# Telegram Bot for Automation of Academic Information Services with The Forward Chaining Method

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*Abstract*—Academic information is an important information for students in assisting academic activities, every effort has been developed to improve academic services. With the continuous development of various mobile devices or smartphones, the traditional way of Short Message Service (SMS) has been replaced by instant messaging applications that make the communication process more real-time. So this research will try to use technology in instant message as a means of academic service information, it is expected academic information can be delivered more quickly and up-to-date. Telegram as one of the instant messaging application that offers various advantages in its feature than other instant messaging application. The most popular feature and is being developed on telegram is the bot feature, where a third party or user can develop bot features according to user requirements. Thus telegram can help overcome various problems such as academic information seeking problems. For that made the application of lecture information service using Telegram Bot. The making of this information service application is built with Rational Unified Process (RUP) process model, Forward Chaining method and using Python Telepot Framework for Telegram Bot API for application to run via Telegram instant message. With the making of this application, facilitate communication and delivery of academic information to lecturers, students, and the academic community.

Keywords—Academic Information, Forward Chaining, Rational Unified Process (RUP), Python Telepot, Telegram Bot

# I. INTRODUCTIVON

Developments in the field of information technology make the process of getting information now undergoing rapid changes. Likewise, academic information needs are currently the main requirement of the Siliwangi University campus, although there are already web-based academic services and some optimizations have been carried out by research [1], [2] and also from the server side conducted by research [3], but the delivery of information to students is still not optimal. The development of information technology is now beginning to emerge instant messaging applications with various choices on mobile devices or smartphones. Telegram as one of the instant messaging applications that offers various advantages in its features compared to other instant messaging applications [4]. The most polarized feature being developed on telegram is the bot feature, where third parties or users can develop bot features according to user needs.

So that in this study academic information services will be developed by utilizing telegram bot technology. In realizing information services that are easy, accurate, innovative and fast processes, an inference method is needed that is adapted to the conditions of the study. The forward chaining method is a chain that is sought or passed from a problem to obtain a reasoning solution from the facts to the conclusion contained in the facts. The main advantage of forward chaining is that this method will work well when the problem starts from gathering or uniting information and then finding conclusions what can be taken from the information [5]. In the process of working this method is in accordance with the framework that will be used and the conditions are in accordance with this study. The framework will utilize the inlinekeyboard function in the telegram as a button to find facts or information.

So that the focus of this study will be to use the forward chaining method as a search for the facts of academic information on the telegram bot of Siliwangi University academic information services.

# II. RELATED WORKS

In the study [6] entitled "Making Application of Teaching and Learning Evaluation Questionnaire Using Telegram Bots at the Faculty of Engineering, University of Muhammadiyah" has produced a telegram bot which serves as a means to provide an assessment of the work of lecturers for one semester. In this study, telegram bots were used as a medium to provide lecturers with an assessment, but not yet a method of tracing facts.

In research [7] entitled "The Comparison between Forward and Backward Chaining" states that the forward chaining method is more suitable for problems that have multiple cases. While for backward chaining it is more suitable for specific cases. Likewise, in the research [8] entitled "Knowledge Base Implementation in missing data applications" the forward chaining method has been used successfully as a solution to the problem.

# III. RESEARCH METHOD

This study uses the Rational Unified Process (RUP) method which was first developed by Rational Software Corporation, RUP uses the object oriented concept, with activities that focus on developing models using the Unified Model Language (UML) [9]. RUP divides the stages of software development into 4 phases as follows:

## A. Inception

Identification of the cause of the problem can be seen from the problems in the process of obtaining lecture information that is still not organized in a single application system, so the design of the application is very necessary to maximize the process of obtaining lecture information. This is intended to facilitate the fulfillment of lecture information needs using telegram bots. In identifying the decision point can be done making a telegram bot application where the telegram bot itself will process the message, then it will find the answer that matches the message sent earlier in accordance with the application system procedure. So thus the answers received will be in accordance with the needs of the information entered by the user.

## B. Elaboration

### 1) Use Case Diagram

In Use Case Telegram bot application diagram there are 2 actors, namely students and lecturers who are different, lecturers get access rights to add information and for other rights the same as users of other users who can access lecture information. For more details, see in Fig 1.
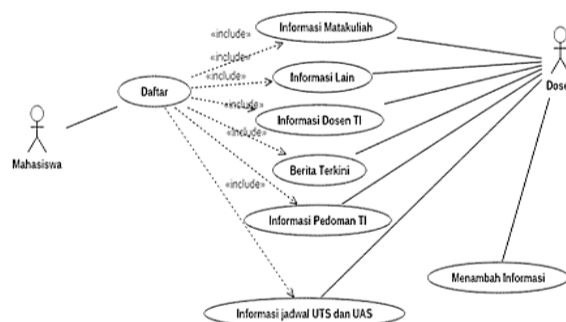


Fig. 1. Application Use Case Diagram

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*2) Class Diagram*

Class diagrams explain attributes and processes or methods, in this study telegram users can access information from other classes. For more details, see in Fig 2.
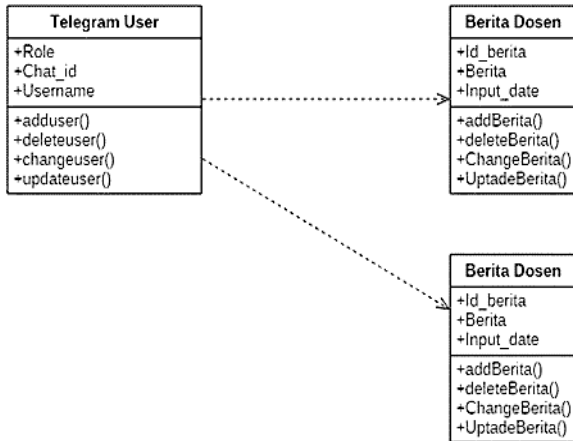


Fig. 2.   Class Diagram

## C.  Construction

Construction is the stage to implement the design results with the program code [9].

## D.  Transition

Application beta testing of user expectations. The testing in this study was conducted in 2 stages, namely white box and black box.

## IV.  RESULT AND DISCUSSION

### A.  Implementation of the Forward Chaining Method

The results of the implementation are some of the services provided by the bot. Table 1 and Table 2 are examples of results from the implementation of lecture information services in the form of daily information or in this application called the latest news.

TABLE I.          LATES NEWS LIST

| Code | Information | Code | Information |
|------|-------------|------|-------------|
| R1 | Berita Terkini | R11 | Rahmi |
| R2 | Rianto | R12 | Rohmat |
| R3 | Reza | R13 | Cecep |
| R4 | Alam | R14 | Acep |
| R5 | Eka | R15 | Andi |
| R6 | Heni | R16 | Husni |
| R7 | Neng | R17 | Firman |
| R8 | Nur | R18 | Berita Dosen Terkini |
| R9 | Aldi | R19 | Berita Informatika terkini |
| R10 | Adi | | |

Table 1 explains the facts or rules that will be compiled according to information needs. The need for accuracy so that lecturer data is not confused.

TABLE II.          CONCLUSION NEWS LIST

| Code | Conclusion | Information/ Output |
|------|-----------|---------------------|
| H1 | Berita Terkini + Berita Informatika Terkini | *Message* |
| H2 | Berita Terkini + Berita Dosen Terkini + Heni | *Message* |
| H3 | Berita Terkini + Berita Dosen Terkini + Rianto | *Message* |
| H4 | Berita Terkini + Berita Dosen Terkini + Alam | *Message* |
| H5 | Berita Terkini + Berita Dosen Terkini + Rohmat | *Message* |
| H6 | Berita Terkini + Berita Dosen Terkini + Aldi | *Message* |
| H7 | Berita Terkini + Berita Dosen Terkini + Adi | *Message* |
| H8 | Berita Terkini + Berita Dosen Terkini + Andi | *Message* |
| H9 | Berita Terkini + Berita Dosen Terkini + Cecep | *Message* |
| H10 | Berita Terkini + Berita Dosen Terkini + Acep | *Message* |
| H11 | Berita Terkini + Berita Dosen Terkini + Husni | *Message* |
| H12 | Berita Terkini + Berita Dosen Terkini + Firman | *Message* |
| H13 | Berita Terkini + Berita Dosen Terkini + Nur | *Message* |
| H14 | Berita Terkini + Berita Dosen Terkini + Rahmi | *Message* |
| H15 | Berita Terkini + Berita Dosen Terkini + Neng | *Message* |
| H16 | Berita Terkini + Berita Dosen Terkini + Eka | *Message* |
| H17 | Berita Terkini + Berita Dosen Terkini + Reza | *Message* |

Table 2 explains the preparation of facts or rules that have been explained in table 1 which later becomes the conclusion of the method. Then after that can be described a decision tree like Fig 3.
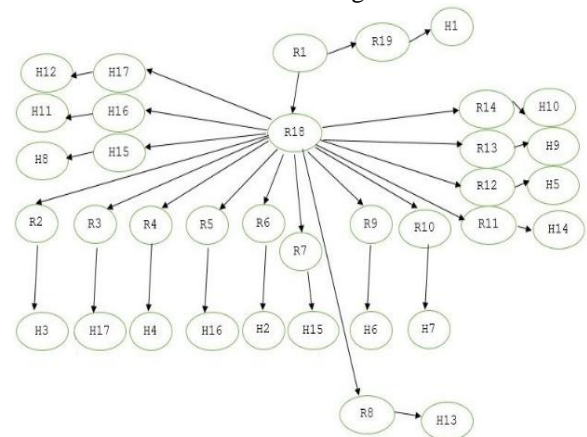
Fig. 3. Lates News Tree

After describing the decision tree, a knowledge base can be made on the latest news information that can be seen in Table 3.

TABLE III.     LATES NEWS KNOWLEDGE

| Code | Rule |
|---|---|
| R1 | IF Berita Terkini AND Berita Informatika Terkini THEN Berita Terkini + Berita Informatika Terkini |
| R2 | IF Berita Terkini AND Berita Dosen Terkini AND Rianto THEN Berita Terkini + Berita Dosen Terkini + Rianto |
| R3 | IF Berita Terkini AND Berita Dosen Terkini AND AlamTHEN Berita Terkini + Berita Dosen Terkini + Alam |
| R4 | IF Berita Terkini AND Berita Dosen Terkini AND Husni THEN Berita Terkini + Berita Dosen Terkini + Husni |
| R5 | IF Berita Terkini AND Berita Dosen Terkini AND RahmiTHEN Berita Terkini + Berita Dosen Terkini + Rahmi |
| R6 | IF Berita Terkini AND Berita Dosen Terkini AND Reza THEN Berita Terkini + Berita Dosen Terkini + Reza |
| R7 | IF Berita Terkini AND Berita Dosen Terkini AND CecepTHEN Berita Terkini + Berita Dosen Terkini + Cecep |
| R8 | IF Berita Terkini AND Berita Dosen Terkini AND Acep THEN Berita Terkini + Berita Dosen Terkini + Acep |
| R9 | IF Berita Terkini AND Berita Dosen Terkini AND Adi THEN Berita Terkini + Berita Dosen Terkini + Adi |
| R10 | IF Berita Terkini AND Berita Dosen Terkini AND Nur THEN Berita Terkini + Berita Dosen Terkini + Nur |
| R11 | IF Berita Terkini AND Berita Dosen Terkini AND Eka THEN Berita Terkini + Berita Dosen Terkini + Eka |
| R12 | IF Berita Terkini AND Berita Dosen Terkini AND Neng THEN Berita Terkini + Berita Dosen Terkini + Neng |
| R13 | IF Berita Terkini AND Berita Dosen Terkini AND Heni THEN Berita Terkini + Berita Dosen Terkini + Heni |
| R14 | IF Berita Terkini AND Berita Dosen Terkini AND Andi THEN Berita Terkini + Berita Dosen Terkini + Andi |
| R15 | IF Berita Terkini AND Berita Dosen Terkini AND Rohmat THEN Berita Terkini + Berita Dosen Terkini + Rohmat |
| R16 | IF Berita Terkini AND Berita Dosen Terkini AND Aldi THEN Berita Terkini + Berita Dosen Terkini + Aldi |
| R17 | IF Berita Terkini AND Berita Dosen Terkini AND Eka THEN Berita Terkini + Berita Dosen Terkini + Firman |

Table 3 describes the rules or rules found in the latest news categories. This rule is said to be a combination of two parts, the first part of the premise (If) and the second part of the conclusion (Then) (If_Then).

### B. Interface Implementation



Fig. 4. Lates News Interface

Fig. 5. Lecturer News Interface

Fig 4 describes the continuation of the latest news category, there are 2 new interfaces and if the user chooses the latest informatics news, the user has reached the first conclusion in this category, but if the user selects the latest lecturer news, the user will be faced with a new interface, as shown in Fig 5.

## C. Testing

*1) Changing the Pseudocode Algorithm of the Forward Method Chaining on search Lecture information becomes flow graph.*
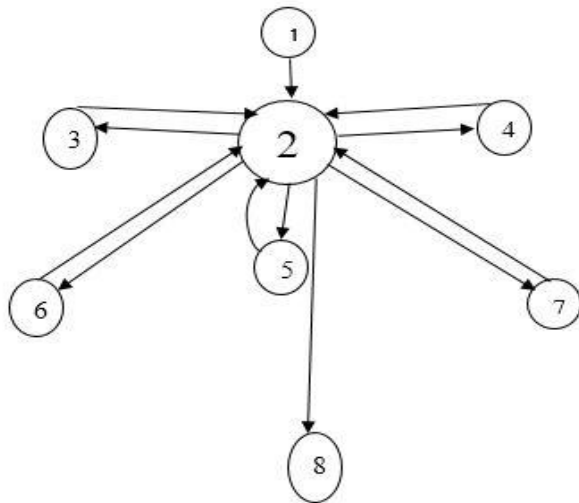


Fig. 6. Flow graph Forward Chaining method on lecture information search

From Fig 6 the cyclomatic complexity can be calculated as follows:

$$V(G) = E - N + 2$$
$$V(G) = 12 - 8 + 2$$
$$V(G) = 4 + 2$$
$$V(G) = 6$$

Where:
E = Number of edge flow graph
N = Number of node flow graph

So, the cyclomatic complexity for is 6. Based on the cyclomatic complexity, there are 6 paths that can be seen in table 4.

TABLE IV.    PATH FORWARD CHAINING METHOD

| Path 1 | Path 2 | Path 3 | Path 4 | Path 5 | Path 6 |
|--------|--------|--------|--------|--------|--------|
| 1,2,3,2 | 1,2,3,2, 4,2 | 1,2,4,2, 5,2 | 1,2,5,2, 6,2 | 1,2,6,2, 7,2 | 1,2,7,2, 8 |

*2) Testing the entire application using blackbox.*

TABLE V.    APPLICATION TESTING

| Class Testing | Scenario Testing | Expected Result | Conclusion |
|---------------|------------------|-----------------|------------|
| Enter Menu | Press the Start button on the telegram interface | Showing the main page, the message appears from the bot and the inline keyboard display | [v] Success [ ] Failed |
| Main Menu | Selecting every fact / information that has been provided by inlinekeyboard includes information from informatics engineering lecturers, current news, other information, course information, UAS and UTS schedule information, IT | Display each selected information. | [v] Success [ ] Failed |

| | | | |
|---|---|---|---|
| | guidance information | | |
| Admin Menu | Change lecture information data | Data or lecture information changes | [v] Success<br>[ ] Failed |
| Admin Menu | Add lecture information data | Lecture data or information is added from the database | [v] Success<br>[ ] Failed |

The test results from the White Box testing that have been done, shows that the forward chaining method implemented on the telegram bot system runs well and the search using inline keyboard is as expected.

The test results from the Black Box testing that have been done, shows that the application built has met the functional requirements and has been able to produce the expected output, especially in the search function that uses the inline keyboard has been running as expected.

## V. CONCLUSION

From the results of the research that has been carried out it can be concluded that the forward chaining method is successfully implemented on telegram bot lecture information services and the method can process information quickly and coupled with the help of online search boards to be easy and invasive.

As for suggestions for further research it is necessary to add push notification when the bot receives new information updates and bots that are made can be integrated with other systems.

## REFERENCES

[1] E. Wahyu and A. Rahmatulloh, "Optimalisasi Kinerja Sistem Informasi Akademik Universitas Siliwangi menggunakan Memcached dan Mirror Server," 2014.

[2] E. W. Hidayat and A. Rahmatulloh, "Optimasi Server SIMAK Menggunakan Memcached dan Mirror Server Untuk Meningkatkan Kecepatan Akses Layanan Akademik Universitas Siliwangi," S@ CIES, vol. 5, no. 2, pp. 69-78, 2015.

[3] A. Rahmatulloh and F. MSN, "Implementasi Load Balancing Web Server menggunakan Haproxy dan Sinkronisasi File pada Sistem Informasi Akademik Universitas Siliwangi,"

Jurnal Teknologi dan Sistem Informasi, vol. 3, no. 2, pp. 241-248, 2017.

[4] S. Radianty, "POLLINDO NEWS & SURVEY MEDIA NETWORK," 17 07 2017. [Online]. Available: www.pollindo.com. [Accessed 04 07 2018].

[5] C. Fenly and H. Harris, Expert Systems: Concepts and Applications. Advahces in library information technology, Washington: Library of Congress, 1988.

[6] R. Dewi, "Pembuatan Aplikasi Kuesioner Evaluasi Belajar Mengajar Menggunakan Bot Telegram Pada Fakultas Teknik Universitas Muhammadiyah," Sains dan Teknologi, pp. 1-2, 2017.

[7] A. Al-Ajlan, "The Comparison between Forward and Backward," International Journal of Machine Learning and Computing, vol. 5, 2015.

[8] H. M. ,. R. Mochamad Gibran Meidiyan, "Implementasi Knowledge base pada Aplikasi Data Orang Hilang," Jurnal Edukasi dan Penelitian Informatika , vol. 3, p. 2, 2017.

[9] G. Booch, J. Rumbaugh and I. Jacobson, Unified Modeling Language User Guide, Boston: Addison Wesley, 1998.

[10] D. T. I. Ade Mutia, "Coding," SISTEM PAKAR UNTUK MENDIAGNOSA PENYAKIT PADA SISTEM PERNAFASAN MENGGUNAKAN METODE FORWARD CHAINING DAN BACKWARD CHAINING, vol. 4, pp. 119-128, 2016.

[11] G. A. K. T. A, Penerapan Forward Chaining Pada Program Diagnosa Anak Penderita Autisme, p. 8, 2009.

[12] B. H.-S. M. V. Brian Henderson-Sellers, "CYCLOMATIC COMPLEXITY: THEME AND VARIATIONS," in School of Information Systems, Kensington, 1993.