Tool for distributed creation of annotated speech corpora

KHUSAINOV AIDAR
INSTITUTE OF APPLIED SEMIOTICS
KAZAN, RUSSIA

Outline

1. Previous work

2. Project results and plans

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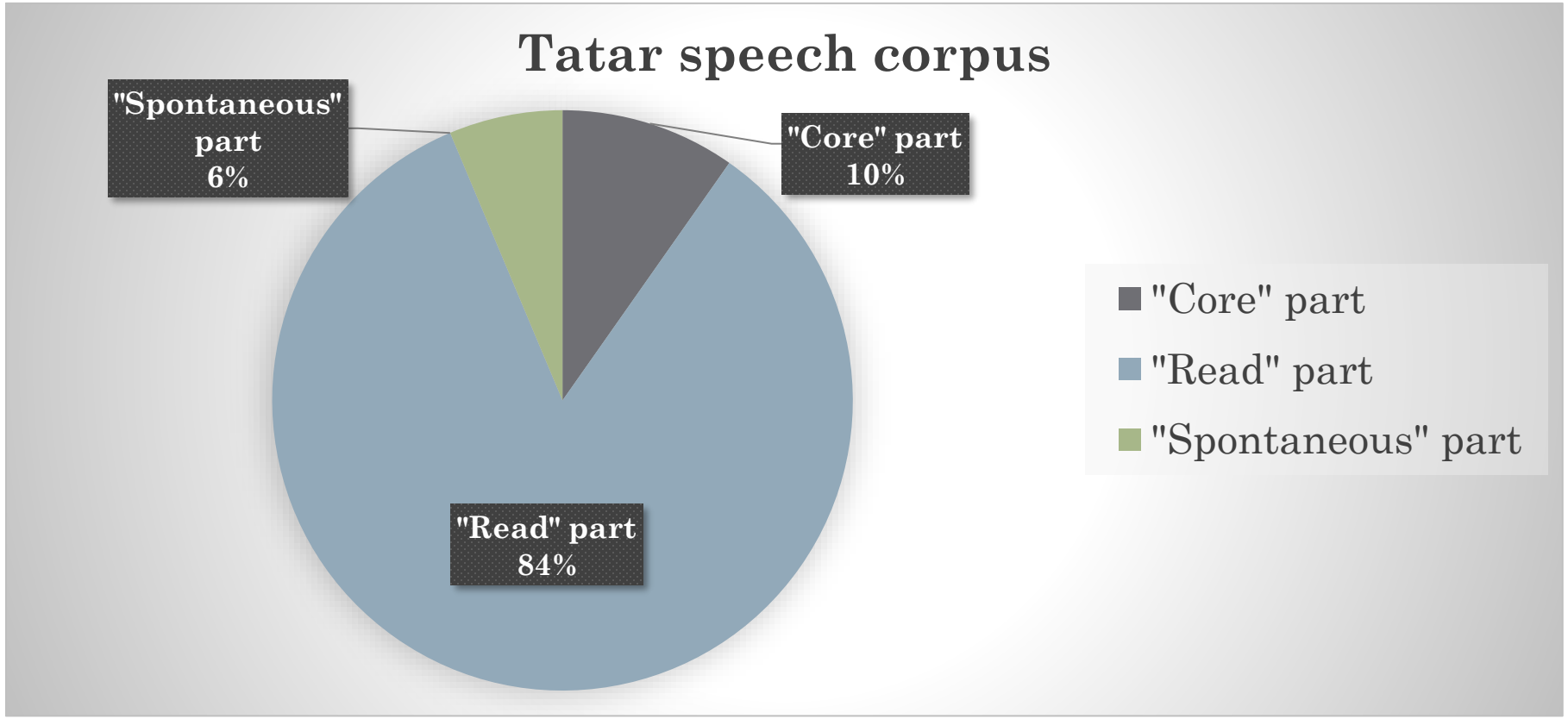
1. Previous work

- Command recognition
  - Dynamic programming algorithm (DTW)
  - Template-matching
  - Tiny one-speaker corpus with several copies for each command
- Isolated word recognition:
  - One-speaker corpus of several hours
  - VAD algorithm based on zero-cross count and signal energy
- Read speech recognition:
  - Multi-speaker corpus of 100 hours
  - ~88% accuracy on the test set
- Spontaneous speech recognition: ???

1. Previous work. Read speech corpus

- Recordings' format: 16 kHz, 16 bps mono WAV PCM
- Speakers: native speakers, Kazan dialect
- Speech type: read speech



1. Previous work. Read speech corpus

- Core part
  - Manually collected separate words and phrases
  - Phonetically full, max context
  - 251 speaker, average duration – 0:01:58
  - Total duration – 8:12:16
- Read part:
  - Rule-based selection from text corpus
  - 190 speakers, average duration – 0:22:18
  - Total duration – 70:39:00
- Spontaneous part:
  - Non-overlapping dialogues
  - Total duration – 5:19:33

1. Previous work. Read speech corpus

Speech corpus	
# speakers	**499**
Duration	**99:09:59**
Male / Female	30% / 70%
*Spontaneous speech**	*5:19:33*

* We're recording spontaneous speech too, but it's not annotated

1. Previous work. Read speech corpus

- **Annotation**
  - Speaker's name
  - Age
  - Gender
  - Native language
  - Nationality
  - Speech quality (expert's mark from 1 to 5)
  - Dialect
  - Microphone model
  - Comment

1. Previous work

- All systems built using the Kaldi toolkit (based on librispeech recipe)

Systems	Acoustic unit	Training audio data	Features	Language models
Mono, MonoSW	monophone	separate words	MFCCs	small 3-gram
Tri1, Tri1SW	triphone	separate words	+ delta, delta-delta	+ 3-gram full
Tri2, Tri2SW	triphone	“Core” part	+ LDA / MLLT	as above
Tri3, Tri3SW	triphone	“Core” part	+ fMLLR	as above
Tri4, Tri4SW	triphone	full training corpus	as above	+ 4-gram
NN, NNSW	triphone	full training corpus	as above	as above

1. Previous work

System	LM	WER		SER		CER	
		Word	Sub-word	Word	Sub-word	Word	Sub-word
Mono	Pruned 3-gram	52,06	-	39,65	-	27,70	-
Tri1	Pruned 3-gram	28,80	24,08	18,32	13,98	12,54	8,18
Tri1	3-gram	22,59	18,42	14,09	10,84	9,78	6,44
Tri2	Pruned 3-gram	24,14	21,20	13,95	11,46	8,69	6,40
Tri2	3-gram	19,08	16,17	10,86	9,11	6,91	5,82
Tri3	Pruned 3-gram	21,16	18,67	11,35	9,74	6,67	5,33
Tri3	3-gram	17,21	14,90	9,04	7,81	5,37	4,91
Tri4	Pruned 3-gram	18,57	19,70	9,29	10,08	5,24	5,54
Tri4	3-gram	15,19	16,09	7,46	8,29	4,18	4,59
Tri4	4-gram	15,10	15,71	7,41	8,05	4,15	4,44
NN	Pruned 3-gram	16,47	17,17	8,27	8,13	4,94	4,29
NN	3-gram	12,99	13,25	6,44	6,37	3,86	3,41
NN	4-gram	12,89	**12,79**	6,38	**6,14**	3,83	**3,29**

Outline

1. Previous work

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2. Project description

Main goal – to build first annotated Tatar corpus for broadcast speech.

The main task is to create required tool for annotation process.

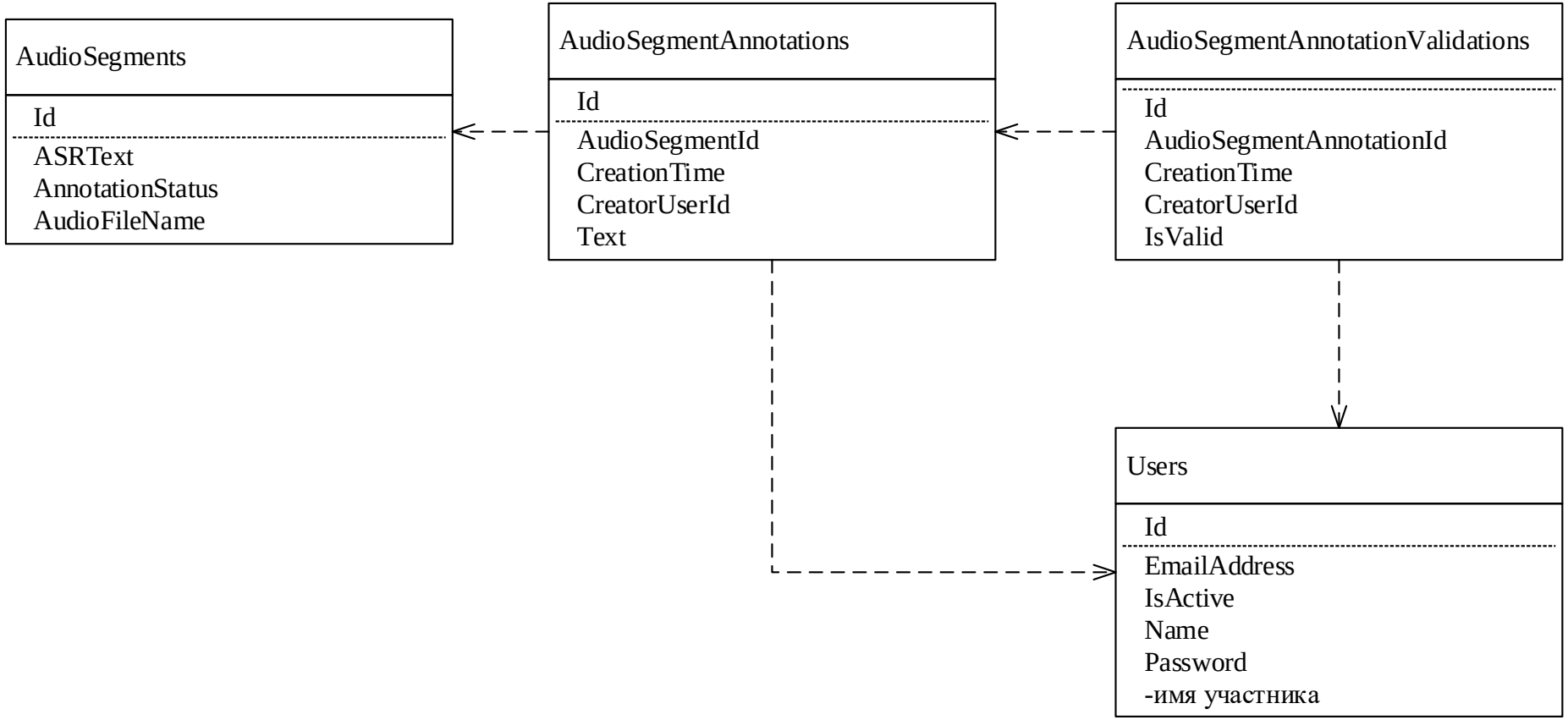
- Software architecture;
- DB creation;
- Software development;
- Audio analysis tools.

2. Project description

- ASP.Net Core
- React.js
- DDD (Domain Driven Design):
  - Infrastructure Layer
  - Domain layer
  - Application Layer
  - Service Layer
  - Presentation Layer
  - Client Applications

2. Project description

PostgreSQL



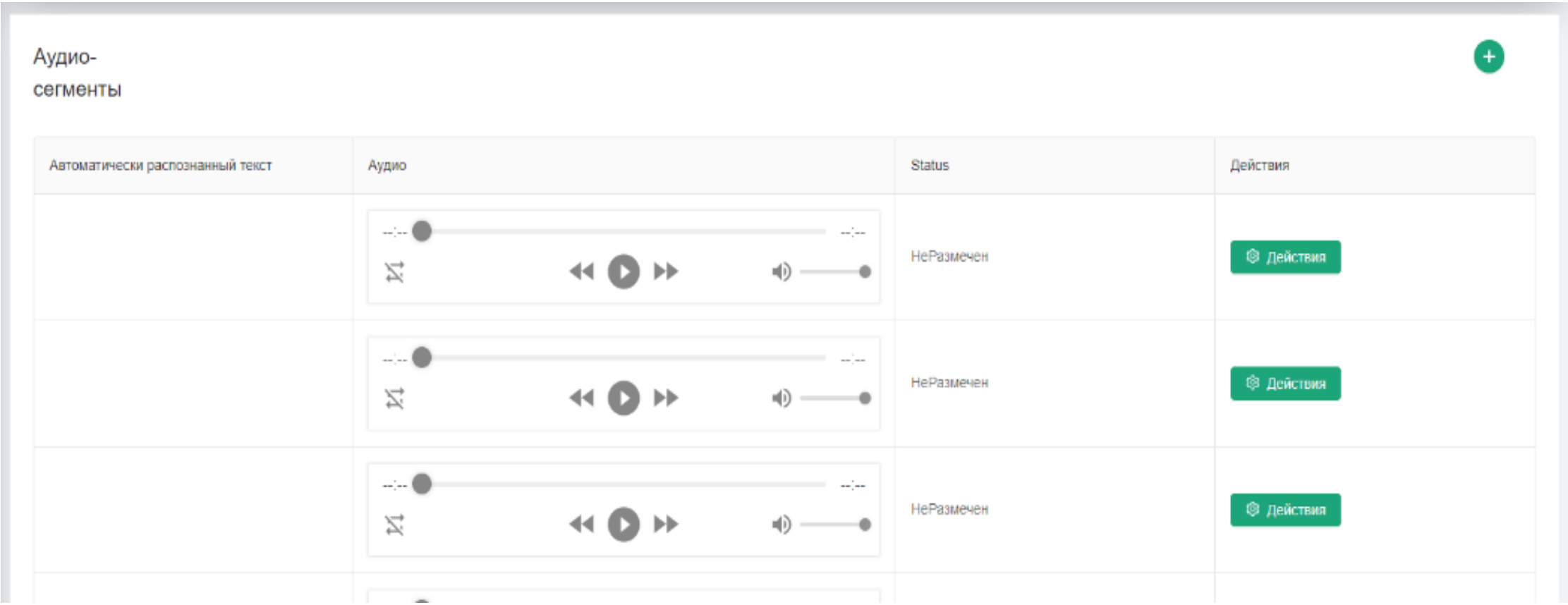
2. Project description

Basic functionality:

- Audio files upload;
- VAD and splitting uploaded files into fragments;
- Web-form for annotating fragment;
- Web-form for validating made annotations;
- View status of annotation of all segments;
- Downloading the annotations.

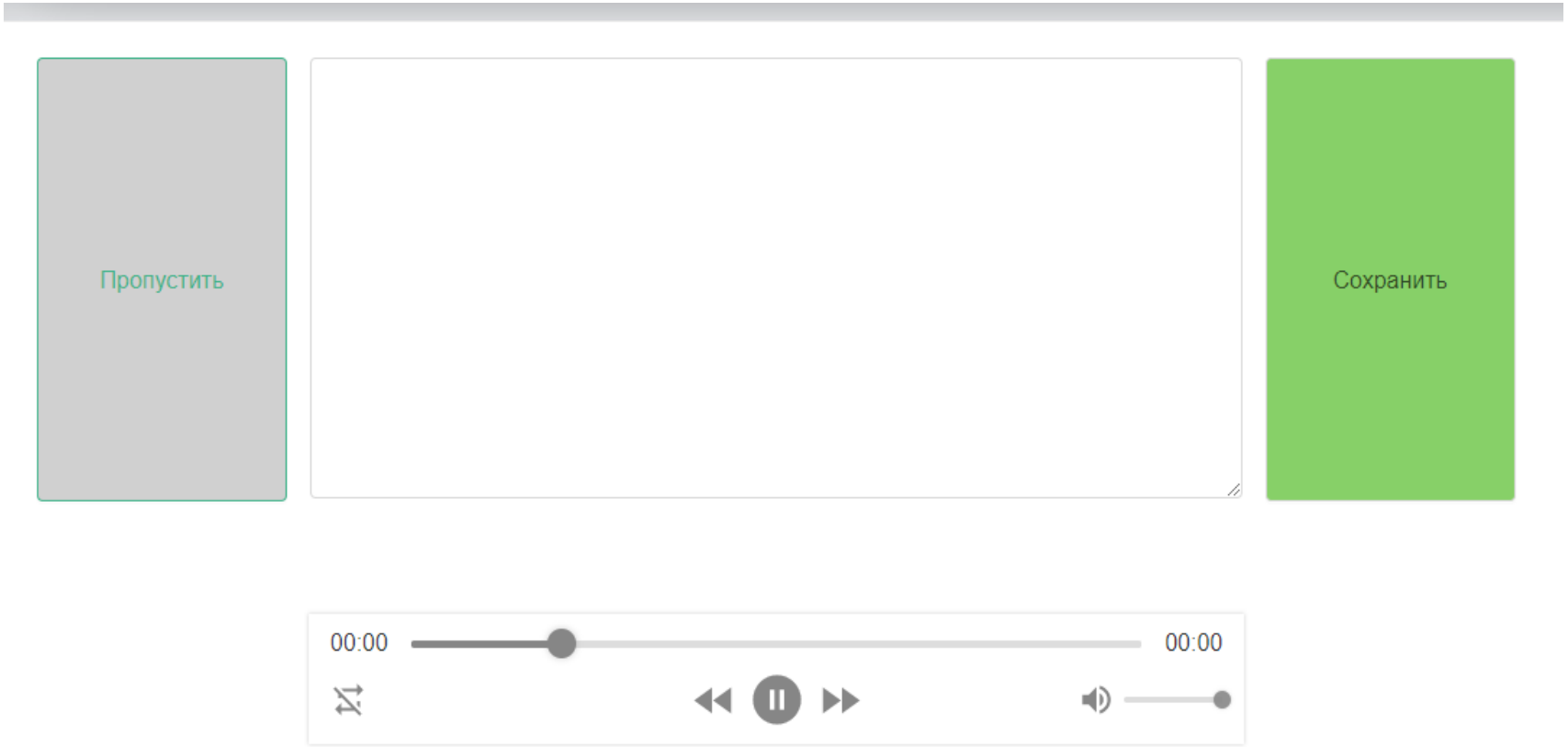
2. Project description

View fragments' statuses



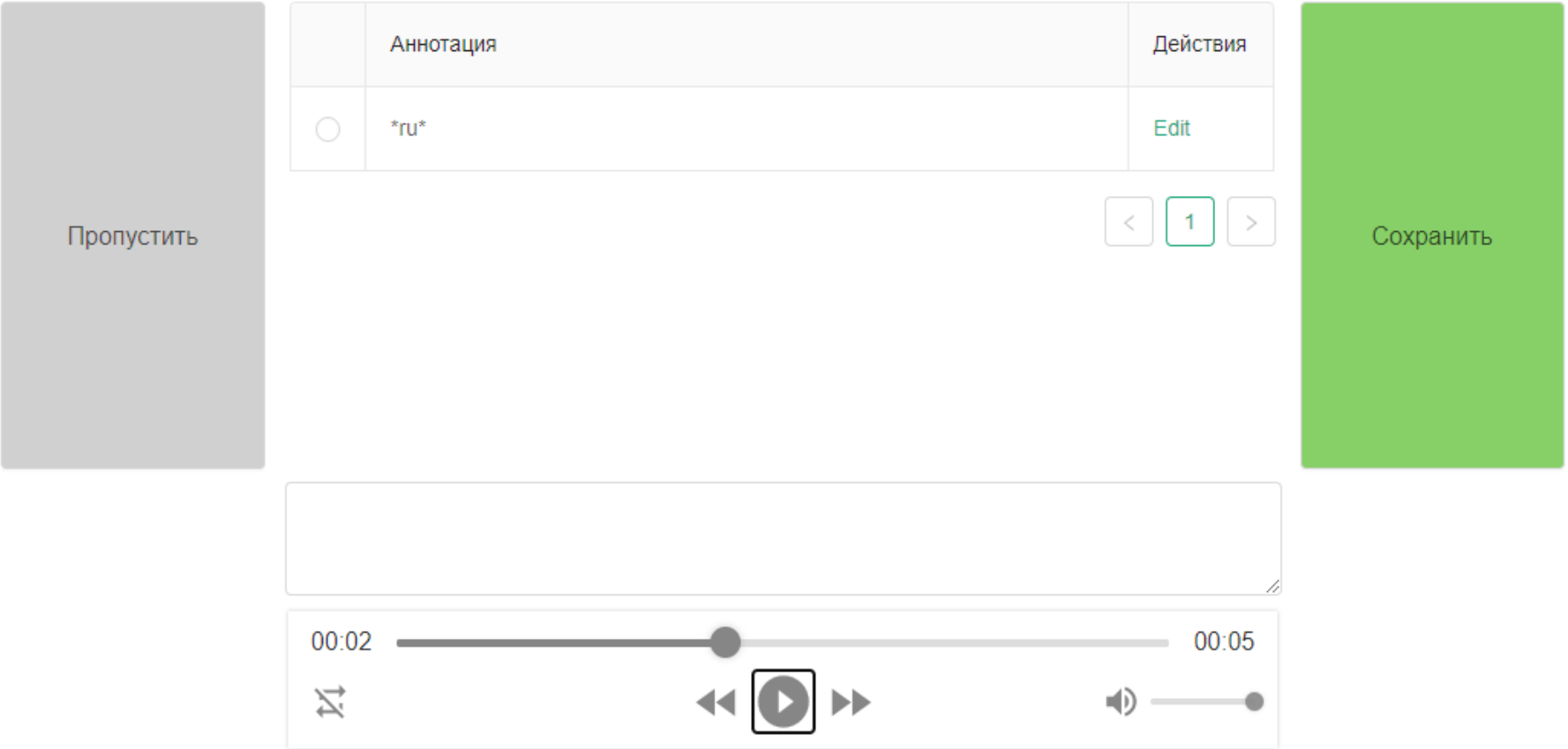
2. Project description

Annotating fragments



2. Project description

Validating fragments



2. Project description

Initial data:

- From TNV Planeta broadcast company;
- Recordings from December 2019;
- AVI video with mp3 96 kB/s stereo audio signal;
- Converted to 16 bps 16 kHz WAV;
- Total duration – 733 hour.

2. Project description

We manually selected segments for the first stage annotation:

- News programs;
- Interviews;
- Talk-shows.

In total 40 segments (23 hours 21 minutes) have been uploaded to the system.

This gave us 22 432 audio fragments with a duration less than 15 seconds.

2. Project description

Plans:

- Start working with annotators in University;
- Train an ASR system;
- Use this system to generate hypothesis to speed up the annotation process.

- 2000 hours…

Thank you

Khusainov Aidar

khusainov.aidar@gmail.com