Developing Chatbot For Academic Record Monitoring in Higher Education Institution

A Heryandi
Universitas Komputer Indonesia, Jl. Dipati Ukur 112-116 Bandung, Indonesia

Email: andri@email.unikom.ac.id

Abstract. Monitoring academic records at a higher education institution is highly needed by both students and parents of students. Although the system is usually already available in the form of a web site, it is still considered too complicated because it must involve a troublesome authentication process, especially for parents. Nowadays, chat applications have been very widely used by the community both young people and even the elderly. There are many chat applications that are widely used including WhatsApp, LINE, Telegram, and Facebook Messenger. The chat application provides an Application Programming Interface (API) service for sending or receiving messages. Therefore, the API can be used to create applications (chatbot) that will serve users in the form of chat. In this study, chatbot was built using the services of Telegram. This is because sending messages via Telegram is free. The information to be served is information about students' attendance at lectures, grades, and financial records. With this application, a college can provide facilities for students or parents of students to view academic records easily, cheaply, and can be accessed anytime. With this application, a college can provide facilities for students or parents of students to view academic records easily, cheaply, and can be accessed anytime.

1. Introduction

Monitoring academic records is very important for stakeholders in a higher education institution. Students and parents are included in these stakeholders [1]. Most of higher education institution has a system that can be used by students or parents of students to access student academic data. Many universities use web-based services to provide academic information. However, there are often problems (especially students' parents) who find it difficult to access the academic record. One of the difficulties faced is the login screen which requires parents to enter the Student Registration Number (NIM) and enter a certain password. This will be very difficult because it is often found that the parents of students do not know the Student Registration Number and passwords that are often forgotten. To provide services directly to parents, in addition to using a website, a higher education institution can make a faster information delivery service. This can be done by adding services such as chat. Now, chatting services have been widely used by the community both by young and old people. In Indonesia the most popular chat service applications include WhatsApp, LINE, Telegram, and Facebook Messenger. However, if this chat service is provided, then a chat agent is needed who can conduct question and answer. If this is done manually using an administrative staff, the process of providing information will be slow. Therefore, in this study, the question and answer process in chat conversation will be done automatically by the computer using chatbot.

A chatbot is a machine conversation system which interacts with human users via natural conversational language [2] and bots are used in many service areas as an information provider in
online mode [8]. A chatbot is an instant messaging account that able to provide services using instant messaging frameworks with the aim of providing conversational services to users in an efficient manner [3]. Chatbot is a trending application which has made by an Artificial Intelligence. It is being used in humanoid robots, personal assistant, car assistant, etc., to make the human work easier. Chatbot has become more popular in business as they can reduce customer service cost and handles multiple users at a time with a round the clock availability, reliability, and accessibility [10]. The chatbot is more helpful when it comes to the educational purpose [4]. Chat services that provide facilities for creating a chatbot are Telegram, Facebook Messenger, WhatsApp and LINE. To make it easier for a parent to access student academic data, the authentication process will use the seamless authentication method. This authentication method offers quick and effortless authentication [5], where with this method parents can access student data using only the cell phone number used in the chat application. This number will be checked into the academic database. If this telephone number/phone cell number is registered, then parents will be considered as having the authority to access the academic data of the students concerned. This method will make it easier for parents to access student academic data even if parents do not know the student ID or password to access it.

In this research, chatbot will be made using the Telegram service. This is based on superiority in terms of security [6], and a simple chatbot application programming interface (API) facility. Chatbot will service requests for academic information such as student information, grade information, attendance information and financial information.

2. Method
This study aims to build a chatbot system using Telegram services that can serve academic information requests from students' parents. This includes how to receive data requests from parents, then process them and end with sending data information to parents. This will involve several processes such as using webhook [7] to receive messages and using the Bot API to send messages in response.

3. Results and Discussion

3.1 Telegram Chatbot
Bots are third-party applications that run inside Telegram. Users can interact with bots by sending the boot messages, commands, or inline requests. Bots can be controlled by using HTTPS requests to Telegram bot API server [9]. Figure 1 illustrates how Telegram chatbot works.

![Telegram Chatbot Workflow](image)

**Figure 1.** Telegram Chatbot Workflow
The Telegram chatbot workflow is as follows:
1. Telegram users send messages through the Telegram application
2. Messages received on the Telegram server will be forwarded to the bot server (bot agent server) using the webhook that has been defined when bot creation. Based on the message received, the bot agent will take action according to the message received and then arrange a reply that will be sent to the Telegram user.

3. After the replies are arranged, the bot agent server sends the message to the Telegram server using the bot API.

4. Messages that have been received by the Telegram server will be forwarded to the end users of Telegram in the form of chat conversation.

3.2 Seamless Authentication

Seamless authentication is a method where the user is authenticated without the burden of credential requests. With this method, a user can authenticate faster and without more effort. In this study, authentication will be carried out seamlessly because the target user often does not have (or forget) data (student identification number or password) that can be used to authenticate himself as a student parent. Authentication of a student's parents is done by checking the student cell phone number registered in the Telegram into the parent's contact data that has been stored in the university’s academic information system database.

The Telegram API allows developers to retrieve Telegram user’s phone numbers used in Telegram using the Keyboard Button feature which will make requests to Telegram users to share their phone numbers. When a Telegram user allows to share his telephone number, the number will be checked into the parent's contact data in the existing academic information system database. If this number is found, the Telegram user is considered a student's parent.

3.3 Defining Software Requirement Specification

Defining software requirements specifications is used to determine what functionalities will be available in a software. In this chatbot system, the functionalities that will be provided are as follows:

1. Obtaining Telegram user data
   This functionality is used to retrieve Telegram user data from the Telegram server, specifically data about the telephone number used by the Telegram user.

2. Authenticating Telegram user against data in existing academic database
   This functionality is used to check whether the telephone number of a Telegram user is registered as the student's parents' telephone number.

3. Registering Telegram user
   This functionality is used to register Telegram users whose telephone numbers are registered as student parents.

4. Select student
   This functionality is used to conduct student selection when the parents' phone numbers are registered as parents of more than 1 student.

5. Sending grade information
   This functionality is used to send information on student grades.

6. Sending financial information
   This functionality is used to send financial information.

7. Sending class Attendance information
   This functionality is used to send information about student’s class attendance.

8. Sending student information
   This functionality is used to send information about student’s profile according to academic database.

9. Sending university information
   This functionality is used to send information about university (name, address, and contact).
3.4 System Architecture
Figure 2 shows the proposed system architecture that will integrate all entity involved in this system.

![System Architecture Diagram](image)

All activities in this system are initiated by Telegram users by writing messages addressed to chatbots. This message is sent to the Telegram server which will forward this message to the bot agent server using the webhook method. Messages that have been received from the webhook will be processed by the bot agent server to get an answer. If the answers can be compiled directly without requiring access to the information system database, then the answers will be sent immediately. But if compiling answers requires accessing data into the database (for example requests for requests for value, financial or attendance lectures), the bot agent server will make requests via a web service that will access the academic information system database. After the answers are arranged, the bot agent server will send the answer to the Telegram server using the Telegram API which will then forward the answer to the Telegram user device.

3.5 Chatbot Workflow
This conversation system is designed so that users (parents of students) do not enter too much data when making data requests. Therefore, this system does not accept requests in the form of natural languages but by using certain request codes that are implanted into a custom keyboard that is simply clicked on by the system user.

Because of the above, we need a workflow that will be carried out by bot agents to service requests for information from users. The workflows (Figure 3) carried out by bot agents are as follows:
1. The bot agent will retrieve the username of the Telegram user who is sending the message
2. The bot agent will check the database whether the Telegram username has been registered.
3. If the username has been registered, then the process will proceed to step 5.
4. If the username has not been registered, the Telegram username will be registered in the database.
5. The system will check to the database whether the username has registered the cell number, if it is then the process will proceed to step 7.
6. If the user has not registered his phone number, the bot agent will ask the user to share the cell phone number used in the Telegram. After the user allows to share his cell number, the cell phone number will be registered in the database.
7. Then the bot agent will check the existence of the cell phone number into the academic information system database by searching for student data whose parents’ contacts are the same as the cell phone number of the Telegram user.
8. Based on the list of students there will be an examination of the number of students in the list. If there are only one student on the list, the student will become an active student and the process will proceed to the next step. But if the student in the list is more than one, then the system will display a student selection page. Selected students will be set as active students.
9. After the student is activated, the system will display a menu of choices to be selected by the user.
10. If the user chooses student information, value information, financial information, the bot agent will make a request to the web service that is connected to the academic information system database. After the information is obtained, the process continues to step 13.
11. If the user chooses university information, the bot agent will immediately compile answers in the form of address information, and university contacts. The process will proceed to step 13.
12. If the user chooses to replace a student then the process will continue back to step 8.
13. After the answers are arranged, the answers are sent to Telegram using the Telegram API.
14. After the answer is sent to Telegram, the conversation page will return to display the selection menu (step 9)
3.6 Chat Conversation Screenshot

Figure 4 shows the chat conversation screenshot between student’s parent with the chatbot. Figure 4 shows a screenshot of registering a Telegram user (parent) to chat system. Figure 5 shows the screen when the bot agent asks Telegram users to share phone numbers for parent’s authentication process. Figure 6 shows the screen when Telegram users successfully authenticate to chat system using parent’s phone number. Figure 7 shows the academic information sent from chatbot.

Figure 3. Chatbot Workflow.
Figure 4. Screenshot of Registering a Telegram User (parent) to Chat System

Figure 5. The Screenshot of the Bot Agent Asks Telegram Users to Share Phone Numbers for Parent’s Authentication Process.
Figure 6. The Screenshot of Telegram Users Successfully Authenticate to Chat System Using Parent’s Phone Number.

Figure 7. The academic information sent from chatbot.
4. Conclusion

In the research, Chatbot can be used as an alternative method of serving data requests from stakeholders in a university such as parents. Chatbot will be able to provide information faster and cheaper than through academic staff. Seamless authentication makes the process of authenticating parents easy and fast.

Acknowledgement

Authors would like to say thank to team member of Universitas Komputer Indonesia Academic Resource & Data Center Division (Mr. Adam Mukharil Bachtir, Mr. Angga Setiadi, Mr. Ridwan Nulloh, Mr. Donny Reza & Mr. Dede Suryaman) for their involvement in this research, for their help in providing data, web services and testing the chatbot.

References

[1] Mainardes, E. W., Alves, H., & Raposo, M. 2010. An exploratory research on the stakeholders of a university. Journal of Management and Strategy, 1(1), pp. 76.

[2] Shawar, B. A., & Atwell, E. S. 2005. Using corpora in machine-learning chatbot systems. International Journal of Corpus Linguistics, 10(4), pp. 489-516.

[3] Rahman, A. M., Al Mamun, A., & Islam, A. 2017. Programming challenges of chatbot: Current and future prospective. In 2017 IEEE Region 10 humanitarian Technology Conference (R10-HTC) (pp. 75-78). IEEE.

[4] Kumar, M. N., Chandar, P. L., Prasad, A. V., & Sumangali, K. 2016. Android based educational Chatbot for visually impaired people. In 2016 IEEE International Conference on Computational Intelligence and Computing Research (ICCIC) (pp. 1-4). IEEE.

[5] Mare, S. B. 2016. Seamless Authentication for Ubiquitous Devices (Doctoral dissertation, Dartmouth College).

[6] Sutikno, T., Handayani, L., Stiawan, D., Riyadi, M. A., & Subroto, I. M. I. 2016. WhatsApp, viber and telegram: Which is the best for instant messaging? International Journal of Electrical & Computer Engineering 6(3), pp. 2088-8708.

[7] Setiadi, H., & Paputungan, I. V. 2018. Design of telegram bots for campus information sharing. In IOP Conference Series: Materials Science and Engineering 325(1), p. 012005. IOP Publishing.

[8] Ranavare, S. S., & Kamath, R. S. 2020. Artificial Intelligence based Chatbot for Placement Activity at College Using DialogFlow. Our Heritage, 68(30), pp. 4806-4814.

[9] Latvala, S., Sethi, M., & Aura, T. 2020. Evaluation of Out-of-Band Channels for IoT Security. SN Computer Science, 1(1), pp. 18.

[10] Mekni, M., Baani, Z., & Sulieman, D. 2020. A Smart Virtual Assistant for Students. In Proceedings of the 3rd International Conference on Applications of Intelligent Systems (pp. 1-6).