Implementation of tensor flow-based deep learning in the learning application of around things in English

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Abstract. English is the most widely used international language in communication and is the second language after Indonesian. English will be taught more easily and effectively to children from an early age. But it needs learning media that suits the needs of children's growth. Learning media should be fun and able to get the child moving to explore the surrounding environment. This research aims to create an English learning application by applying Tensor flow machine learning that is able to recognize objects around us and package them in a learning application in which there is a game that is able to attract the attention of children to learn English. This research was built using the RUP (Rational Unified Process) system development method which consists of 2 dimensions. The first dimension consists of dynamic aspects in development consisting of inception, elaboration, construction, and transition phases. The second dimension represents static aspects which are grouped into 4 important elements, namely who is doing, what, how, and when. The machine learning process consists of 3 stages, namely data input (object image capture), preprocessing, and the training process. The results of this study are in the form of a learning media application that can recognize surrounding objects by applying Tensor Flow-based deep learning. The application consists of 2 parts, namely vocabulary learning and a quiz for the introduction of surrounding objects. Parents have a role to be able to add names and objects to the quiz in the application. The results of the research can be used as a learning medium according to the needs of the child.

1. Introduction

English is the language of instruction in the world that is very well taught to children from an early age because at an early age they can easily imitate and practice language skills [1]. However, it is not easy to get children's attention to learn English. Efforts to be able to attract children's attention is to create a learning media that is packaged to make it more attractive and interactive. The learning material is given starts from everything around us. The recognition of existing objects is a way to attract children's attention to learn about them. Learning media that are made must pay attention to the aspects of child development so that the learning process is carried out not making children passive.

Nowadays, when people get a new smartphone, most of them will download apps (applications) immediately [2]. This triggers the number of applications that can be downloaded on the Play store. However, existing applications tend to make children focus more on the device and not actively move. In addition, the application reduces the participation of parents or teachers in educating the child. The
shift in the learning model amid the popularity of devices requires a change in making device-based learning media but does not make children passive.

Deep Learning is part of Machine Learning which consists of many layers (hidden layers) and forms a stack, this layer is an algorithm or method that classifies commands that are inputted to produce output. Convolutional Neural Network is one of the developing deep learning methods. This method uses an input source in the form of an image that will be processed to produce a pattern that will be used to simplify the classification process. Tensor flow is an interface for expressing machine learning algorithms and for executing commands using information held about that object or a recognized target and can distinguish one object from another [3]. The Tensor flow library makes it easy to implement deep learning.

Therefore, to solve the above problems, innovation is needed in making learning media applications to make it more attractive and interactive. The use of Tensor flow technology that applies the concept of deep learning is expected to be an alternative solution in attracting children's attention to learning English. This application is expected to be able to bring back the role of parents to see children's development by being directly involved in the application in making a quiz to see children's development.

2. Methodology

This research consists of 3 main stages, namely the identification of problems to be taken as a research topic, data collection using observation techniques and literature studies, and system development using the Rational Unified Process system development method. This research consists of two methods, namely the collection method. Data and system development methods. Data collection consisted of observation and literature study. Observations are made to observe existing applications and phenomena related to the use of applications by children. Observations are made on learning applications that are related to learning English. A literature study is a data collection method based on literature that is related to the research to be carried out.

The application to be developed uses the Rational Unified Process (RUP) system development methodology [4]. RUP’s process has two structure or, if you prefer, two dimensions:

a. The horizontal axis represent time and shows the lifecycle aspect of the process unfolds. This dimension represents the dynamic aspect of the process as it is enacted, and it is expressed in term of cycles, phases, iterations, and milestones

![Figure 1. Research Methodology](image)
b. The vertical axis represents core process disciplines, which group activities logically by nature [5]. The activities are divided into 2, namely the main workflow and support workflow. The main work streams include business modeling, requirements, analysis and design, implementation, test, deployment. Support workflows include Configuration and Change Management, Project Management, and Environment.

Each phase that is carried out does not include all activities in the main and supporting work streams. In this study, no support workflow was used. The main workflows used in the inception phase include business modeling, requirements, analysis and design, implementation, and testing. In the elaboration phase, it is focused on business modeling, requirements, analysis and design. The construction phase focuses on requirements, analysis and design, implementation, testing and deployment. The last phase focuses on 3 activities related to implementation, testing and development.

3. Result and Discussion
Application development is made through 4 phases which contain the Rational Unified Process (RUP) system development method. Broadly speaking, the stages of system development that are made are as follows:

3.1 In the first phase of RUP, the inception phase produces:

a. The business process of applications will be built.
   - Applications that will be developed in analyzing objects and displaying object names in real-time are using Tensor flow technology.
   - There is a quiz feature in the application. Parents can add questions to the quiz using image processing and the ORB algorithm.
   - Applications can save and display the order of scores obtained

b. Identifying User Needs and Establishing Requirements
   - The users of this application consist of children and parents, where children can play word guessing quizzes with object detection using the ORB algorithm and the Freak algorithm. Parents can add questions by first capturing images, correct answers, and wrong answer choices and adding them to the application database.
   - The application can be used on smartphones with the Android 4.4 Kitkat operating system and a minimum of 2 MP camera.
   - Application operates offline

c. Testing
   The testing technique that will be used to test the application is to use conventional testing. Conventional testing consists of black-box and white-box testing.

3.2 Elaboration Phase
In the second phase of the RUP, namely elaboration, results in application design with details of nearly 80% of use cases, application design and application architecture have been made. UML tools are used to analyze and design applications [6]. The UML is an industry-standard language that allows us to clearly communicate requirements, architectures and designs [4]. The application design carried out in the second phase produces use cases, activity diagrams, sequence diagrams and class diagrams. As mentioned earlier, this literature review will be limited to journals published in 2010 through 2018. The time span is to see if research on the feature independence assumption on the Naïve Bayes method is still relevant.
This application has 2 users, namely children and parents with different roles, namely user and admin. Children as a user can play the application in which consists of 2 parts, namely learning vocabulary using Tensor flow and playing quizzes. Users can see the score obtained and how to play the application. Parents as admin have a role added objects and answers. Admins are required to register first to act as admin. Admin must be logged in to be able to add questions to the quiz.

Activity Diagram is a description of the flow of events in an application that describes the activities carried out by users and applications. At play quiz diagram activity, describing the processes running in the application carried out by the user. The user selects the play quiz menu and then points the camera at the object. If the object was detected, the system would be displayed a question about the object's name. The user will choose the available answer, if its correct it will show a notification and the score will increase. If it’s wrong it will only show a notification for the wrong answer.
Scenario diagram depicts a scenario or series of steps and responses from the components in applications in the form of controls, views, classes and others. In Figure 4, it can be seen that there are several components involved in the process of playing the quiz such as interfaces, controls, object classes, and a database for storing scores.

3.3 Construction Phase
In the third phase, the process of changing from design to program code is carried out which in turn will form a complete application. The tools used to create applications include Unity, the Tensor Flow library, the Mobile net SSD library, and firebase. The process in machine learning consists of 3 parts, namely preprocessing, data training, and testing. In this study, the use of resources, both computers, and smartphones, for one data training process can be done, but it takes a very long time. Using google collaboration can be used as an alternative but is not the focus of this research. Reason for speed up and equalize the object name and shorten the time, the dataset provided by Google is used. Also, to produce quizzes in real-time, an image processing process is used. The algorithms used are ORB and Freak algorithms.

The implementation of the design using the tool above produces an English learning application called going. Going stands for guess object in English. The initial display page is the page that first appears on both the user and admin side when the application is run.
On the learn menu, Directing the camera to the object was required to point the camera at the object whose name will be known. If the object is on the dataset, it will display the name according to the existing dataset. In Figure 5, Displayed the object was known as the rocking chair and the detail button will appear. The detail button serves as a link that will automatically open a search using a browser and a google search engine regarding the rocking chair.

![Figure 6. Play quiz to Guess Object](image)

On the play quiz menu, the user is required to point the camera at the object then it will be processed to display questions and answer choices based on input from the admin. Users are asked to choose the correct name, if they choose the correct answer, the score will display a notification and the score will increase by 100 points. If the user answers incorrectly, a notification for the wrong answer will appear and the score will not increase. The score page will show the order from highest to lowest. Any changes will always be updated, so the score will always display the proper sequence.

![Figure 7. Score](image)

The score page is used to display scores in order from highest to lowest. Every change continually is updated so that it adjusts to the order that has been determined.
To be able to add questions to the quiz, there are several steps that the admin must take. Application security for admins is done in 2 ways, namely registration, and login. Registration is required for the verification process and activation of the admin account. Adding questions is done in 2 stages, namely adding an image of the object and adding a list of correct and incorrect answers. The testing phase is a critical element of the quality of the software application that has been built and presents the main study of the specification, design, and coding process. Black-Box testing is the process of testing the fundamental aspects of an application without paying attention to the internal logic structure of the software. This testing process is carried out to determine whether the software application can run and function properly. [1]. The black box testing of applications that have been made can be seen in the table 1.

Table 1. Black-box testing

| No | Function tested | Test method | Expected results | Expected results |
|----|-----------------|-------------|------------------|-----------------|
| 1  | login           | Input wrong user name and password | Notification appears “username and password false” | As expected valid |
|    |                 | Input wrong user name and right password | Notification appears “username and password false” | As expected valid |
|    |                 | Input right username and wrong password | Notification appears “username and password false” | As expected valid |
|    |                 | Input right user name and password | The page adding objects and questions appears | As expected valid |
| 2  | Add objects    | Capture image | The captured object appears and the name is entered | As expected valid |
| 3  | View object    | Point the camera at the object | The object name appears | As expected valid |
| 4  | Play Quiz      | Point the camera at the object and guess the word with the wrong answer | Answer notification appears “your answer is not correct” | As expected valid |
|    |                 | Point the camera at the object and guess the word with the correct answer | Answer notification appears “your answer is correct” and the score will added with 100 | As expected valid |
3.4 Transition Phase
The last phase, it's focused on how to build documentation and the testing using the user acceptance test (UAT). Documentation related to application usage information by users. Testing using the UAT technique focuses on scheduling, manufacturing, and testing the instruments used.

4. Conclusion
In this paper, it can be concluded that the application that has been made is in accordance with the specified specifications. Where the user is required to explore the objects around him. Exploration means to keep moving, this is useful for stimulating the motor nerves of the user. Users are becoming more active in the use of technology. The role of parents is expected to support vocabulary addition and monitor user development.

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