Virtual assistant for remote submission of applications for enrollment in educational organizations

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Abstract. This article discusses the possibility of using and implementing a chabot virtual assistant. The main goal of the chatbot is providing opportunity remote submission of applications for enrollment to automate and optimize the work of admissions committees of both higher and secondary educational institutions. The purpose of this article is to develop a model for building a virtual assistant in the form of chatbot that is based on the Telegram messenger to enable simple, fast and remote submission of applications to educational organizations. The study analyzed the existing methods of applying for enrollment such as email, postal service, personal application submission via the admissions office or Government services portal of the Russian Federation. Based on this analysis, the existing limitations of the work of admissions committees were identified, and a proposal for implementing a chatbot that allows you to apply for enrollment using the Telegram messenger was described using a finite state machine.

Keywords: Virtual assistant, chatbot, Telegram, state machine, finite state machine, messenger

1   Introduction

A chatbot is a companion program with a predefined algorithm of questions and answers that come in the form of text messages, audio messages, or images. This allows you to virtually conduct a dialogue with the users of the system around the clock. The principle of operation is based on pre-written communication scenarios, and the bot immediately gives the necessary answer to the interlocutor during the dialogue. Chatbots can be used on websites, in messenger or social networks. In some cases, they can replace the mobile app/ Nowadays, chatbots are widespread in many areas of activity, such virtual assistants are often used in applications of telecommunication

operators, banks, transport companies, and also replace operators to solve trivial issues, which helps to reduce the processing time of an incoming request.

The development of chatbots is a popular technology field, because such a virtual assistant can reduce the required staff of operators to solve common tasks, eliminates errors related to the human factor, and can be used to collect analytical data and classify them.

Since 2020, Russian applicants can apply to educational organizations by sending application forms to the postal address or email address of the university or college, as well as fill out an application for admission on the Government services portal of the Russian Federation. However, at the moment, this service is available only for 53 universities of Russia. You need to find the correct forms and a list of necessary documents for sending applications by mail or email. Documents may differ greatly depending on the educational organization.

2   Materials and methods

Telegram Messenger is the most secure and fastest of modern messengers. Access to the application is possible from anywhere in the world where there is an Internet connection, and is possible both from a mobile device and from personal computers on all common operating systems. Telegram's security policy guarantees the confidentiality of data and the absence of the transfer of personal information and correspondence to third parties, which ensures the safe sending of personal documents. Telegram bot does not require any effort to integrate into an existing system, the transfer of information is possible using JSON objects.

Telegram Messenger has an open source code and API for developers. Messenger offers a Bot API that allows you to create programs that use Telegram as an interface for chatbot development. Programs can be run both on personal computers and deployed on remote servers for continuous operation.

Data transfer security is provided by the Telegram intermediary server, which processes and encrypts all transmitted messages, and the server is accessed using HTTPS.

The Telegram API features are extensive and are constantly being improved. The Telegram bot accepts input information in the form of updates, as well as data input via customizable keyboards. Using keyboards reduces the time to access the bot and eliminates the possibility of erroneous input. The keyboard can be either permanent or built-in. Permanent keyboards can be used to implement a custom menu, while built-in keyboards can be used to select an answer from the possible options.

Telegram bot receives an update in the form of an Update object, which implies an action, for example, an incoming message from a user. The Update object contains the required parameter update_id – this is the unique identifier of the incoming update, and also contains one of the optional parameters: message, callback_query, inline_query, chosen_inline_result. Updates are stored on the server for 24 hours, waiting for the bot to process them. The chatbot will use message and callback_query to remotely submit applications for enrollment in educational organizations.

Message is an update that can contain the following objects: text, sticker, photo, audio or video file, voice message, location, document, contact from the address book.

A CallbackQuery is an object that represents an incoming feedback request from an inline keyboard to a message.

Keyboards are convenient for creating a custom menu, and can also be used to select an answer option from several suggested ones. There are two types of keyboards in Telegram: a permanent keyboard and a build-in one, ReplyKeyboardMarkup and InlineKeyboardMarkup, respectively.

To create an inline keyboard, use an object of the InlineKeyboardMarkup type. The built-in keyboard contains an array of strings, each of which is an array of Inline Keyboard Button objects. The InlineKeyboardButton is one separate button on the built-in keyboard. The required parameter of the button is the text parameter, which contains the button caption. It is also mandatory to have one of the optional fields, for example, url, which will open the URL when the button is clicked, or callback_data-data that will be sent to callback_query when the button is clicked.

3   Results

The sequence of operation of the Telegram bot for remote submission of applications for enrollment in educational organizations consists of the following algorithm: the user, using the bot interface, sends messages and requests, depending on the message or request, the bot goes to one of the possible states and sends the user a response corresponding to the current state. If an error occurs while processing a message or request, the bot returns an error message to the user and remains in the previous state. If the request is successful, the bot will move to the next state according to the script. The sequence of the chatbot operation is shown in Figure 1.
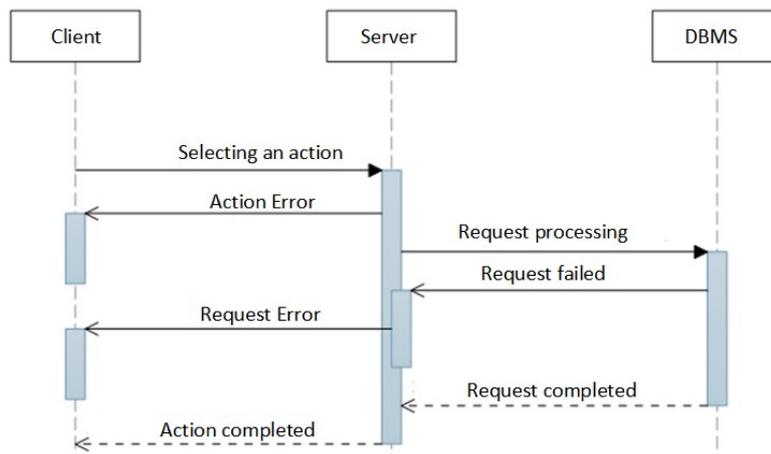
Fig. 1. The sequence of the chatbot operation.

The work of a chatbot can be illustrated by constructing its automaton model, a transition table, and a system of canonical equations. The automatic model is shown in Figure 2.
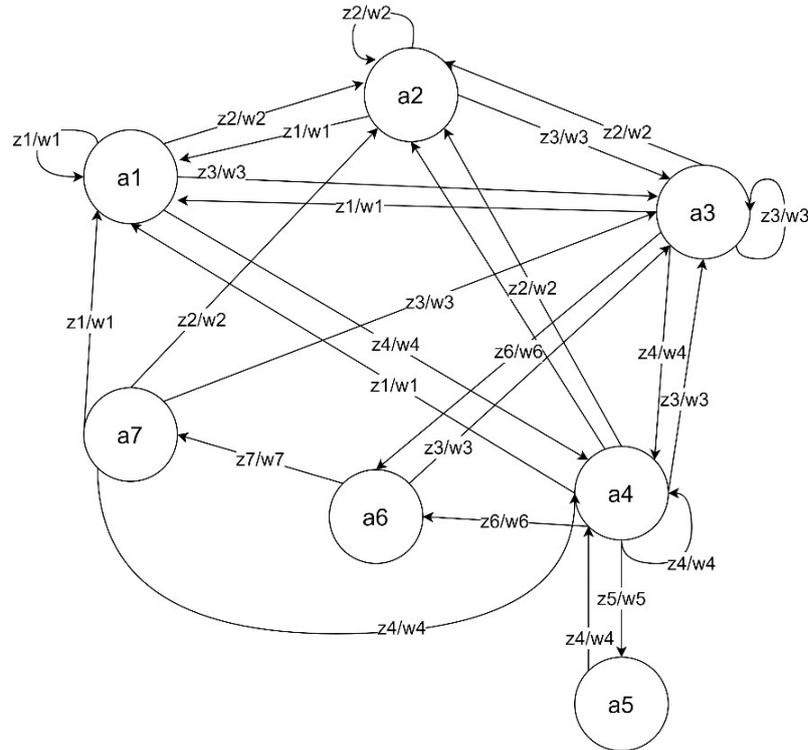
Fig. 2. The automatic model.

According to the automaton model, you can build a system of canonical equations, given in formula 1, as well as a direct transition table, shown in Table 1.

a1 – state "Greeting";

a2 – state "Education organizations list";

a3 – state "Educational program list";

a4 – state "Fill out the application form";

a5 – application submission state;

a6 – state of input data validation;

a7 – error state;

signals z_1, z_2, z_3, z_4, z_5, z_6, z_7 is signals that match the message states.

4   Discussion

The most common way to apply for admission to higher and secondary educational institutions is to personally submit an application through the admission committee, which requires the personal presence of the applicant, or a representative who has a

notarized power of attorney to dispose of copies of the applicant's documents and their originals.

Table 1. Direct table of state machine transitions.

a_i	$z_i(t)$	$a_s(t+1)$	$a_s(t)$
a_1	z_1	a_1	w_1
	z_2	a_2	w_2
	z_3	a_3	w_3
	z_4	a_4	w_4
a_2	z_1	a_1	w_1
	z_2	a_2	w_2
	z_3	a_3	w_3
	z_4	a_4	w_4
a_3	z_1	a_1	w_1
	z_2	a_2	w_2
	z_3	a_3	w_3
	z_4	a_4	w_4
	z_6	a_6	w_6
a_4	z_1	a_1	w_1
	z_2	a_2	w_2
	z_3	a_3	w_3
	z_4	a_4	w_4
	z_5	a_5	w_5
	z_6	a_6	w_6
a_5	z_4	a_4	w_4
a_6	z_3	a_3	w_3
	z_7	a_7	w_7
a_7	z_1	a_1	w_1
	z_2	a_2	w_2
	z_3	a_3	w_3
	z_4	a_4	w_4

Sending documents by Russian Post is another way to submit an application. To do this, you need to download the application, fill it out, attach copies of the necessary documents to it and send it by registered mail with an inventory of attachments. However, you can only send copies of documents by mail. For the submission of the originals, the personal presence of the applicant or a trusted person is required.

The next option for submitting documents to educational organizations is the "Admission to University online" service on the Government services portal of the Rus-

sian Federation. But at the moment, only 53 Russian universities can apply through this service.

It is also possible to submit documents by e-mail. The applicant sends all the necessary documents and scans to the e-mail address of the admissions committee. And there are many nuances here. The opportunity to submit documents in electronic form is not available in all educational institutions. Also, each educational organization determines the list of necessary documents and requirements for them independently. For example, in the universities of Peoples ' Friendship University of Russia, Moscow Polytechnic University, Southern Federal University and Belgorod Technological University, you do not need to notarize the documents before sending them.

However, many of these options are not possible for applying to colleges where personal application through the admissions committee is more popular.

For many of us, messengers have become an integral part of life, with the help of them, the educational process and the interaction of teachers and students during distance learning were organized.

Currently, the application process for admission to educational organizations is not automated and still requires the personal presence of the applicant. Quarantine measures introduced in 2020 revealed the vulnerability of the system. Many higher and secondary educational institutions have started accepting documents via e-mail, and some educational organizations have developed personal accounts of applicants on official websites. The ability to submit an application via messenger can simplify this process, because the user does not need to search for information on their own and understand the unfamiliar interface of the educational organization's website.The chatbot will collect all the necessary data in the course of correspondence with the user. A chatbot is easier to develop and expand its functionality. Telegram bot does not require a separate application and is available around the clock in one of the most popular and secure messengers in Russia and the world. And the familiar interface of the messenger will not require time to adapt to the bot interface.

In order to apply for admission, the user needs some initial data, such as the educational organizations available for application, a list of the fields of study programs they are implementing. The mechanism of filling out and sending the application is also necessary. Therefore, the proposed Telegram bot may contain the following functional elements:

— get a list of all educational organizations available for applying;
— getting a list of available specialties in a specific educational organization;
— mechanism for filling out the application by answering the user's questions to the bot.

The virtual assistant must provide the ability to work from anywhere and at any time with access to the Internet, automate the application processing mechanism, provide up-to-date information about available educational organizations for submitting applications and a list of available educational programs in each educational organization. The application should have a simple, intuitive interface for the user to work with, perform correct and fast processing of database queries, validate the data entered by the user for their subsequent correct recording, and store a large amount of

data about applications, applicants, educational organizations and training areas within a single database.

5   Conclusion

As part of the research work, an analysis of the existing methods of applying for admission to educational organizations was carried out, as well as the restrictions that arose in connection with the quarantine measures of 2020 were identified. To eliminate these restrictions, a proposal for the implementation of a chatbot implemented on the Telegram messenger platform was described. The proposed chatbot allows you to get acquainted with the list of educational organizations available for applying, the list of training areas in each educational organization, as well as fill out and send an application for admission to the desired university or college.

6   Acknowledgments

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