

COMPARISON OF MELODIC PORTRAITS OF ENGLISH AND RUSSIAN DIALOGIC PHRASES

СРАВНЕНИЕ МЕЛОДИЧЕСКИХ ПОРТРЕТОВ
АНГЛИЙСКИХ И РУССКИХ ФРАЗ ДИАЛОГОВОЙ
РЕЧИ

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INTRODUCTION

The present work is a follow up study to the previously introduced model of universal melodic portraits (UMP) of Accent Units* for representation of phrase intonations:

Language- and Speaker Specific Implementation of Intonation Contours in Multilingual TTS Synthesis // Speech Prosody 2006

Universal Melodic Portraits of Intonation Patterns in Russian Speech // "Dialogue 2014"

An Experience of Melodic Portraits Creation of Complex Declarative Sentences of Russian // "Dialogue 2015"

***Accent Unit often referred to as Accent Group (AG)**

DEFINITION-1

- An utterance (sentence) can consist from **one or more intonation phrases (IPh)**
- An **IPh** can be represented by one or more of **AUs (AGs)**
- An **AU** can be composed of one or more **phonetic words (PhW)**
- If there is more than one **PhW** in an AU, then only one word bears the **main stress (MS)** (strong accent) while other words carry a **partial stress (PS)** (weak accent)

DEFINITION-2

Each AU consists of

- **nucleus** (center or head)– the main stressed vowel (syllable),
 - **pre-nucleus** – all phonemes preceding the main stressed vowel, and
 - **post-nucleus** – all phonemes following the stressed vowel.
-

UMP-MODEL. FUNDAMENTALS-1

The UMP model assumes that **topological features** of melodic contour for particular type of intonation do not depend on a **quantity or quality** of phonemic content of AUs pre-nucleus, nucleus or post-nucleus, nor on the **fundamental frequency** range specific for a given speaker.

UMP-MODEL. FUNDAMENTALS-2

The UMP model represent different intonation constructs as a set of melodic patterns in normalized space ***{Time – Frequency}***.

- **Time normalization** is performed by bringing pre-nucleus, nucleus and post-nucleus elements of AU to standard time lengths.
-

UMP-MODEL. FUNDAMENTALS-3

Fundamental frequency normalization is performed by calculation of

□ ***F min and F0 max,***

□ or ***M and ζ*** - statistical values

within the ensemble of melodic contours for different types of intonation produced by a certain speaker.

UMP-MODEL. FUNDAMENTALS-4

Fundamental frequency normalization is calculated by using the formulas:

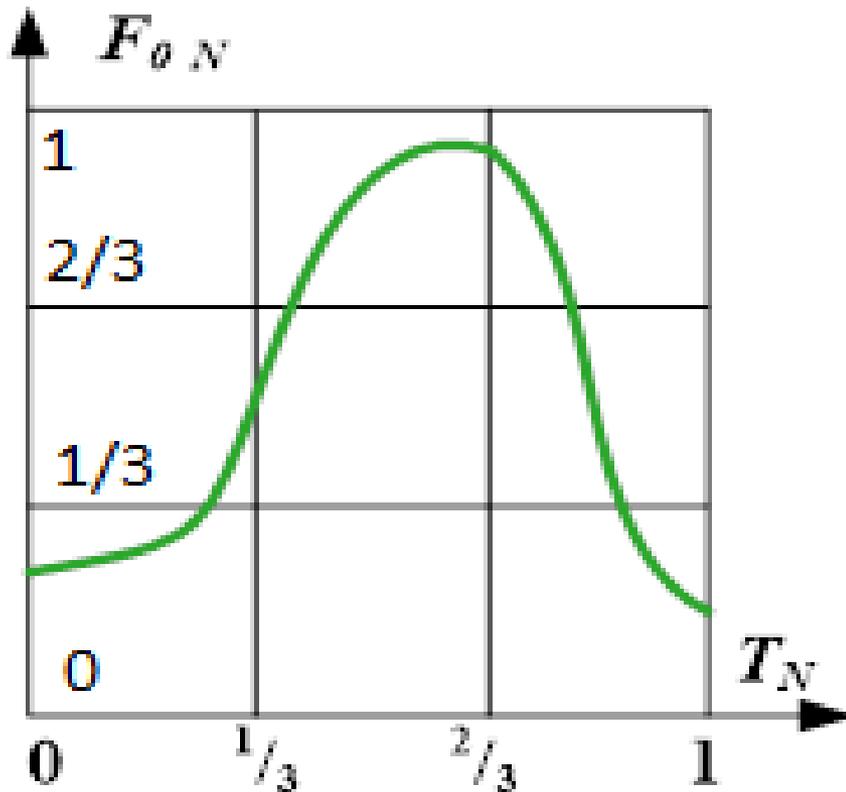
$$F0n = (F0 - F0 \text{ min}) / (F0 \text{ max} - F0 \text{ min}) \text{ or}$$

$$F0n = (F0 - M) / \zeta$$

- **M** is mathematical expectation,
- **ζ** is standard deviation.

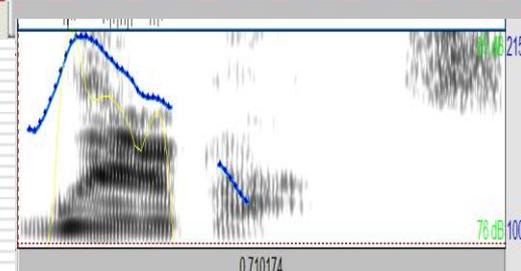
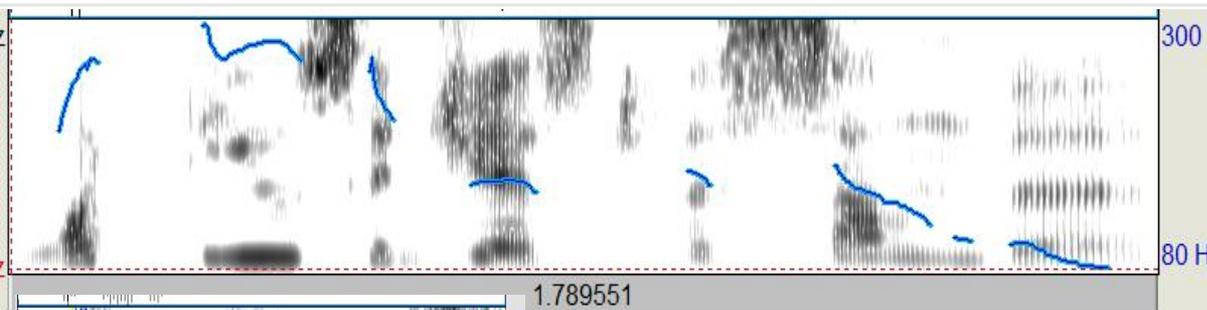
M can be interpreted as a register and *ζ* – as a diapason of speaker's voice.

UMP - STRUCTURE

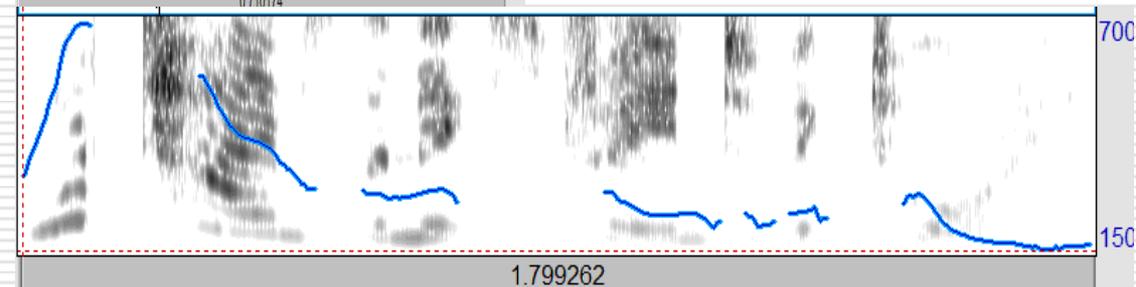


- *The intervals on the abscissa:*
[0 - 1/3] – pre-nucleus, [1/3 - 2/3] – nucleus, [2/3 - 1] – post-nucleus.
- *The intervals on the ordinate:*
[0 - 1/3] – low level, [1/3 - 2/3] – mid-level, [2/3 - 1] – high-level.

ILLUSTRATION-1 (*special question*)



- Male voice:**
1. Wha+t do you suggest for sunburn?
 2. Whe+reabouts?



Female voice:

1. Wha+t time's the next train to Victoria?
2. Ho+w much would it cost?

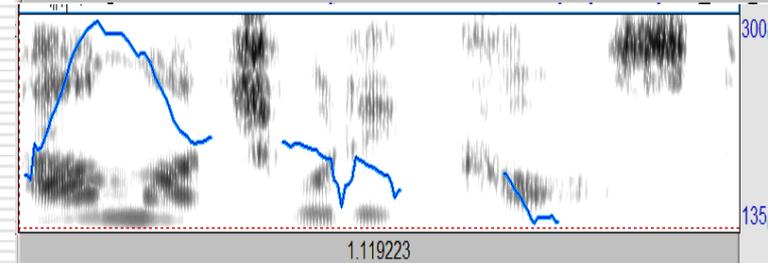
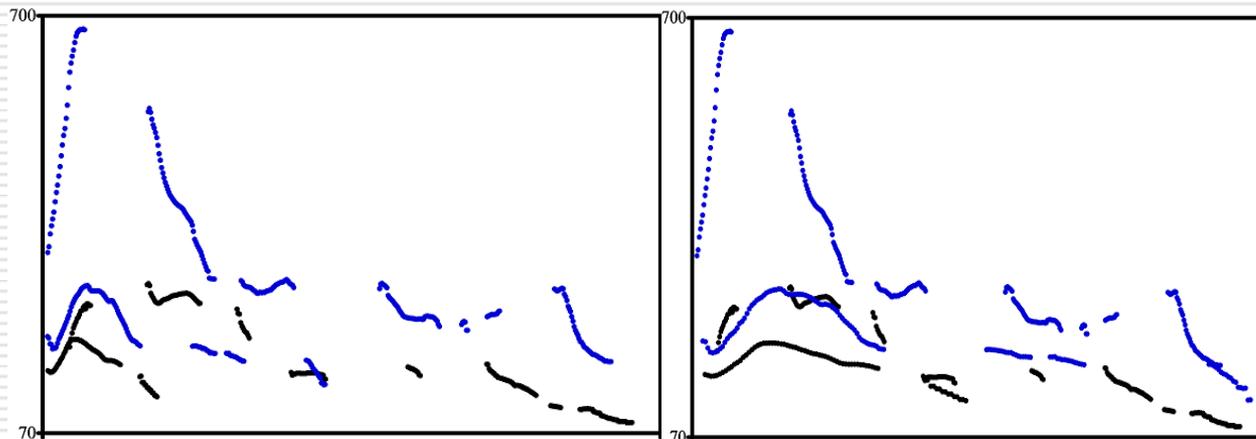
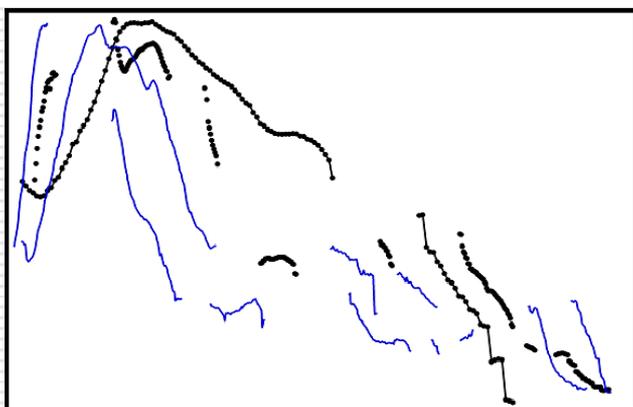


ILLUSTRATION-2 (*nomalization types*)

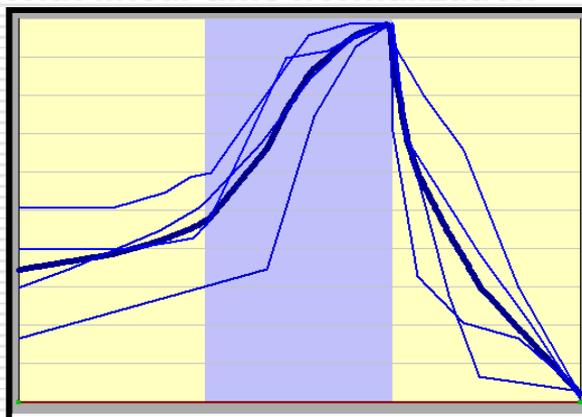


With no normalization

With linear time normalization



With linear time and F0 normalization



With UMP nomalization

Male voice:

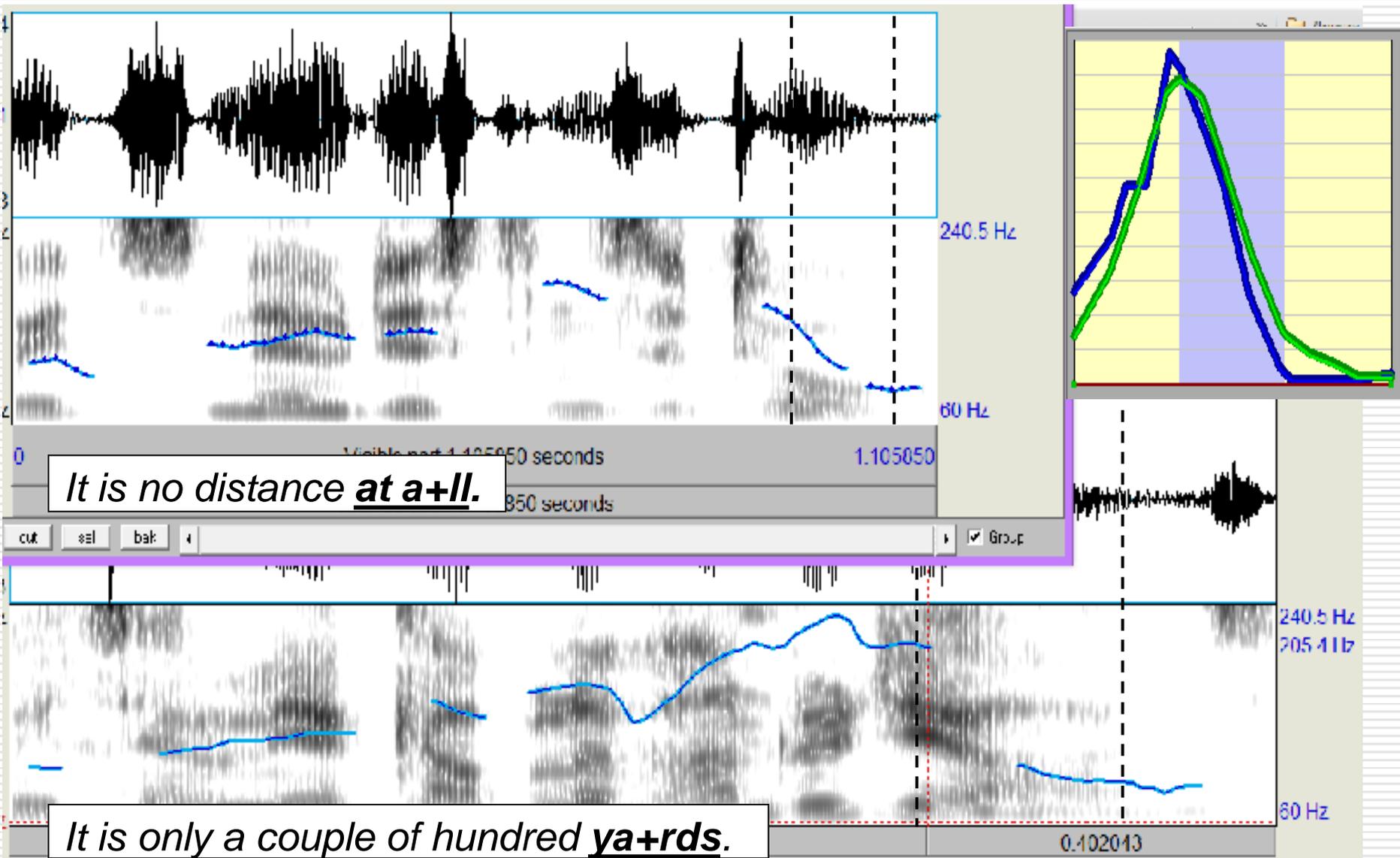
1. Wha+t do you suggest for sunburn?
2. Whe+reabouts?

Female voice:

3. Wha+t time's the next train to Victoria?
4. Ho+w much would it cost?

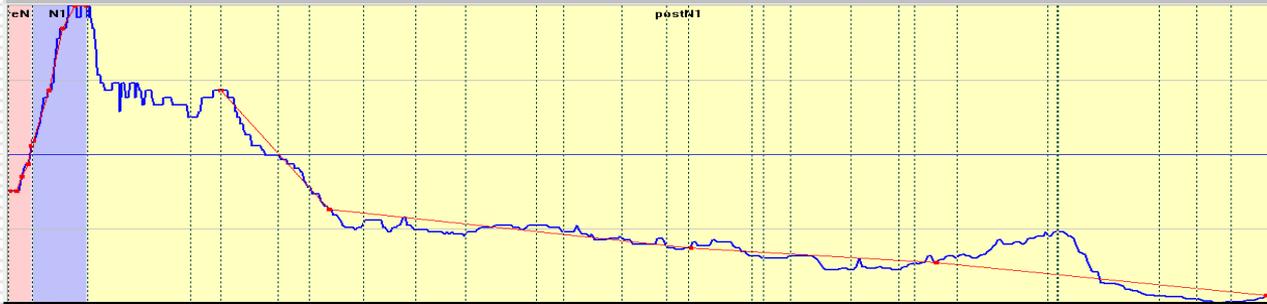
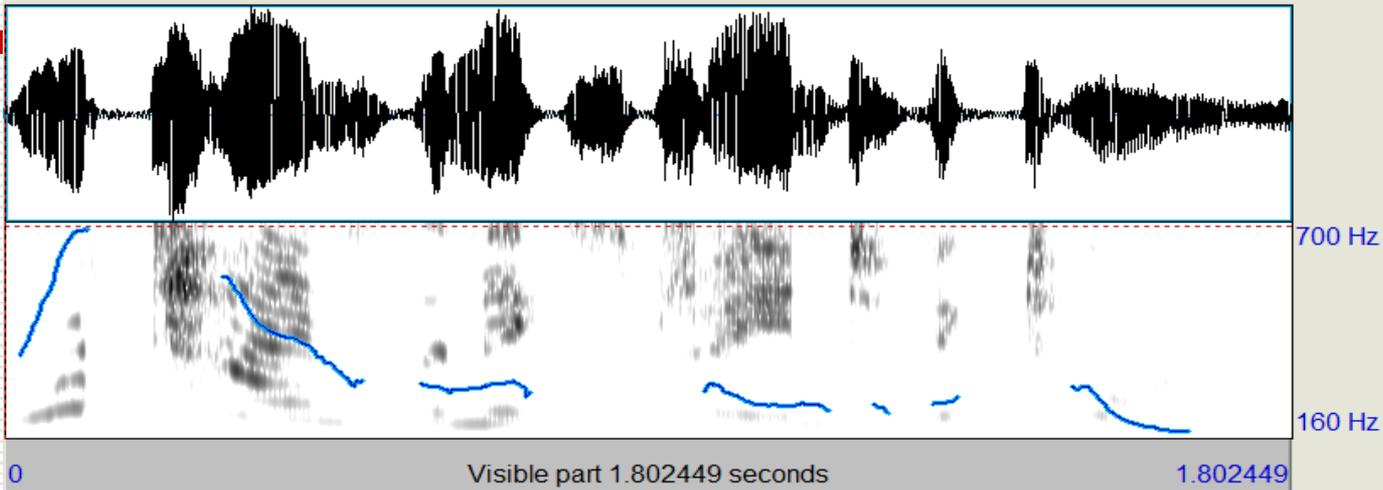


ILLUSTRATION-3 (*affirmative statement*)



UMP-CREATION

'wɒ t t aɪmz ðə ne ks t r eɪ n tu: vɪ k'tɔ:rɪ ə



Female voice:

Wha+t time's the next train to Victoria?

PHONOCLONATOR

PhonoClonator - [IK3 Eng Rus]

File Actions View Settings Window Help

Speaker Voice_arc

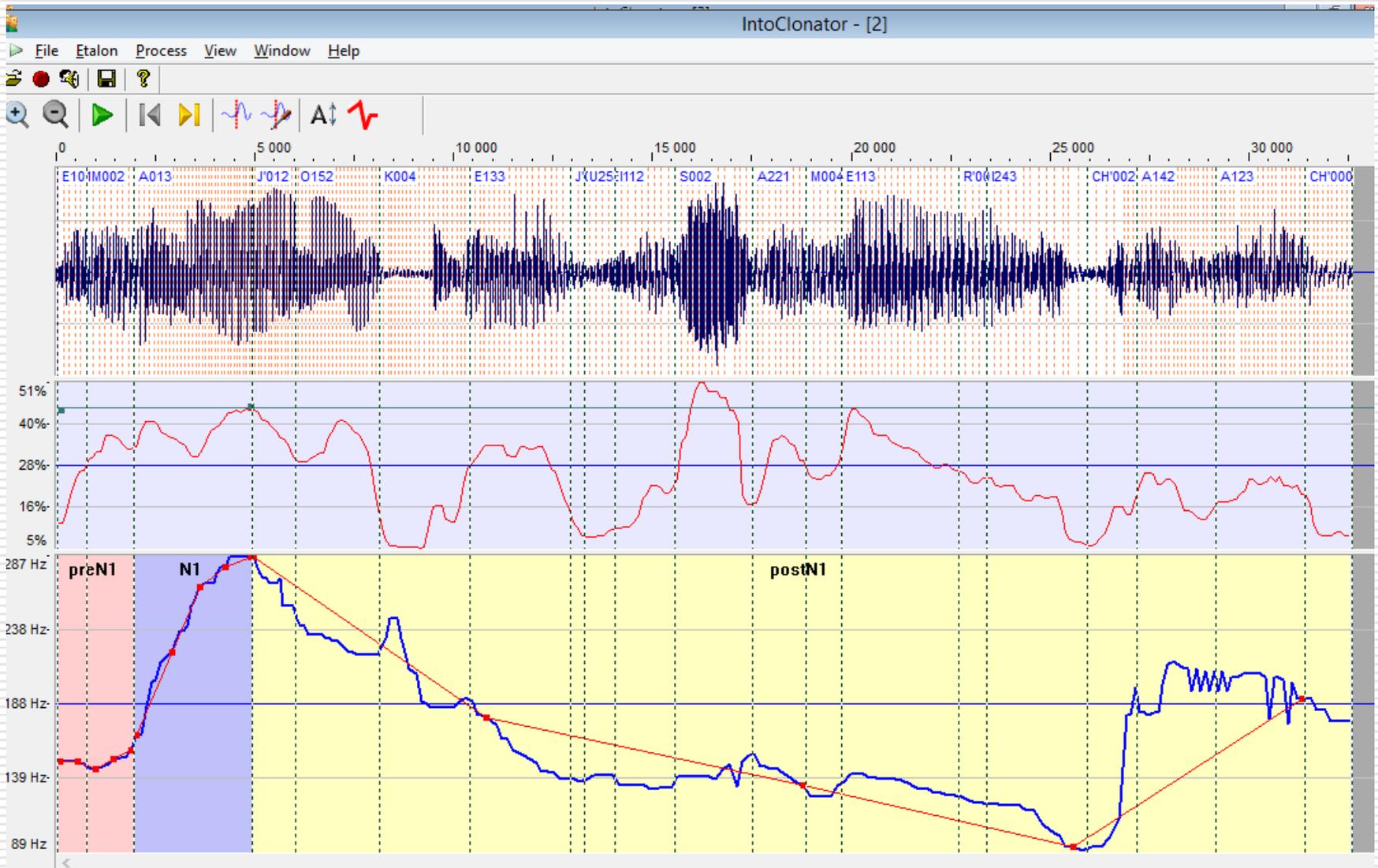
No	Phrase orthographic text	Allophones	Units for phonetic-acoustical base
1	ду= зы=с ба+с го=уту зэстэ=ишэн	D004,U122,_Z004,Y122,Z001,_B002,A012,Z001,_G003,O131,U312,T0...	D004,U122,Z004,Y122,Z001,B002,A012,Z001,G003,O131,U312,T002,U...
2	э=м а+й о=кэ=й уи=з амэ=ри ча=а=ч	E101,M002,_A013,J'012,_O152,K004,E133,J'012,_U253,I112,S002,_A2...	E101,M002,A013,J'012,O152,K004,E133,J'012,U253,I112,S002,A221,M0...
3	ду+йу го=уту зэси= фра=а=нт	D002,U023,J'012,U242,_G003,O131,U312,T002,U222,_Z004,E223,S'00...	D002,U023,J'012,U242,G003,O131,U312,T002,U222,Z004,E223,S'002,I1...
4	нэ=в уи= го+т ма=ч ф=за туго=о=у	N004,E121,F002,_U213,I112,_G001,O032,T001,_M004,A113,CH'001,...	N004,E121,F002,U213,I112,G001,O032,T001,M004,A113,CH'001,V003,...

E101	M002	A013	J'012	O152	K004	E133	J'012	U253	I112	S002	A221	M002	E113	R'012	U243	CH'002	A142	A123	CH'000

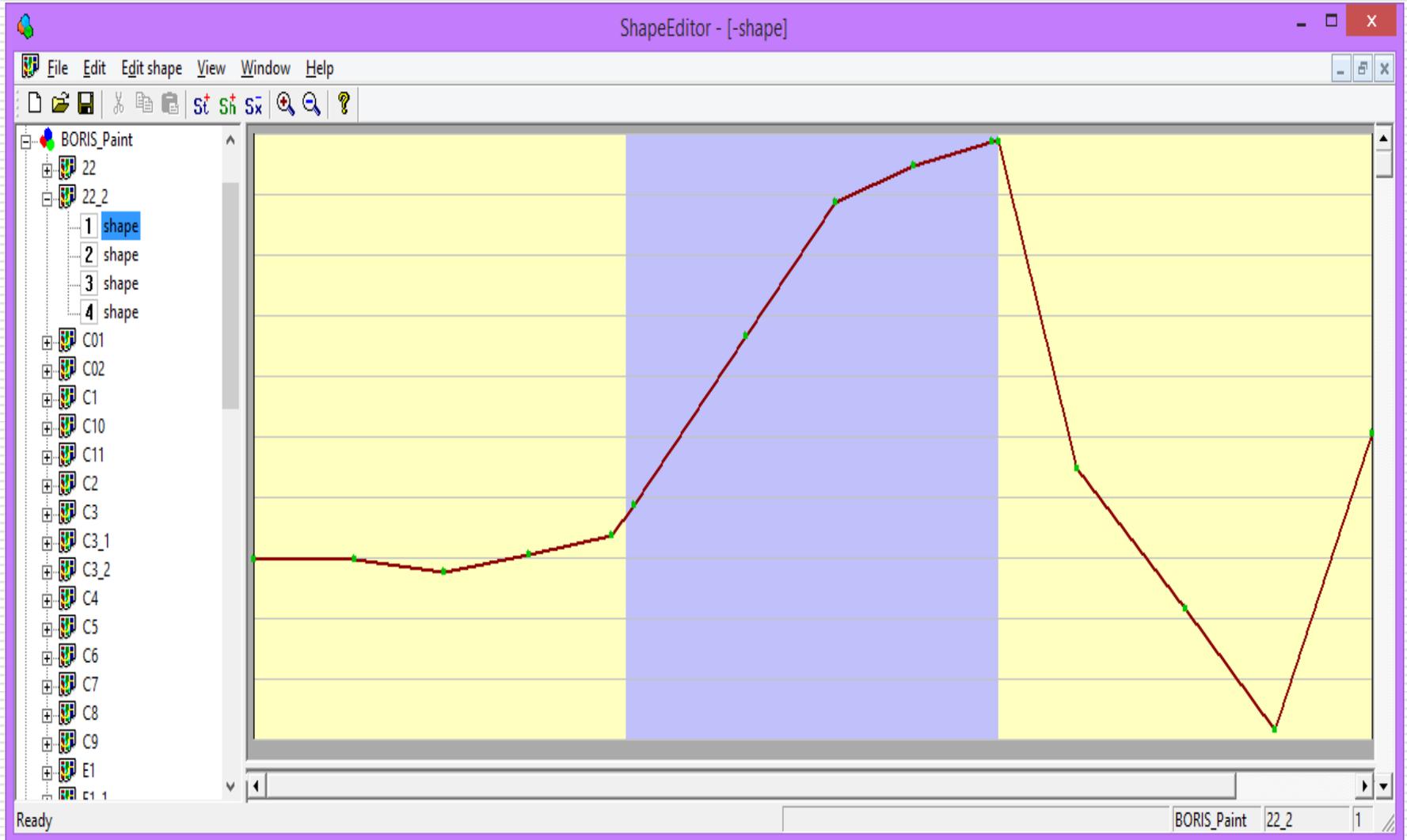
E101	M002	A013	J'012	O152	K004	E133	J'012	U253	I112	S002	A221	M002	E113	R'012	U243	CH'002	A142	A123	CH'000

- A012
- A013
- A113
- A122
- A123
- A142
- A221
- A222
- B002
- CH'000
- CH'001
- CH'002
- D002
- D004
- E101
- E113
- E121
- E123
- E133
- E222
- E223
- F001
- F002
- G001
- G003
- I112
- I141
- I243
- I322
- J'012
- K004
- M002
- M004
- M002

INTOCLONATOR



UMP-CREATOR



SITUATIONAL DIALOGUES

The English Centre, Eastbourne Ockenden M. (2005)

Situations relevant to those studying or travelling in England, including

- ❑ **eating out,**
 - ❑ **entertainment and travel,** as well as more general functions such as
 - ❑ **greetings,**
 - ❑ **complaining,**
 - ❑ **apologizing.**
-

SITUATIONAL DIALOGUES

(content)

The manual includes:

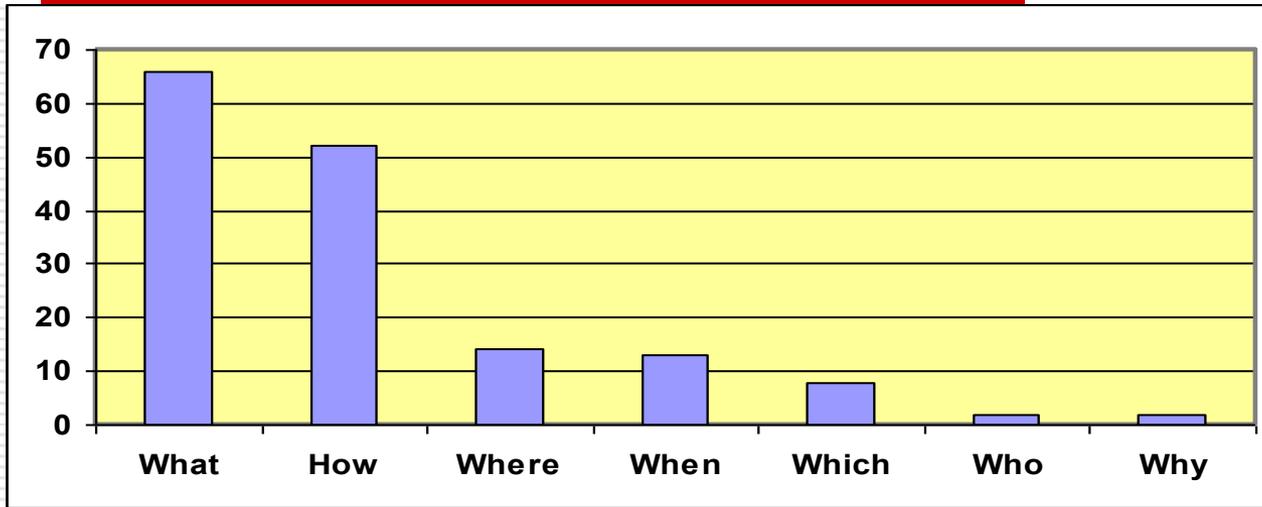
- **44 everyday situations**, each containing four dialogues in natural conversational English;
- All dialogues consist
- **1051 sentences**, spoken by
- **male and female** speakers.

In the present study we have restricted ourselves to three major types of phrase intonation:

- ***Special questions***
 - ***General questions***
 - ***Affirmative statements.***
-

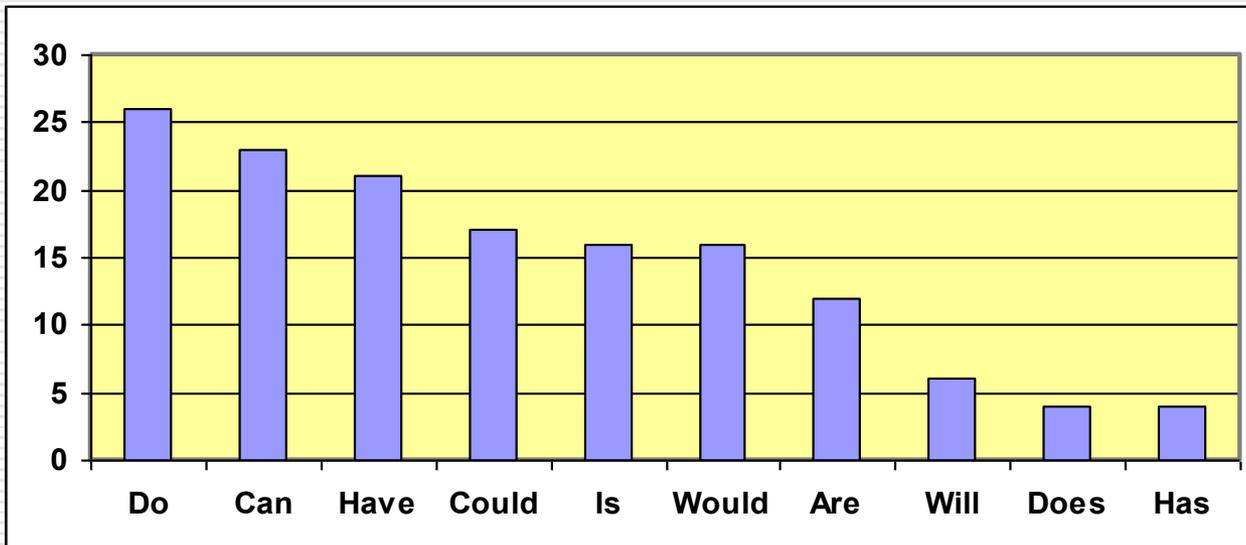
SITUATIONAL DIALOGUES

Interrogative sentences. Statistics



Special
questions

Total: 157



General
questions

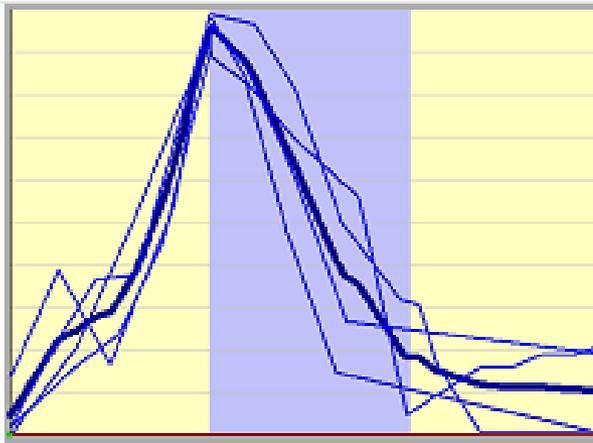
Total: 140

EXAMPLES OF ENGLISH AND RUSSIAN PHRASES (*affirmative intonation of statements*)

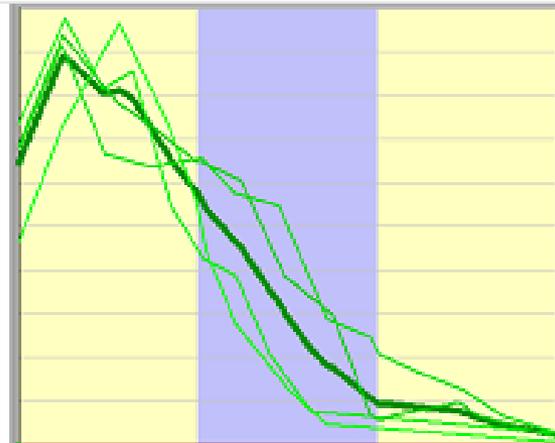
English	Russian translation
<ul style="list-style-type: none">- Is it far?- <i>It is only about five minutes walk.</i>	<ul style="list-style-type: none">- Далеко ли это?- <i>Это всего в пяти минутах ходьбы.</i>
<ul style="list-style-type: none">- Will it take me long to get there?- <i>It is no distance at all.</i>	<ul style="list-style-type: none">- Долго ли мне придётся идти?- <i>Это вообще не расстояние.</i>
<ul style="list-style-type: none">- Should I take a bus?- <i>You can walk it in under five minutes.</i>	<ul style="list-style-type: none">- Мне нужно подождать автобуса?- <i>Вы сможете дойти за пять минут.</i>
<ul style="list-style-type: none">- Is it too far to walk?- <i>It is only a couple of hundred yards.</i>	<ul style="list-style-type: none">- Долго ли идти пешком?- <i>Это всего в паре сотен шагов.</i>

RESULTS OF UMP CREATION

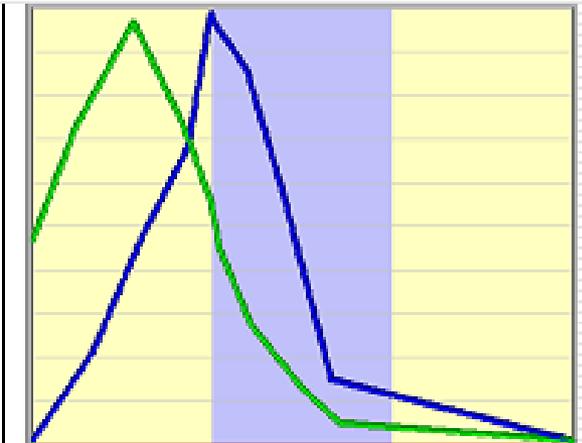
(affirmative statements)



(a) English



(b) Russian



(c) English & Russian

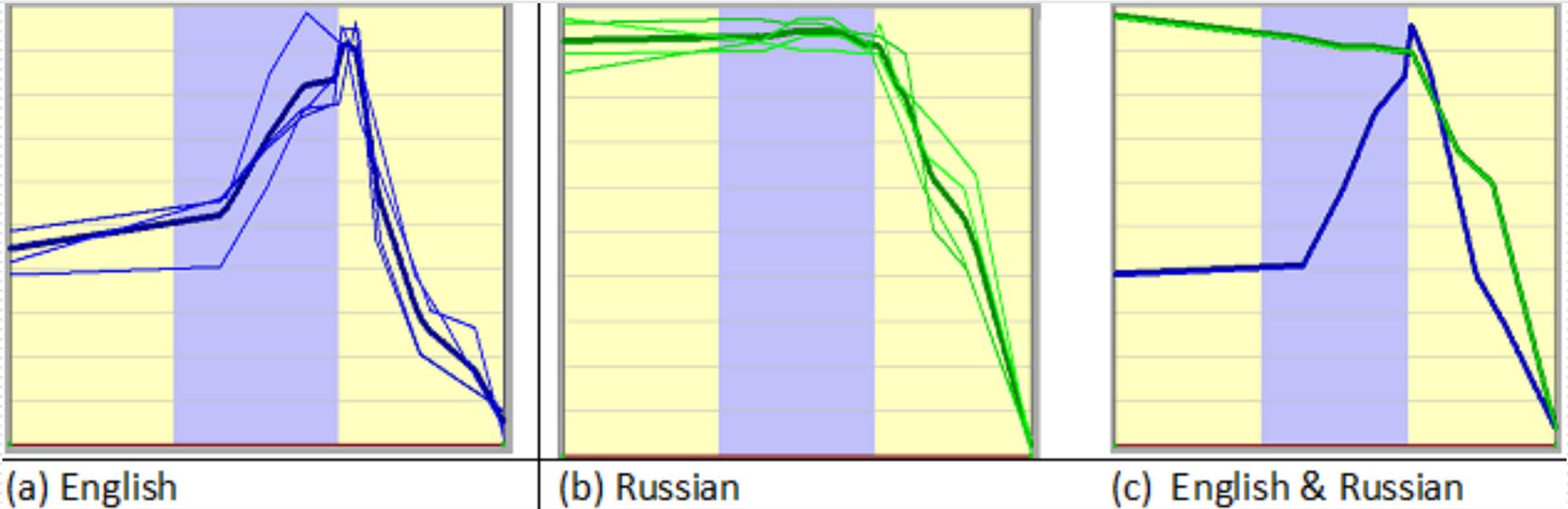
The differences of English and Russian affirmative statement UMPs:

- *the most changes are found in pre-nucleus and nucleus regions;*
- in the pre-nucleus region, maximum of the Russian UMP curve falls closer to the middle of the region, whereas the English UMP curve peaks at the end;
- *in the nucleus region, the English UMP curve is characterized by a sharper decline in comparison to the Russian UMP curve.*
- in the post-nucleus region, both Russian and English MP curves show an identical low level steady decline.

EXAMPLES OF ENGLISH AND RUSSIAN PHRASES (special question)

English	Russian translation
<ul style="list-style-type: none">- <i>What can I get you drink?</i>- A black coffee for me, please.	<ul style="list-style-type: none">- Что Вам налить выпить?- Чёрный кофе, пожалуйста.
<ul style="list-style-type: none">- <i>What are you going to have to drink?</i>- I'd like something cool.	<ul style="list-style-type: none">- А что Вы желаете выпить?- Хотелось бы чего-нибудь прохладного
<ul style="list-style-type: none">- <i>What are you going to have?</i>- A half of bitter, please.	<ul style="list-style-type: none">- Что бы Вы хотели сейчас?- Полкружки горького, пожалуйста.
<ul style="list-style-type: none">- <i>What is it to be?</i>- The same again, please.	<ul style="list-style-type: none">- А что будете Вы?- То же самое, пожалуйста.

RESULTS OF UMP CREATION (special question)



The differences of English and Russian special questions

UMPs:

- - *the most significant changes are found in the pre-nucleus and nucleus regions;*
- - *in the pre-nucleus region, the averaged Russian UMP is characterized by considerably higher level than the English UMP;*
- - *in the nucleus region, the English UMP curve is characterized by a sharp rise in tonal frequency whereas the Russian curve remains on a steady high level;*
- - *in the post-nucleus region, both Russian and English UMP curves demonstrate identical sharp interval decline.*

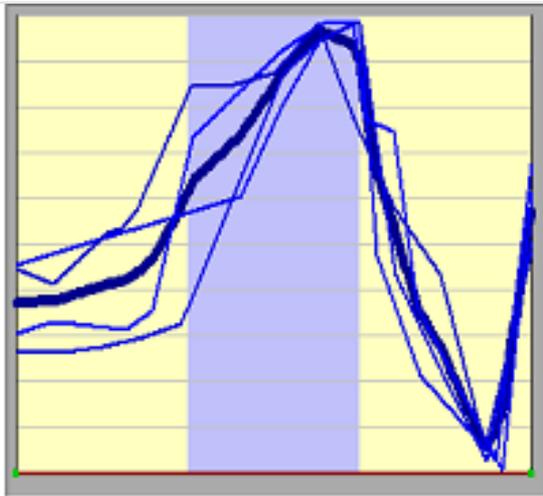
EXAMPLES OF ENGLISH AND RUSSIAN PHRASES

(general question)

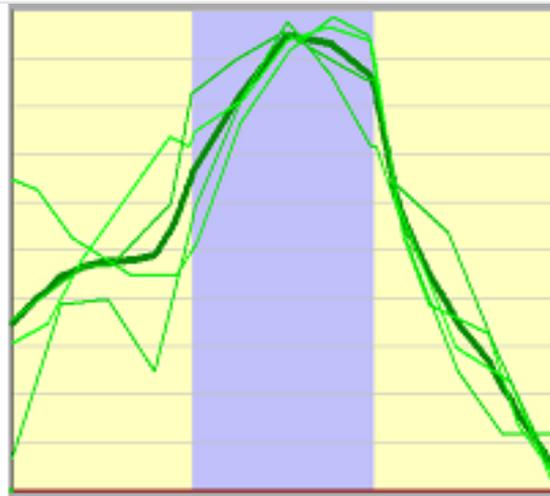
English	Russian translation
<p>- <i>Does this <u>bus</u> go to the station?</i></p> <p>- No, youll have to get off at the bank.</p>	<p>- <i>Этот автобус идет на вокзал?</i></p> <p>- Нет, он идёт к банку.</p>
<p>- <i>Am <u>I</u> OK for St Marys Church?</i></p> <p>- No, we only go as far as the park.</p>	<p>- <i>Я <u>правильно</u> иду к церкви?</i></p> <p>- Нет, вы только дойдёте до парка</p>
<p>- <i><u>Do</u> you go to the sea-front?</i></p> <p>- No, youre going the wrong way.</p>	<p>- <i>Вы идёте к приморскому бульвару?</i></p> <p>- Нет, Вы пошли неправильным путём.</p>
<p>- <i>Have we <u>got</u> much further to go?</i></p> <p>- <u>It's the next stop.</u></p>	<p>- <i><u>Должны</u> ли мы ещё дальше ехать?</i></p> <p>- Ваша остановка – следующая.</p>

RESULTS OF UMP CREATION

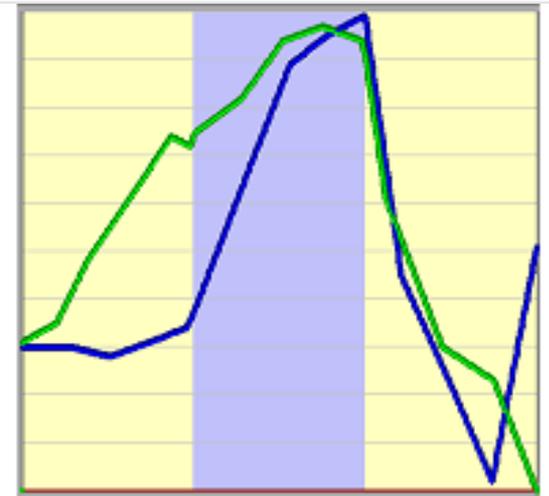
(general question)



(a) English



(b) Russian

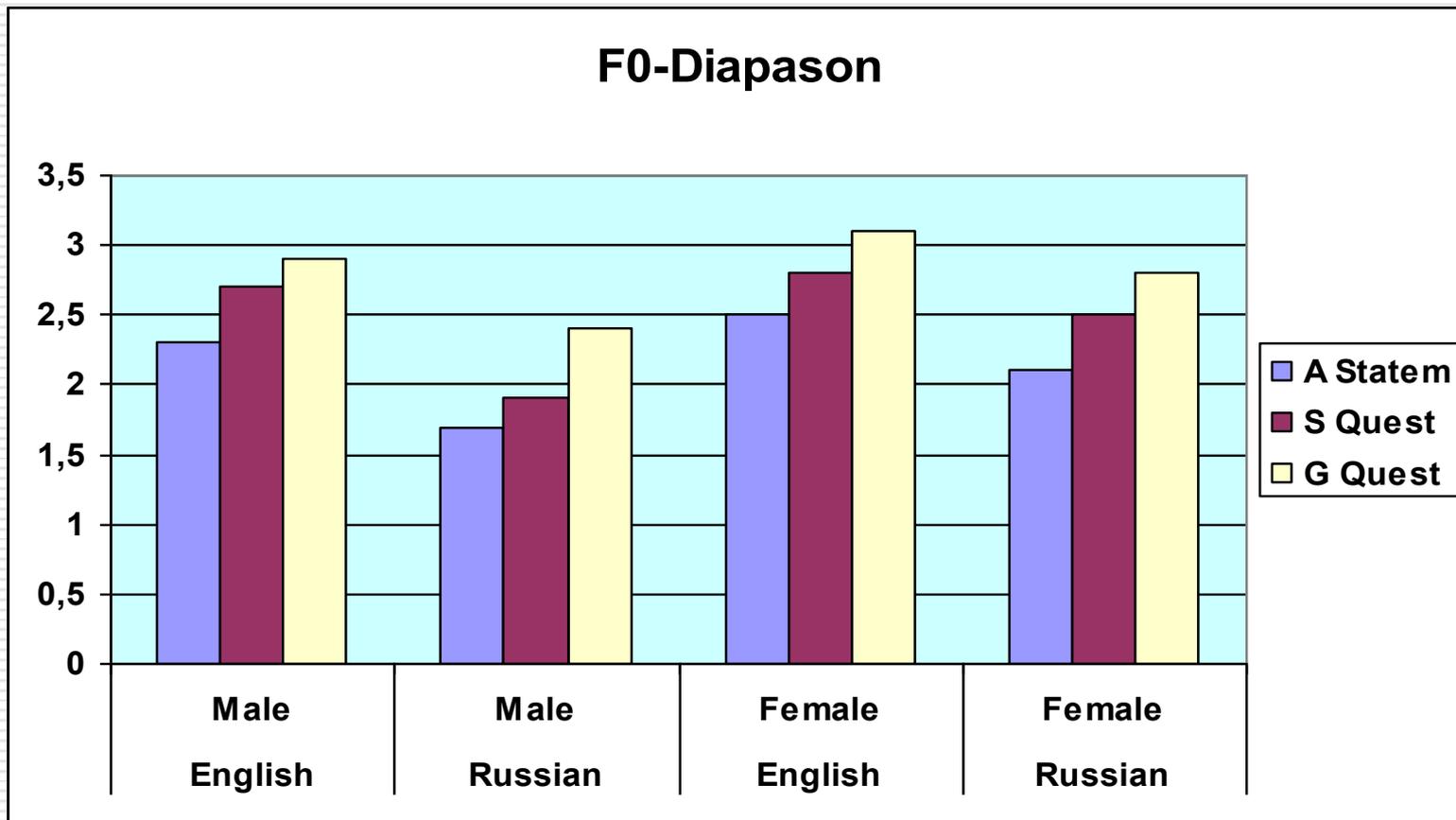


(c) English & Russian

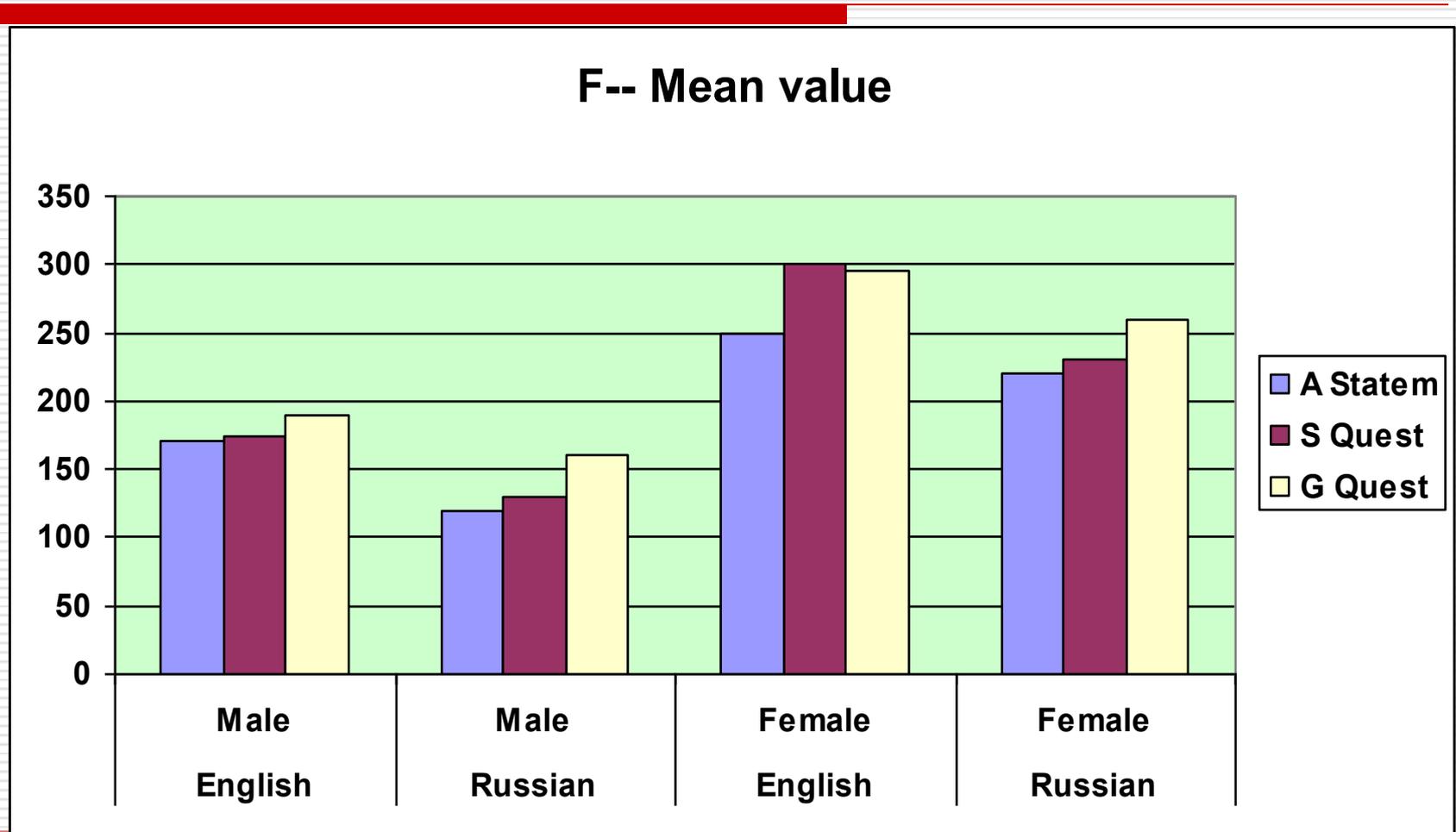
The differences of English and Russian special questions UMPs:

- ❑ - *the most significant changes are found in the pre- and post-nucleus regions;*
- ❑ - *in the pre-nucleus region the English UMP curve is characterized by a steady low level, whereas the Russian UMP follows a substantial rise;*
- ❑ - *in the post-nucleus region the English UMP curve is characterized by sharp decline with a subsequent rise towards the end of the phrase.*
- ❑ - *in the nucleus region, the English UMP curve shows a sharper rise in comparison to the English one.*

F0-STATISTICS



FO-STATISTICS



CONCLUSIONS

- The UMP model of the phrase intonation allows to investigate the **differences between languages** (*for instance, English and Russian*) by applying precise quantitative assessments.
- The UMP model could potentially find an effective application **in foreign language studies**:

Using the appropriate software that realizes the described stages of UMP construction, a learner could be able to visually compare the intonation of the pronounced phrase with its target intonation portrait and work to eliminate a foreign accent by proper training.
