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Development of a text analysis agent for a logistics company's Q&A system

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Abstract. The "Twin" system is an omnichannel communication platform for building voice and chatbots, capable, in particular, of receiving data in one language and transmitting in another. "Twin" can record voice and text, display detailed statistics and analytics for each call or dialog. In this article, using the Twin system, a chatbot was created for the field of cargo transportation, it describes its advantages and disadvantages and the principle of creating of such chatbots.

1. General questions of the construction of question-answering systems

One of the six areas of scientific research of artificial intelligence is the processing of texts in natural language. The development of question–answering systems(Q&A systems) is based on the analysis of the ambiguity of natural language, which is a type of information search systems capable of processing a user—entered question in natural language and giving a meaningful answer [1,2].

Unlike the classical keyword search task, in which the result is a list of documents containing the answer to a question, in the question-and-answer search task, the result is a short and concise answer generated by the system as a result of analyzing various data sources. An example of such sources is a collection of full-text documents (many pages of the global Internet), and the answer is made up of fragments of the most relevant document in the collection.

All early question-and-answer systems faced the problem of the lack of BigData [3,4] — a large volume of digitized facts and rules. Really working expert systems were obtained only in a limited domain of knowledge. Thanks to recent academic work, many researchers have begun to realize the problem and have agreed that its solution lies in the form of a new approach based on understanding natural language and reasoning in a knowledge-based environment — "Natural Language Understanding and Reasoning for Intelligence" (NaLURI) [5]. An important factor is the inclusion in the system of answering questions of such demanding functions that not only allow you to answer a wide range of questions and get a better quality answer, but also affect the response time.

2. Description of the test software package - the Q&A system "TWIN"

The "Twin" system is an omnichannel communication platform for building voice and chatbots, capable, in particular, of receiving data in one language and transmitting in another [6,7].

"Twin" can record voice and text, display detailed statistics and analytics for each call or dialog. The "Twin" system supports and integrates 6 communication channels - SMS, calls, messengers,



online chat, mail, social networks. The speech recognition module in the "Twin" system uses in its work the integration of two of the currently most developed existing speech recognition solutions - Yandex Speech Kit and Google Speech API. The platform provides the ability to connect to the customer's IP PBX, use its telecom operator and integrate with almost any CRM or ERP system. The robot can work with any modern IP-PBX. "Twin" is based on working with Big Data and neural networks.

3. Description of the freight agent

The cargo transportation agent is designed to help the user with the delivery and packaging of cargos.

Before developing a Q&A system software agent [8-10], it is necessary to identify entities and intentions. The entity is a word or phrase intended for a specific, well-defined object or phenomenon that distinguishes this object or phenomenon from a number of similar objects or phenomena. The intention can be defined as the meaning of what was said, i.e. what the user meant by saying a certain phrase.

Some entities of this subject area: height, type of the good, delivery time, address etc.

@hight	hight
@type_of_item	type of the good
@delivery	delivery time
@receiver	receiver
@address	address

Figure 1 - Marking of entities.

Some intentions of this subject area: phone number, type of goods, weight of goods, etc.

#telephone_number	telephone number
#type_of_items	type of goods
#twin_what_is_it	what is it
#twin_goodbye	client saying goodbye
#mass	weight
#size	size of goods

Figure 2 - Marking of intentions.

Compound intentions solve the main problem of understanding human speech, namely, people very often express several intentions in one phrase. Therefore, after adding named entities and intentions, for the task of training the agent, the markup of compound phrases is carried out and thus the agent's knowledge base is filled. After filling the agent's knowledge base, the agent is trained using a neural network. The results of processing the phrase by a trained agent are shown in Figure 3.

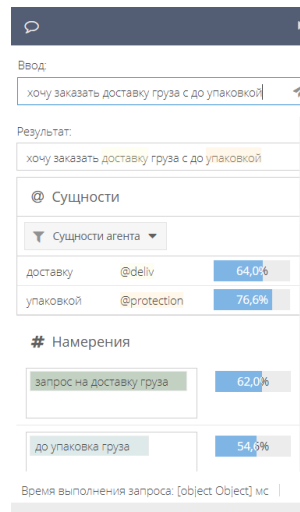


Figure 3 - Results of phrase processing.

4. Test results of the Cargo transportation text analysis agent

When introducing phrases to test the effectiveness of training, the bot easily recognizes entities and intentions. There are some overlays when the bot recognizes the user's intention, but does not recognize entities, as for example in Figure 4, after which this variant of the phrase is entered into the appropriate intention and marked up. The bot is trained repeatedly. After such actions, the chatbot correctly recognizes this phrase (Figure 5). However, there are many variations of what a person can say and ask, so you need to constantly improve and supplement the base of intentions.

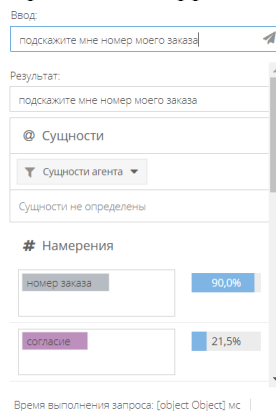


Figure 4 - Checking the recognition of entities and intentions by a chatbot.

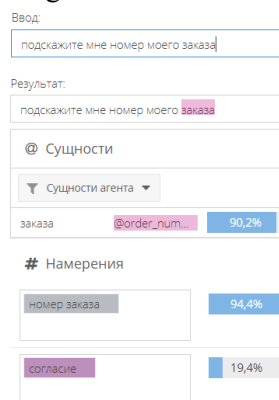


Figure 5 - Recognition of entities and intentions by a chatbot after training.

5. Building a chatbot based on a freight agent.

In the Domain tab, Intents (intentions-what a person can write) (Picture 6) and Actions (Picture 7) (actions – the bot's response to the user's words) are filled in.



```

1  * intents:
2    - twin_greeting
3    - twin_goodbye
4    - twin_what_is_it
5    - twin_thanks
6    - twin_deny
7    - twin_not_know
8    - twin_agree
9    - twin_repeat
10   - delivery_time
11   - reciver_answer
12   - gruzchik_answer
13   - telephone_number
14   - number_of_items
15   - delivery_city
16   - order_number
17   - who_pay
18   - face_form
19   - strahovka
20   - type_of_items
21   - size
22   - mass
23   - cube
24   - direction
25

```

Figure 6 - Filling in of Intents.



```

26  * actions:
27    - utter_greet
28    - utter_goodbye
29    - utter_what_is_it
30    - utter_u_are_welcome
31    - utter_ask_direction
32    - utter_value_cube
33    - utter_calculate_delivery
34    - utter_value_mass
35    - utter_value_size
36    - utter_type_of_items
37    - utter_strahovka
38    - utter_face_form
39    - utter_delivery_time
40    - utter_who_pay
41    - utter_finish
42    - utter_order_number
43    - utter_order_number1
44    - utter_delivery_in_city
45    - utter_number_of_items
46    - utter_ask_telefon
47    - utter_gruzchik
48    - utter_sender_reciver
49    - utter_thanks
50    - utter_delivery_cost

```

Figure 7 - Filling in of Actions.

Based on the Intentions and Actions of the bot, the dialog storylines are filled in on the bot's intentions in the Stories tab (Picture 8).



```

1  ## story1
2  * twin_greeting
3  - utter_greet
4
5  ## story2
6  * twin_goodbye
7  - utter_goodbye
8
9  ## story3
10 * twin_greeting
11 - utter_greet
12 - utter_ask_direction
13 * direction
14 - utter_value_cube
15 * cube
16 - utter_thanks

```

Figure 8 - Filling in of Actions.

In Picture 9 you can see the results of the work that was done. The chatbot accurately determines the entities and intentions of the client and gives the correct answer to the question that was posed. All questions are read correctly.

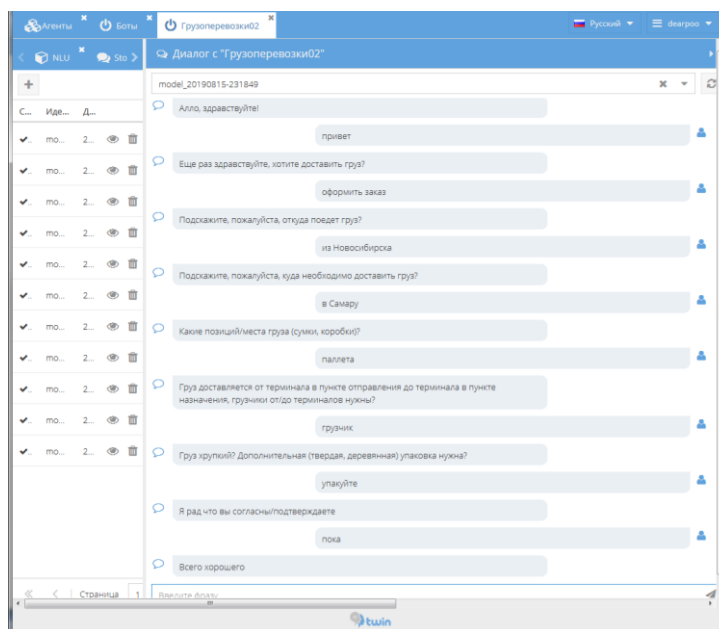


Figure 9 - Conducting a dialogue with a chatbot.

6. Conclusion

In this article, Q&A systems were considered. A test software package called Twin was described, its application and principle of operation were also described.

The developed cargo transportation chatbot based on a question-and-answer system solves the problems posed: it allows quickly answer the questions of the user. The results of the work showed that the chatbot for the field of cargo transportation works without failures, it perfectly reads entities and intentions, based on them it gives the correct answer to the user.

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