

IMPLEMENTATION OF FINITE STATE MACHINE FOR ANDROID-BASED ONDHÂGGA BHASA LEARNING

Ahamad Agus Nur Wahyudi, Arda Gusema Susilowati, Rully Widiastutik
Wiraraja University, Indonesia

Email: yudi22789@gmail.com, arda@wiraraja.ac.id.com, rullywidiastutik@gmail.com

Abstract

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Ondhâgga Bhasa learning as one of the Madurese language levels requires interesting media to increase students' interest and understanding while supporting the preservation of regional languages. This study aims to implement the Finite State Machine (FSM) method in Android-based learning applications to help students understand the levels of Enjâ'-iyâ, Èngghi-enten, and Èngghi-bhunten. The FSM method is applied to the quiz feature to set the state flow and transition based on user answers. The application was developed using Android Studio with the Java programming language and SQLite database. The test was conducted using State Transition Testing to evaluate the implementation of FSM and the System Usability Scale (SUS) to measure the level of user satisfaction. The test results showed that all states and transitions went according to design with a 100% success rate, while the SUS test obtained a score of 87.26 which is included in the very good category. The application is also equipped with audio pronunciation features and multi-level quizzes so that it is able to support a more interactive and fun learning process. Thus, the Android-based Ondhâgga Bhasa learning application developed can be an effective alternative learning media to support the preservation of the Madurese language.

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INTRODUCTION

Regional languages are one of the cultural identities that need to be preserved as part of the wealth of the Indonesian nation. One of the regional languages that is still used by the community is the Madurese language. In its use, the Madurese language has a language level known as *Ondhâgga Bhasa* which consists of three levels, namely *Enjâ'-iyâ*, *Èngghi-enten*, and *Èngghi-bhunten*[2]. Understanding the language level is important to form communication skills in accordance with the norms and culture of the Madurese people.

The learning process of Ondhâgga Bhasa in elementary schools still faces several obstacles, including the use of learning media that is still conventional so that it is less able to attract students' interest in learning[1], [8]. This condition causes students to experience difficulties in understanding the differences in the use of each level of Madurese language. Therefore, a more interactive and interesting learning media is needed so that the learning process can take place effectively.

The development of mobile device technology, especially Android, provides an opportunity to develop learning media that is easily accessible to students. One form of media that can be used is educational games that are able to combine elements of learning and entertainment so that they can increase students' learning motivation[3], [9].

In this study, the *Finite State Machine* (FSM) method was applied to the quiz feature to regulate the flow of the game, state transfer, and system response based on user answers. The application of FSM allows the learning process to take place in a structured manner and in accordance with the scenario that has been designed[4]–[7].

Based on these problems, this study aims to implement the *Finite State Machine method* in the Android-based Ondhâgga Bhasa learning application as an interactive learning medium that can help students understand the level of Madurese language while supporting efforts to preserve regional languages[10]–[12].

LITERATURE REVIEW

Literature review is a theoretical foundation used to support the implementation of research and provide an overview of the concepts and methods applied. In this study, the literature review includes the concept of educational games as an interactive learning medium, the Finite State Machine (FSM) method as a mechanism for regulating the flow of the system, and Ondhâgga Bhasa as learning materials implemented in Android-based applications. In addition, relevant previous research is also used as a reference to identify differences and contributions to the research carried out.

A. Previous Research

Several previous studies have utilized the Finite State Machine method in the development of educational games and learning applications. The results of the study show that FSM is able to systematically regulate the flow of games and user interaction, thereby increasing the effectiveness of the developed applications. However, research on the application of FSM in Android-based Ondhâgga Bhasa learning media is still relatively limited. Therefore, this study focuses on the implementation of FSM to support Ondhâgga Bhasa learning through an interactive and easy-to-use Android application[4]–[7].

B. Educational Games

Educational games are learning media that combine elements of education and entertainment so that they can increase students' motivation and interest in learning. The use of educational games on Android devices provides easier access and more interesting interaction than conventional learning methods. Through the presentation of interactive materials, students can learn while playing so that the learning process becomes more effective[1], [3], [8], [9].

C. Finite State Machine (FSM)

Finite State Machine (FSM) is a modeling method used to regulate the movement of a system from one state to another based on certain inputs or conditions. Each state has different actions and transitions according to predetermined rules. In this study, FSM was applied to the quiz feature to regulate the flow of questions, level shifts, and system responses based on user answers so that the learning process can run in a structured and consistent manner[4]–[7].

D. Blind language

Ondhâgga Bhasa is a level of Madurese language use that is used according to the situation and the interlocutor. The level consists of Enjâ'-iyâ, Èngghi-enten, and Èngghi-bhunten. Understanding the use of this language level is very important because it is related to the norms of politeness and culture of the Madurese people[2].

RESEARCH METHODS

This research was conducted to develop an Android-based Ondhâgga Bhasa learning application by applying the Finite State Machine (FSM) method to the quiz feature. The research methods used include the data collection stage, system design, application implementation, and system testing to ensure that the application can function according to user needs. The application of FSM aims to regulate the learning flow and transfer between states in the application so that the user interaction process can take place in a structured and consistent manner.

A. Research Methods and Cores

This research uses an Android-based application development method by applying the Finite State Machine (FSM) method to the Ondhâgga Bhasa's learning quiz feature. The research stages include data collection, system design, application implementation, and system testing to ensure that the application runs in accordance with the research objectives.

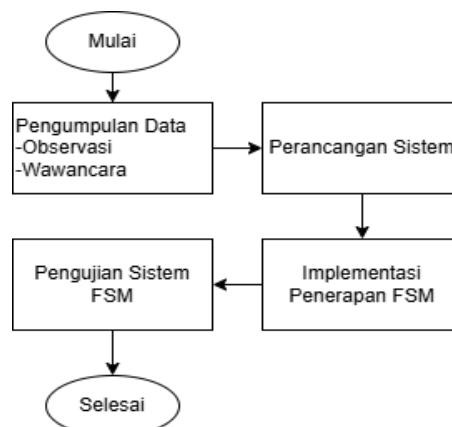


Figure 1. Research Flow Diagram

A. Data Collection

Data collection was carried out through observation, interviews, and questionnaires. Observations were carried out to find out the condition of learning Madurese language in schools, while interviews were conducted with regional language teachers to obtain information about Ondhâgga Bhasa materials and learning needs. In addition, questionnaires were used to measure the level of user satisfaction with the developed application.

B. System Planning

The system design was carried out using the Unified Modeling Language (UML) which consists of a use case diagram, flowchart, and Data Flow Diagram (DFD). The application was developed using Android Studio with the Java programming language and utilized the SQLite database as a medium to store data on materials, questions, answers, and user scores[10]–[19].

C. Implementasi Finite State Machine

The Finite State Machine (FSM) method is applied to the quiz feature to set the transfer of states based on user interaction. Each state represents certain conditions such as the main menu, level selection, problem work, and final results of the quiz. The transfer between states occurs based on the input provided by the user so that the learning flow can run in a structured and consistent manner[4]–[7].

D. System Testing

The system test was carried out using the State Transition Testing method to evaluate the success of the FSM implementation in each state and transition contained in the application. In addition, user satisfaction testing was carried out using the System Usability Scale (SUS) method which involved teachers and students as respondents to assess the level of ease of use of the application[20].

RESULTS AND DISCUSSION

This section presents the results of the implementation of the Android-based Ondhâgga Bhasa learning application as well as a discussion of the performance of the system that has been developed. The evaluation was carried out to determine the success of the application application (FSM) method in regulating the application flow and quiz process, as well as to measure the level of ease of use of the application by users. The test results obtained were then analyzed to determine the effectiveness of the application as an interactive Madurese language learning medium and support the preservation of regional languages.

A. System Development Results

The results of the research are in the form of an Android-based Ondhâgga Bhasa learning application designed to help students learn Madurese language levels interactively. The application provides learning materials consisting of three language levels, namely Enjâ'-iyâ, Èngghi-enten, and Èngghi-bhunten. In addition to learning materials, the application is also equipped with an audio pronunciation feature to help users understand the pronunciation of vocabulary correctly.

The application provides a multi-level quiz feature consisting of several difficulty levels to measure the user's understanding of the material that has been studied. In addition, the system also provides a score storage feature so that users can know the learning results that have been achieved[1], [3], [9].

B. Implementasi Finite State Machine

The Finite State Machine (FSM) method is applied to the quiz feature to set the flow of movement between pages and the learning process in the application. Each state represents a specific condition, such as the main menu, level selection, problem processing process, and the display of the final results of the quiz. The transfer between states is carried out based on user input so that the application flow can run in a structured and consistent manner.

The implementation of FSM allows the system to respond appropriately to user actions, such as moving to the next question, calculating scores, and determining the passing status at the end of the game[4]–[7].

C. Finite State Machine Testing

FSM testing is carried out using the State Transition Testing method by running all application features according to the scenario that has been designed. Testing is carried out to ensure that each state and transition in the application can run according to the expected function.

Table 1 Functional test results of Finite State Machine

Ye s	Tested Features	Testing Scenarios	Results
1	Splash Screen → Main Menu	The user opens the app and the system displays the main menu	Works
2	Main Menu → Menu Blind language	The user selects the Ondhâgga menu Bhasa to learn material	Works
3	Menu Ondhâgga Bhasa → Enjâ'-iyâ' Material	The user opens the Enjâ'-Iyâ' language level material	Works
4	A Menu of Ondhâgga Bhasa → Material That Is Important Grafting	User opens Èngghi-Enten language level material	Works
5	Ondhâgga Bhasa Menu → Material Ènggi-Bhunten	User opens Èngghi-Bhunten language level material	Works
6	Material → Back to Ondhâgga Menu Bhasa	The user returns to the material menu page	Works
7	Main Menu → Quiz Menu	The user selects the quiz menu	Works
8	Quiz Menu → Level Gampang Parana	The user starts the Gampang Parana level quiz	Works
9	Quiz Menu → Easy Level	The user starts the Easy level quiz	Works
10	Quiz Menu → Level Ta' Easy Pate	Users start the Ta' Pate Easy level quiz	Works
11	FSM Correct Answer	The user answers the question correctly, the system adds score and move on to the next question	Works
12	FSM Answer	The user answered the question incorrectly,	Works

The test results show that all states and transitions are successfully executed without any errors found during the testing process. The FSM test success rate reaches 100%, so the FSM method is considered successful in organizing the learning flow and quiz process in the application.

D. System Usability Scale Testing (SUS)

The user satisfaction level test was carried out using the System Usability Scale (SUS) method. This test involved teachers and students as respondents to assess the level of ease of use, interface appearance, and user comfort when using the application.

Table 2 Questionnaire Results

Questions	STS (1)	TS (2)	N (3)	S (4)	SS (5)	Total
Question 1	0	1	9	24	36	305
Question 2	0	1	11	27	31	298
Question 3	0	0	8	26	36	308
Question 4	0	2	10	24	34	300
Question 5	0	0	9	23	38	309
Question 6	0	1	8	27	34	304
Question 7	0	0	7	22	41	314
Question 8	0	1	9	25	35	304
Question 9	0	0	8	24	38	310
Question 10	0	1	10	25	34	302

Based on the results of the SUS questionnaire calculation, a score of 87.26 was obtained which was included in the very good category. These results show that the application is easy to use and can be well accepted by users as an Android-based Madurese language learning medium.

E. Discussion

The results of the study show that the application of the Finite State Machine (FSM) method is able to systematically regulate the application flow through clear state and transition mechanisms. The entire learning process and quizzes can run according to the predetermined design so that it can improve the consistency and stability of the system.

In addition, the use of Android-based learning media equipped with interactive materials, audio pronunciation, and multi-level quizzes is able to improve the user learning experience. The high SUS value shows that the application has a good level of usability and is suitable for use as an alternative learning medium in supporting the preservation of the Madurese language, especially in the Ondhâgga Bhasa.

CONCLUSION

This research successfully implements the Finite State Machine (FSM) method in the Android-based Ondhâgga Bhasa learning application. The FSM method is able to manage the flow of the application and the quiz process through a structured state mechanism and transition so that all features can run according to the predetermined design.

The results of the test using the State Transition Testing method showed a success rate of 100%, which indicates that all states and transitions in the application are functioning properly. In addition, the results of the evaluation using the System Usability Scale (SUS) obtained a score of 87.26 with a very good category, so that the application is considered easy to use and accepted by users. Thus, the Android-based Ondhâgga Bhasa learning application developed can be used as an interactive alternative learning media and support efforts to preserve the Madurese language.

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