

A Game of Arranging Scrambled Letters into Meaningful Words for Young Children using FSA Method

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Abstract. The most gaming enthusiasts are children, because children have a natural tendency to play. Game-based learning helps children to exercising concentration. This study applies Finite State Automata (FSA) method to recognize letters a player selects according to vowel and consonant. The results was a game of recognizing A-Z letter, sorting scrambled letters and arranging scrambled letters into meaningful words. Implementation of the grouping meaningful words are still limited in the use of array data structure and, hence, game development will be required using meaningful word database.

Keywords: Game, Learning Method, Young Children, Array, FSA

I. Introduction

Early Childhood Education (ECD) is an education for children before entering formal education. ECD according to the Republic of Indonesia Act No. 21/ 2003 on National Education System (NES) stated that early childhood development is an effort aimed at children aged 0-6 year old, which is accomplished through the provision of educational stimulation to assist their physical and psychological growth and development to prepare them entering the next educational level. A game-based learning method, i.e., a method of learning whilst playing, is applied in early childhood education. It is intended that the children are learning whilst having fun and playing. When learning doesn't exciting, it can be concluded that the learning process is boring and failed to make the children to have fun. There are many ways to encourage children learning whilst having fun, among other, use of a computer game. Children, especially young children, prefer game as a learning tool. A Game-based learning method provides opportunities for children to explore, discover, express feelings, creativity, and learn new things, whilst having fun. [1] In the learning process, children learn to recognize A-Z letters, a sequence of letters, sorting A-Z letters from scrambled letters and arranging scrambled letters into meaningful words. Game-for-Learning method - especially an exciting game providing challenges and prizes encouraging children to play - will generate a habit of learning whilst playing in children. Game-based learning method is effective methods for children learning, because children more focus on gaming than on conventional learning presentation. Term "conventional" here means that a teacher presents a lesson to the children, while the children pay attention and obey their teacher. This conventional learning will immediately lead to boring for children in learning. When a game presenting a positive values, then the children should have able to accept them more easily than with a conventional learning model [1].

II. Purpose

The purpose of this study is to assist the early childhood teacher in teaching letters and meaningful words from scrambled letters. This study pursues the following objectives:

1. To improve concentration of children in learning.
2. To increase power of their reasoning / analysis.
3. To optimize their right brain function
4. To increase ability of the children to recognize letters and create words more quickly.
5. To improve their ability to quickly mention the name of the goods or object they look at.

III. Method

The study was conducted at Islamic kindergarten AN-NUR in Citangkil village, Citangkil subdistrict, Cilegon city, Banten. Interviews and observation were applied to obtain on-site data. Pre- and post-gaming data sources was obtained from the questioner submitted to the teachers characterizing their students in the process of learning to recognize and arrange letters in the class. The analysis included a learning model in the kindergarten, an analysis of game users, analytical techniques such as pretest (the children's ability before using the game) and post-test (the children's ability after using the game), Array Algorithms and FSA (Finite State Automata). Designing of the game made use of the gaming system and a storyboard. The results obtained were a game for young children to help provide knowledge on how to recognize and arrange scrambled letters into meaningful words, such as balls, cock, eye, and so on.

IV. Result and Discussion

Game-based learning method will generate a habit of playing whilst learning in children, especially when the game is fun and there are challenges with prizes that make children more motivated and eager to play. Game-based learning is one of the effective methods of children learning, because children more focus on gaming than on conventional learning. Conventional means that the teacher teaches to the children, while the children pay attention to and obey their teacher instruction. This method results in boredom of learning in the children. The observation indicated that the children in the classroom are generally difficult to concentrate because of their peers' behavior of disturbing and making noise. In contrast, the children fully focus on gaming to lose track of time. It can be drawn a conclusion that games really teach certain things because children get the full concentration on it.

1. Analysis of Game

User was human beings playing this game for the period of time of this study. The users of this game were kindergarten students with age of 4-6 years old. High attention was paid on user interface and features implemented in the game, so that this game provided a satisfaction, pleasure, and knowledge for the users.

2. Analysis Technique of Software Development

Analysis techniques are applied to provide work flow of the system for developing letter recognition game. They include:

a. Array algorithm

Array algorithm is used to store data in the form of words stored in the internal memory of a computer so that the system does not need to use database, because the data of words that will be used in this game are small. They are A-Z alphabet and meaningful words described in the storyboard, i.e., diagram of arranging letters.

Font Recognition Algorithm

Declaration

Abjad:array[1..26] of

string = ('Aa', 'Bb', 'Cc', 'Dd', 'Ee', 'Ff', 'Gg', 'Hh', 'Ii', 'Jj', 'Kk', 'Ll', 'Mm', 'Nn', 'Oo', 'Pp', 'Qq', 'Rr', 'Ss', 'Tt', 'Uu', 'Vv', 'Ww', 'Xx', 'Yy', 'Zz')

Word:array[1..17] of

string = ('BOLA', 'AYAM', 'RODA', 'MATA', 'IKAN', 'MOBIL', 'ZEBRA', 'RUMAH', 'GELAS', 'BALON', 'DURIAN', 'SEPATU', 'KERETAVICELINCI', 'MUTIARA', 'MATAHARI', 'RAMBUTAN')

Description

{proses}

Enddescription

b. Finite State Automata (FSA)

Finite State Diagram (FSD) describes Finite State Automata. FSD is a type of diagram used in computer science and related fields to describe the behavior of the system. Diagram refers to a two-dimensional geometric symbolic representation of information according to some visualization technique.

FSA is used to recognize token of the scrambled letters and a player arranges the letters into a meaningful word. Given the input string is finite (A-Z), the FSA broke into two parts, namely the Deterministic Finite Automata (DFA) and nondeterministic Finite Automata (NFA). Analysis approach applies DFA. The nature of the DFA is that two outputs are resulted from one state. For ease of analysis, the researchers use the string input of IDV (identifier Vocals) and IDK (identifier consonants), IDV and idK have a different state, starting from the initial state (q0), state (q1) and state (q2). Each state has a transition based on the input string, ie the transition (q0, ...), transition (q1, ...) and the transition (q2, ...). The symbols are to indicate the input string.

Finite State Automata is to recognize scrambled letter token:

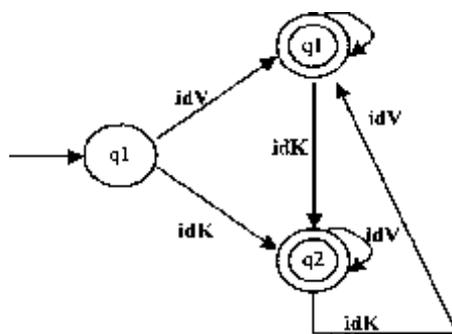


Fig. 1:Analysis of scrambled letters using the FSA

By analyzing results of the image above, for example, input string "BOLA", then the transition is:

Transition (q0,B)= q2

Transition (q2,O)= q2

Transition (q2,L)= q1

Transition (q1,A)= q1

Because the final string indicates final state (double circle), the input string BOLA is accepted. Then the string is examined whether there is a word BOLA in word array. If exist, the result is true, while if not exist, the result is false, indicating it is not the word in question.

V. Research Design

Characteristics and elements contained in the game [9] should guide in designing the system of the game. They include:

- a) Format: The game consists of five level with different difficulties, from the lowest level of introducing letters A-Z to the highest level of arranging words from scrambled letters.
- b) Rules: A player must go through the stages of instructions to complete the task in accordance with any questions. If the goal is completed, the game will continue to the next level.
- c) Policy: when a player makes a mistake in arranging the letter, he or she obtains an opportunity to rescrumble and rearrange with consequence of different prizes.
- d) Scenario: Firstly a player is introduced to letters. It is in accordance with the teaching method of reading for children [8], in which they should pass the early stage. After that, they are asked to find objects that are prefixed by the letter requested by matching them. Still in the same stage, a player is asked to arrange scrambled letters into meaningful word. In this level, he or she is trained to understand letters, instead of memorization. The difficulty level of arranging scrambled letters into meaningful words should be in accordance with questions. A player receives a set of 4 to 8 scrambled letters and should arrange them into meaningful words.
- e) Event/ Challenge: prize of the challenges is gold and silver. Timer is used to provide a challenge to players in order to compete for the star. The next challenge is scrambled letters provided for player to arrange a meaningful word related to object in question.
- f) Roles: A player plays a role as a child holding a scrambled letter to arrange them into meaningful word in accordance with the question.
- g) Decisions: A player makes decisions in determining which letters he or she should select or which strategies he or she adopts so as to finish the game more quickly.
- h) Levels: The game consist of multiple levels of difficulty, each of which consists of questions to be answered to achieve the next level. The difficulty level is adjusted by the method of reading to children with learning how to spell [8]
- i) Score models: the player receive a prize of gold or silver star once he or she complete the task within predetermined time setting. This can be seen at certain levels that require a challenge.

- j) Indicators: The indicator panel contains the letters that have been collected as a reference and how many more letters that should be taken. It is useful to motivate children to find the entire letter to arrange.
- k) Symbols: Arrow symbols indicate the direction to reach the next level. There are also buttons on the menu that is used to get to the level of the game.

Storyboard design

In describing the design of this storyboard, the authors present the use of UML, which is a technique for documentation of programming system, in this, game programming case.

The design of this storyboard contains a discussion of the storyline of this game that will be delivered using text and images. In this game, the story is broken into three parts, namely:

Menu Section

It is an opening page that contains menu. A player selects his or her preference to achieve a certain level of material. This section will appear choices that will lead to a level corresponding to the chosen difficulty level.

Rule Section

This section will display a box of attainment targets which must be done by the players to continue the game. Parts of this rule are on every menu that will lead to the game chart.

Level Section

This section is the liaison between the menu and the sub-levels. This section displays instructions on what to do to solve the run. This level consists of letter recognition, arranging scrambled letters, and stringing letters.

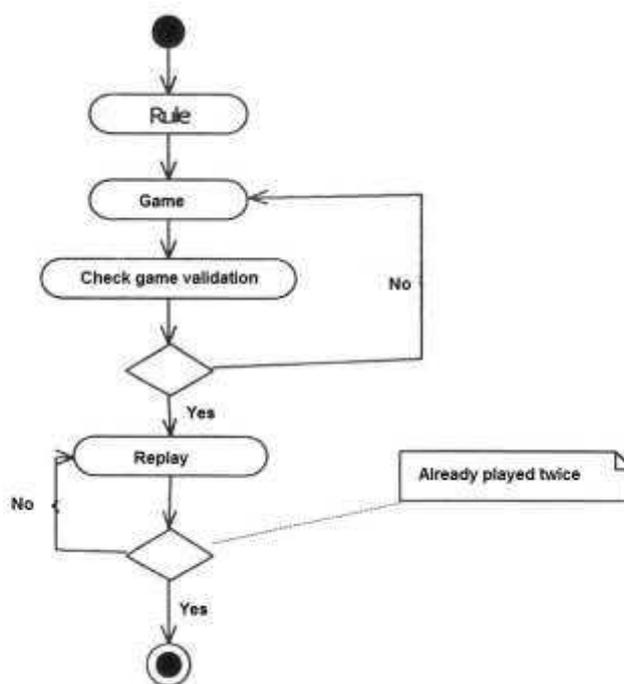


Fig. 2:Activity Diagram of sorting scrambled letters

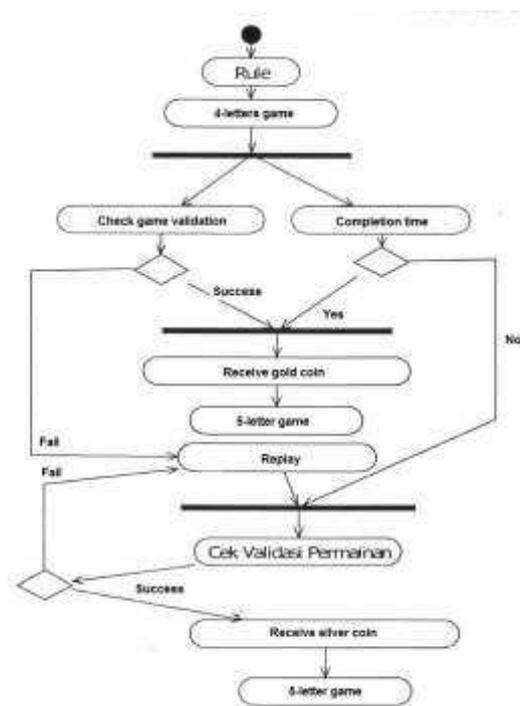


Fig. 3:Activity Diagram of arranging 4,5,6,7 and 8 letters

VI. Conclusions

From the results of this research were carried out starting from the beginning to test the application for letter recognition game for young children to this, it was concluded that:

a. Finite State Automata (FSA) is an automata machine from regular languages. Finite State Automata have a finite number of state, and can be moved from one state to another. Changes in the state expressed by the FSA transition function. Control mechanisms compiled word search string is split in two by way of following the path of vowels and consonants, it is valid to control the game compiled alphabetic string into a word (level 3). As for the AZ alphabet string control using a FSD method (Finite State Diagram) by reason of the search is only performed on one path through letter token is found.

b. The learning process will achieve optimal results when supported by the approaches and methods appropriate, interesting and interactive. Based on the observations in this study, learning of letters recognition using conventional methods is unpleasant for young children students and most students are difficult to focus on learning. Instead, with the the game-based learning method, learning of letter recognition is pleasure for them and they can focus on the subject. Besides, they may learn at home under the guidance of their parents.

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