k**ör+me**).**

Definition1. The phenomenon of the progressive assimilation is called such process, when previous sound influences on the following. Therefore, we formulate by following theorem about phenomenon of the progressive assimilation.

Omarov's theorem1. For sounds of the Kazakh language presented by tables 1,2,3 exists the phenomenon of the progressive assimilation.

Proof: From this table, we see that change of initial sounds endings for roots (base), having in the end of clear and voiceless sounds, it is presents of the phenomenon progressive assimilation: endings, beginning with sonorous sounds

(l m n) on the base of the table 1 by following forms

л =A_{31}{*л, р*}$\rightarrow A_{31}${*l, r*}=*l,*

A_{41}{*м,н,*$\hat{n}$}=*м* $\rightarrow A_{41}${*m,n,*$\hat{n}$}=*m,*

A_{42}{*м,н,*$\hat{n}$}=*n* $\rightarrow A_{42}${*m,n,*$\hat{n}$}=*n,*

by combination with roots, having in the end of the vowels sound, under influence of noisy sounds are changed such that sonorous sounds **(l, m, n)** of suffixes cross over the corresponding noisy (by vertical columns of the table about place of formation of these sounds), such that after clear sounds follows clear and after voiceless - voiceless.

Father using Maps for endings with vowel sounds we receive proof of theorem1.

Omarov's consequence 1. Combinations "clear" + "no clear» and» voiceless "+"no voiceless" we not see; obviously of similar kind combinations in the Kazakh language are not admitted.

Any word is called Omarov's chain consisted from root, suffix and ending.

Omarov's theorem 2. In relation of nasal sounds table #3 discovers quite reverses of the dissimilation phenomenon.

: **Proof: I**nitial sounds of suffixes are nasal (or generally sonorous) after vowels, by combination with roots, ended on nasal transforms into clear: **"m"** go over to **"b",-** "**n**" " go over to "**d**" - "**l"** " also in "**d**".

Worked out of the programming software in form of the packet of applied programs for computer investigations of presented fails for the phonetics, sin harmonium»s low, Omarov's automation (translator) of the Kazakh language on the base Latina font with Control program (menu).

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