REFERENTIAL CHOICE IN MULTIMODAL COMMUNICATION

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RFBR

Facial

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Russian
Multichannel
Discourse

Prox

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OUTLINE OF THE TALK

1. Russian Pear Chats and Stories (RuPeCS) corpus

2. Referential choice as a phenomenon

3. Annotation and coding

4. Distribution of referential expressions in the corpus

5. Applications: how referential markup in the multimodal framework contributes to studies of human communication

   - Case study I: referential choice and pointing gestures

   - Case study II: referential choice and eye fixations

RUSSIAN PEAR CHATS AND STORIES (RUPECS) AS A MULTIMODAL CORPUS

- https://multidiscourse.ru/main/

- 24 sessions of communication in groups of four participants, discussing "The Pear film" [Chafe 1980]

- Each of them has a fixed role (Narrator / Commentator / Reteller)

- One of the largest multimodal sources in terms of annotated channels

- Vocal, oculomotor, manual, cephalic channels

- Referential annotation: pilot subcorpus of 3 sessions (## 4, 22, 23), 9 videos, total duration: 141 minute

DESIGN

Reteller (R)

Listener (L)

Commentator (C)

Narrator (N)

TECHNICAL SOLUTIONS
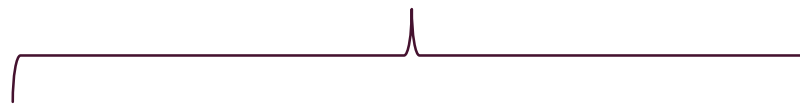
Recorder

JAI GO camera

GoPro camera

Eye tracker

Audio recording

Video recording

Eye movement detection

2. REFERENTIAL CHOICE AS A PHENOMENON

- Referential choice: the choice of a language expression which refers to any definite object or phenomenon.

- The same entity can be referred to in many ways: NP / personal pronoun / reflexive / zero form / ...

- The final choice of the expression depends on a range of linguistic and extralinguistic factors (Arnold 2001; Kaiser, Truswell 2008; Kibrik et al. 2016)

- Full (full NPs) VS reduced reference (personal pronouns / demonstratives / zeroes)

- Deictic and anaphoric reference

TYPES OF ANNOTATED REFERENTIAL EXPRESSIONS (RE)

1. Anaphoric expressions

   ■ Full reference: NP with a head noun or numeral

   (1) a potom spuskaetsâ **[po /l<u>e</u>stnice]**

       'and then [he] passes down the stairs'

   (2) Žuët **[tol'ko /p<u>e</u>rvyj]**

       'Only the first one is chewing'

   ■ Reduced reference: personal pronouns / demonstratives / definite pronouns / indefinite pronouns / zeroes

   (3) Nu potomu <u>čto</u>/**[tot]** nemnožko byl v\š<u>o</u>ke;

       'Well as **[that** *one***]** was a bit shocked'

TYPES OF ANNOTATED REFERENTIAL EXPRESSIONS (CONT.)

2. Deictic expressions: here – only subject reference (overt VS zero expressions of 1st and 2nd person subjects)

(4) (/M<u>o</u>žno **[ja]** rasskaž<u>u</u>ʰ?

'Can **[I]** tell?'

(5) **[Ø_{pro}]** \Voobšč<u>e</u> ne pomn'u etogo!

'[*I*] absolutely do not remember it'

- In most cases the pronoun is overt, yet its omission is also quite common (from 1/4 to 1/3 of all occurrences [Kibrik 1996]; [Grenoble 2001]).

- Factors affecting the choice between an overt and a zero form, have been investigated (e.g., [Seo 2001; Zdorenko 2010]), but still remain neither definitively classified nor fully understood.

ANNOTATION AND CODING TOOL

- Concrete reference only

- Frame-by-frame software ELAN

- Parameters:

- Type of reference (full/reduced) with further precisions (NounP/NumP/Pronoun/Dem/Other)

- Animacy

- Gender

- Number

- Syntactic role

REFERENTIAL ANNOTATION EXAMPLE (ELAN)

Nest structure

DISTRIBUTION OF REFERENTIAL EXPRESSIONS: ANAPHORIC REFERENCE

- Full NPs (52%) > personal pronouns (34%) > zeroes (13%) > demonstratives (1%) across the demo corpus of three sessions

- Consistent with other results on Russian oral discourse (e.g., [Grenoble 2001])

- No clear correlation between the ratio of particular referential expressions and the speaker's role (N/C/R)

- However, individual variation (e.g., a rather high percentage of pronouns in 23N, compared to other speakers, see **diagram 1**) draws attention and may be the subject of further research.
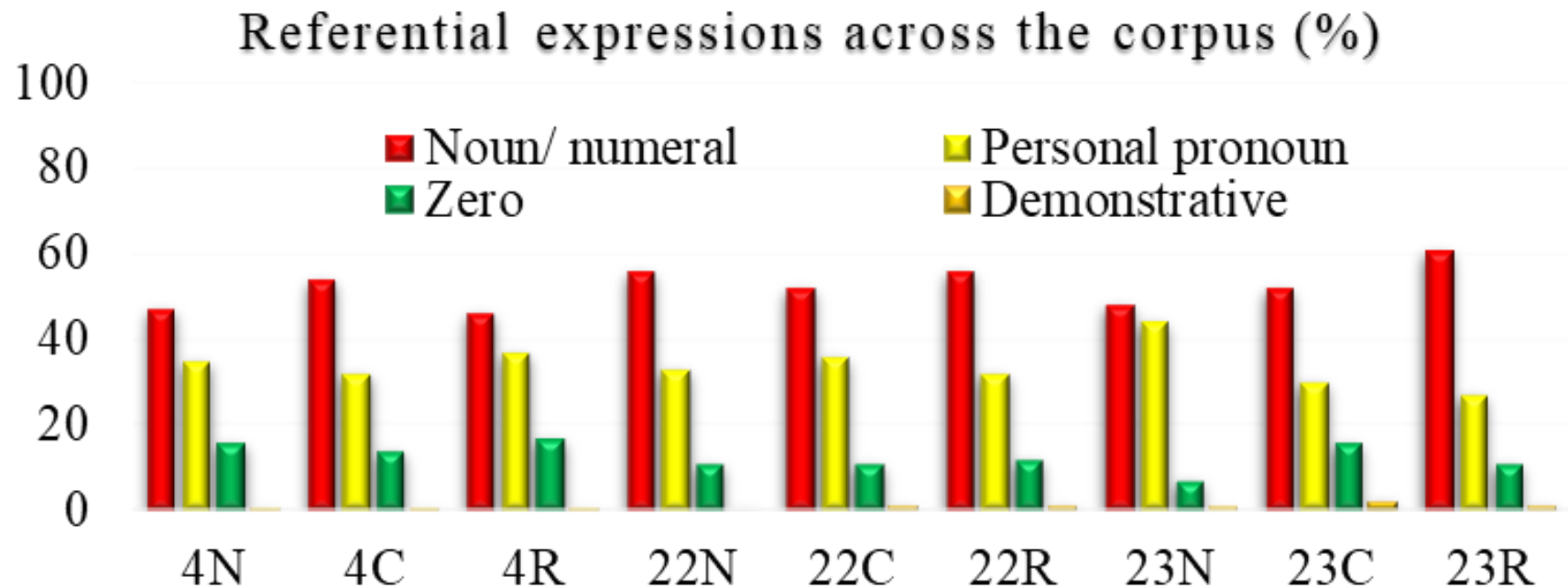
Diagram 1. The distribution of different anaphoric expressions according to the speaker's role (N/C/R)

DISTRIBUTION OF REFERENTIAL EXPRESSIONS: DEICTIC REFERENCE

- The expected advantage of the pattern with an explicitly expressed pronoun (67%) over the zero one was revealed

- Commentators used a significantly larger percentage of constructions with a zero subject pronoun, compared to other participants (Fisher's exact test, p-value <0.01)

1ST AND 2ND SUBJECT PRONOUNS ACROSS THE CORPUS (OVERT VS ZERO FORMS)
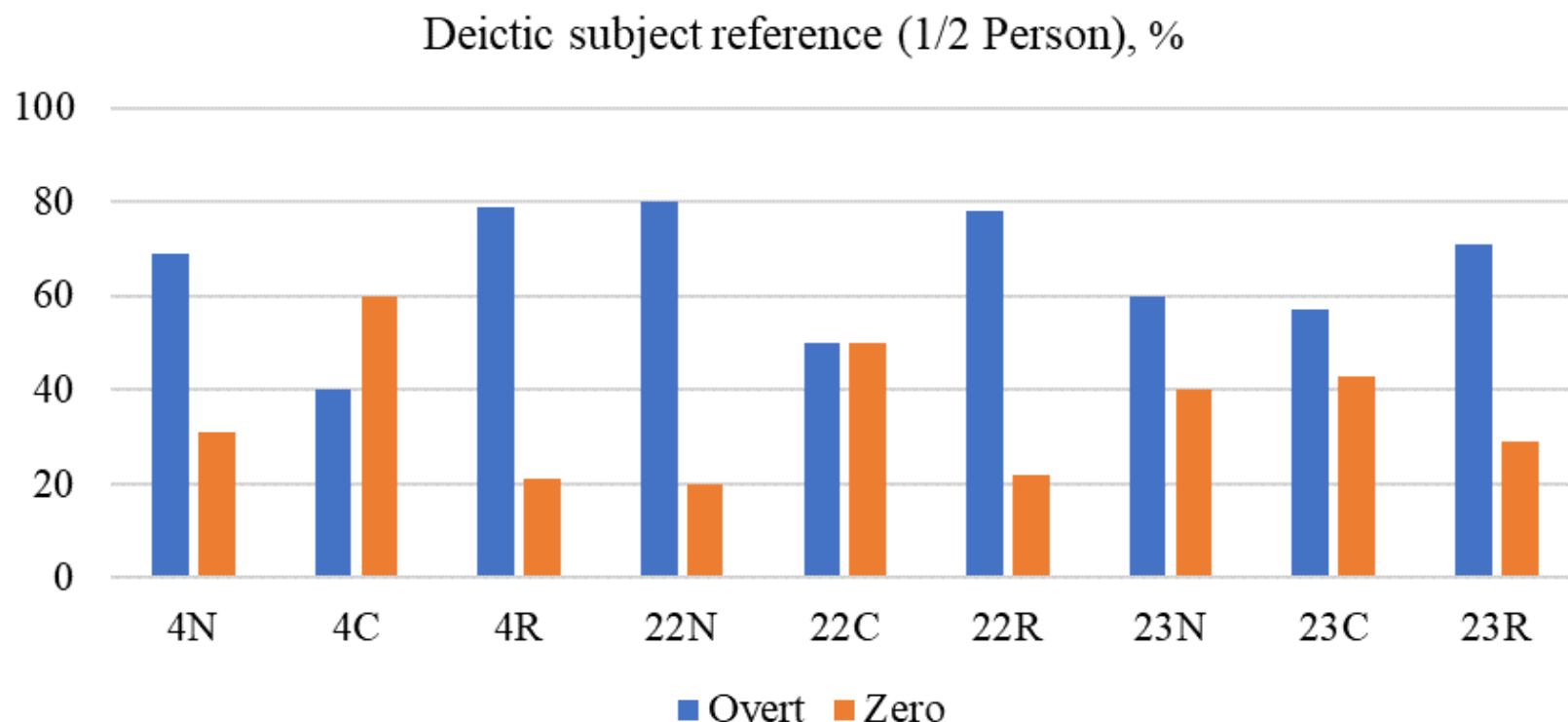

Diagram 2. The distribution of personal deictic expressions, according to the speaker's role (N/C/R).

EXAMPLE (22C)

SOME CONCLUSIONS ON DEICTIC RE DISTRIBUTION

- Apparently, the role of the Commentator, who participated only in a spontaneous conversation process and never produced a more structured monologue, was associated with more conditions for the discourse subject ellipsis (Zdorenko 2010)

- Fougeron, Breillard 2004: "the absence of the first person subject pronoun is related to the neutralization of the speaker's role"

- Compared to N and R, C focused to the least extent on himself/herself.

APPLICATION OF REFERENTIAL ANNOTATION IN THE MULTIMODAL CONTEXT

CASE STUDY 1. REFERENTIAL ANNOTATION IN THE INTERACTION WITH MANUAL CHANNEL

PREVIOUS FINDINGS

- New and cognitively less accessible referents are more likely to be expressed by full NPs with a noun head [Chafe 1994] and accompanied by a gesture [Levy, Fowler 2000; Gullberg 2006].

- In contrast, pronouns and zeros are associated with the most cognitively accessible information that does not imply additional expression on a non-verbal level.

- Our aim: to test this hypothesis on Russian-language data, focusing particularly on pointing gestures.

DEICTIC (=POINTING) GESTURES AND REFERENCE

- Kibrik 2011: Pointing is the most specialized of all gestures in terms of its association with particular verbal expressions, specifically referential expressions; and conversely, reference is closely related to pointing.

- Gullberg 2006; Perniss & Yoshioko 2008; Debreslioska et al. 2013; Azar, Özyürek 2015– Studies on reference tracking along with co-speech gestures

- Deictic gestures were quite rarely treated separately (but see however, (Sluis, Krahmer 2007) on Dutch; (Azar, Özyürek 2015) on Turkish)

CURRENT TASK AND PRINCIPLES

- Aim: Track coordinations between strokes in pointing gestures and referential expressions of different types

- Pilot subcorpus of 3 recordings (## 4, 22, 23); 9 videos; total duration: 141 minute

- All pointing gestures were extracted from the previously conducted manual annotation [Litvinenko et al. 2016].

- Then strokes (the most semantically significant phases of the gestures) were aligned with referential expressions that overlapped with them in time, according to the principle of "minimal overlapping" [Fedorova et al. 2015].

POINTING GESTURES: SOME PRINCIPLES OF DETECTION (LITVINENKO ET AL. 2018)

- Speaker indicates at some referent or point in time and space

- No complex trajectory

- No complex hand form

- Pure location of referent in gesture space with a hand or a finger

- Configuration: a bit more tense than in beats; gesture space activated

COORDINATION OF REFERENCE AND POINTING STROKES IN ELAN

Pointing stroke

Manual annotation

Referential annotation

EXAMPLE (23N)

Russian Pear Chats and Stories
Pears23N-vi.avi
First Telling

RESULTS: FULL VS REDUCED REFERENCE

- Full NPs with a head noun/ numeral are significantly more often accompanied by a gesture stroke (χ-square, p-value < 0.01).

- Consistent with similar findings on other languages (Debreslioska 2013: 434)

- Demonstratives are significantly more often accompanied by a pointing stroke than personal pronouns

FULL VS REDUCED REFERENCE:

	4N	4C	4R	22N	22C	22R	23N	23C	23R	Total
Pointing gestures (raw numbers)	78	14	30	52	30	40	54	19	39	356
Noun/ Numeral	37 (45%)	3 (14%)	14 (47%)	20 (38%)	12 (37%)	15 (38%)	21 (39%)	8 (42%)	22 (56%)	153 (44%)
Pronoun	4 (5%)	2 (14%)	7 (23%)	3 (6%)	7 (23%)	4 (10%)	7 (13%)	2 (10%)	8 (21%)	44 (14%)
Dem in Dem_all	2 (2%)	0 (0%)	2 (7%)	0 (0%)	2 (7%)	1 (3%)	0 (0%)	1 (5%)	2 (5%)	11 (3%)

REFERENCE AND POINTING STROKES: NOUNS/ NUMERALS VS PERSONAL PRONOUNS

Aligned with a pointing stroke, % (χ-square < 0.01)

Legend:
- Noun / Numeral (red)
- Personal pronoun (yellow)
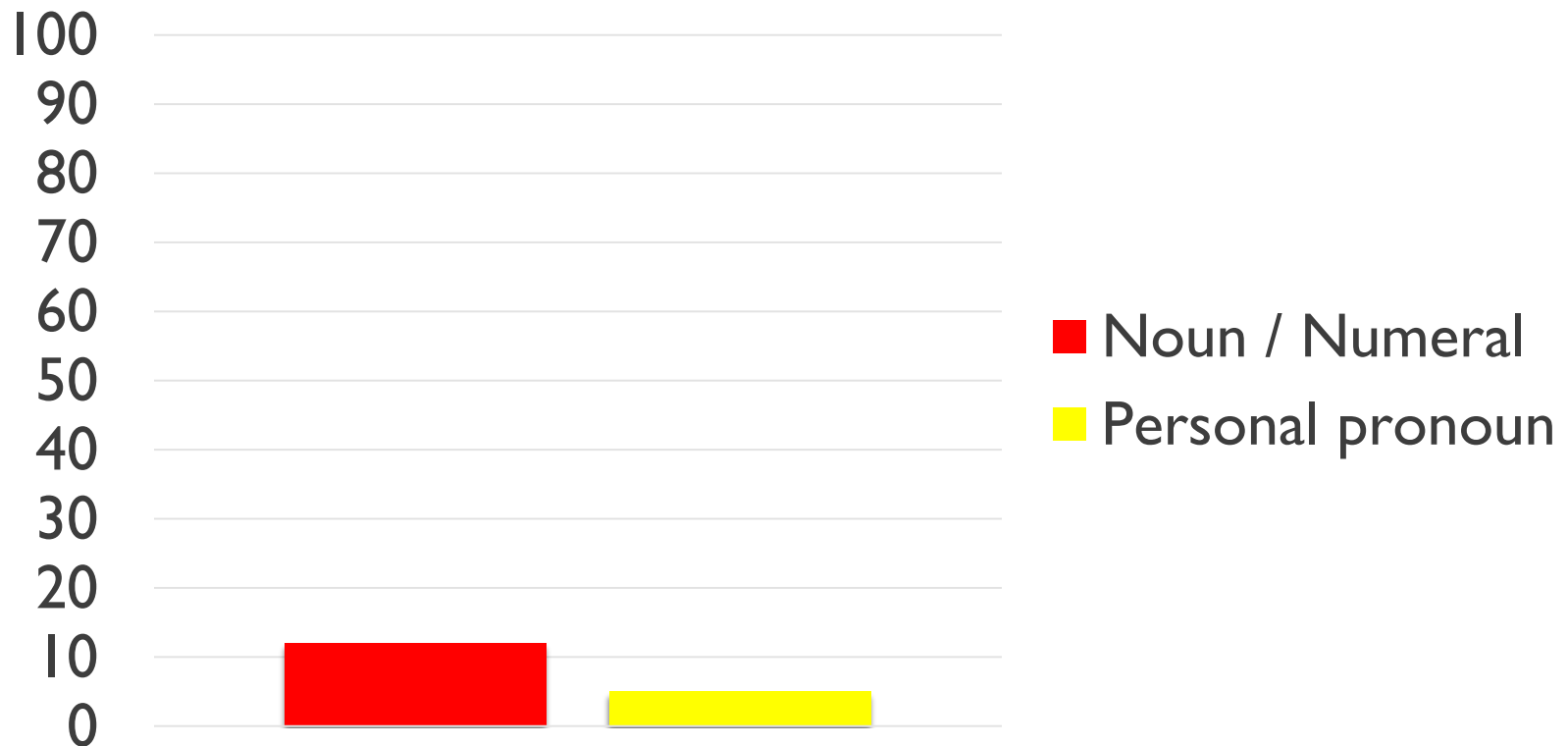
REFERENCE AND POINTING STROKES: NOUNS / NUMERALS VS DEMONSTRATIVES

Covered by a pointing stroke, % (p-value = 0.05, χ-square)
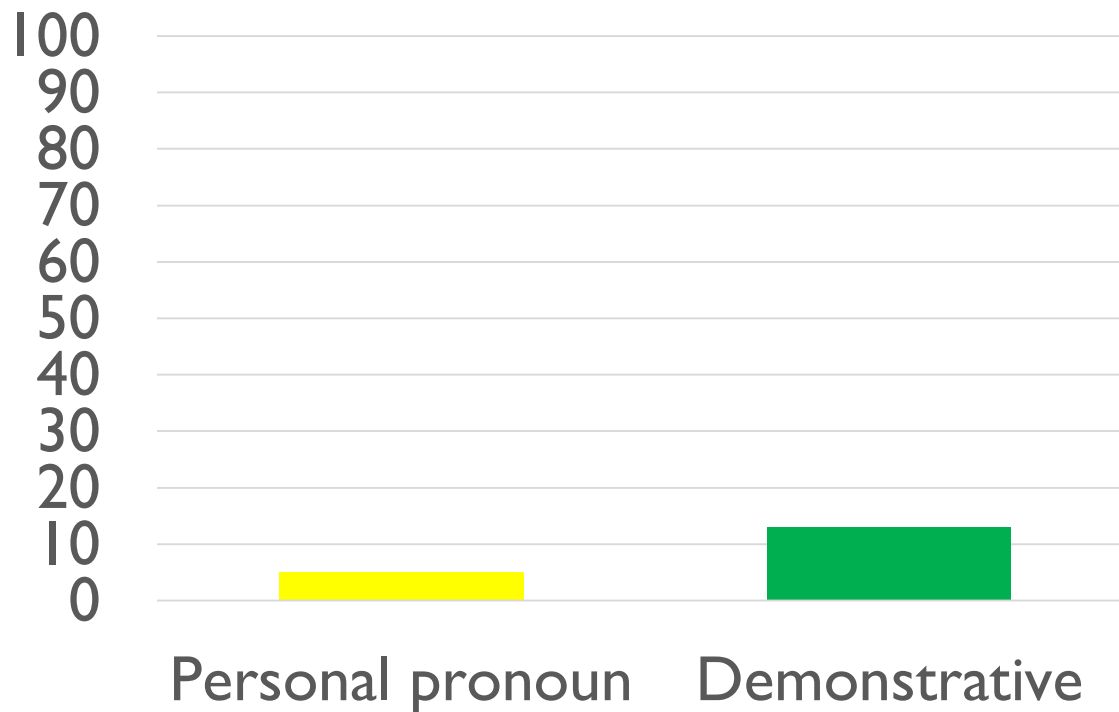
OTHER CORRELATIONS

- Syntactic role, gender, animacy: no influence detected

- The only significant correlations lie within the parameter of number

- 121 of 148 Units belonged to SG (82%)

	TOTAL	ALIGNED WITH PT STROKES	%	p-value (χ-square)
Full NP SG	871	121	14%	0.05
Full NP PL	380	37	9%	

CONCLUSIONS

- Nouns are significantly more often accompanied with pointing strokes than personal pronouns

- The factor of number: SG significantly more often

- Demonstratives (including demonstratives in DemNPs) are significantly more often accompanied by pointing strokes than personal pronouns

- This data can serve as an aid to the analysis of human communication, e.g. can help determine the most probable referential expression in case of a sound loss.

# APPLICATION OF REFERENTIAL ANNOTATION IN THE MULTIMODAL CONTEXT-2

CASE STUDY 2. REFERENTIAL ANNOTATION IN THE INTERACTION WITH OCULOMOTOR CHANNEL

ANY CORRELATIONS BETWEEN EYE MOVEMENTS AND FURTHER REFERENTIAL CHOICE?

- Hypothesis: does the narrator tell more about objects on which the he fixed his eyes longer while watching the movie?

- Pilot study on 22N, first telling stage (4 minutes)

- Eye tracking technology:

  - Export of eye tracking data onto the video scene (or "superimposing the marker of visual attention");

  - Extract and then manually annotate all fixations with durations exceeding 100 ms, specifying the target of gaze (Tobii Pro Glasses Analyzer software)

EXAMPLE
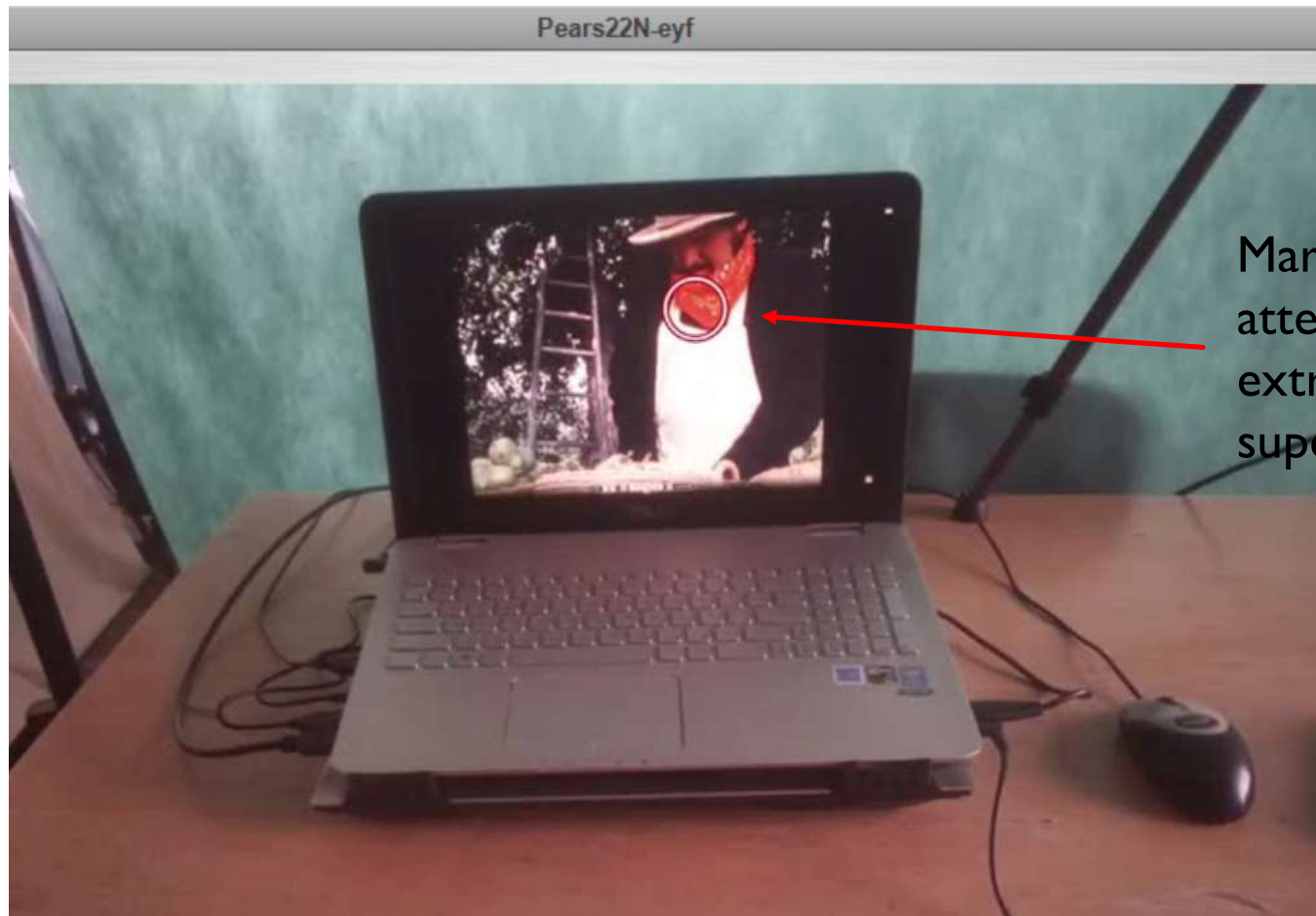
Marker of visual attention extracted and superimposed

METHODOLOGY

- Each eye gaze was attributed to a particular object of the film.

- 7 main animated characters of the film - the farmer, the boy, the group of three boys (here cases where the gaze was directed at one of these boys were also included), the girl and the passing man with a goat were selected for further analysis

- The subsequent narrator's story was analyzed, based on how often the selected characters were mentioned.

- The frequency was measured in the number of consecutive EDUs chains with a reference to the same character. In each of these chains, the referent was introduced with a full NP in the first EDU, and then, activated, was referred to by a reduced expression (personal pronoun or a zero)

(6)   (e) /и–и **какой-то видимо** /ф<u>е</u>рмер

или может быть **какой-то нанятый–й (h)** /тов<u>а</u>рищ

он собирает \гр<u>у</u>ши.

 Он в –↑→ф<u>а</u>ртуке-е

 на **нём** есть соломенная \/шл<u>я</u>па,

 (h)

 \в<u>от</u>,

и **он** с такой –с–силой–й ==

 \ч<u>у</u>вствуется,

 что груши /кр<u>е</u>пкие,

он их с \с<u>и</u>лой отрывает.

RESULTS

- The frequency of eye fixations on more frequently mentioned referents (the farmer, the boy, the group of three boys) were significantly higher (χ-square, p-value < 0.01), than on less frequently mentioned referents (the girl, the man with a goat).

- The mean length of the fixation on subsequently more frequently mentioned referents was significantly higher than the value on less frequently mentioned referents (χ-square, p-value < 0.01)

- The pilot study has proven the initial hypothesis

APPENDIX

	The farmer	The boy	The girl	Three boys	The man with the goat
Fixations	65	58	9	66	17
Overall fixation length (ms)	78340	99540	6640	94580	11700
The mean length of the fixation	1284	1531	738	1433	835
Number of mentioning	22	21	5	16+7=23	2
Number of chains of EDUs with the same referent	4	3	1	2	1
Number of EDUs in chains (1st chain+2nd chain+…+ last chain)	9+7+3+2	10+15+5	4	11+5	1

FURTHER PLANS

- Separate studies of First telling stage / Conversations / Retelling

- Multimodal issues: what is happening with other channels at the same time?

- …

THANK YOU FOR YOUR ATTENTION!