

"ANYWORD" BILINGUAL DICTIONARY: DESIGN AND IMPLEMENTATION OF LINEAR SEARCH ALGORITHMS IN ANDROID-BASED OPEN-SOURCE APPLICATIONS

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ABSTRAK

Kemajuan teknologi informasi pada masa saat ini, membuat penyebaran informasi semakin cepat dan akurat. Hal tersebut membuat tempat penyampaian informasi menjadi penting terkait dengan informasinya. Penelitian ini membuat template aplikasi "AnyWord" kamus dua bahasa berbasis Android yang bersifat fully open-source code. Penelitian ini dirasa perlu karena belum tersedianya template aplikasi kamus yang ringan dan mudah dioperasikan serta bersifat gratis untuk digunakan oleh umum. Pengembangan aplikasi menggunakan model waterfall dan menggunakan perangkat lunak Android Studio dan SQLite. Untuk melakukan uji coba aplikasi, peneliti memilih menggunakan beberapa istilah geometri berbahasa Inggris dari <http://www.mathwords.com/>. Istilah geometri dipilih karena penerapannya pada jurusan lain misalnya di jurusan sistem informasi, geometri dipelajari oleh mahasiswa saat mempelajari AutoCad, Desain UI / UX, dan lain-lain. Validasi dilakukan secara daring kepada seorang ahli pemrograman. Selanjutnya ujicoba aplikasi dilakukan juga secara daring kepada 20 mahasiswa di lingkungan kampus. Hasil rata-rata keduanya adalah 90,27%. Jadi sesuai dengan skala Likert, aplikasi "AnyWord" layak dan dapat digunakan oleh umum.

Kata Kunci: android; kamus; open-source; dua Bahasa;

ABSTRACT

Advances in information technology at this time make the dissemination of information faster and more accurate. This makes the place of delivery of information important in relation to the information. This research creates an open source two-language dictionary application template "AnyWord" based on Android. This research is deemed necessary because the full source code of a dictionary application that is lightweight and easy to operate is not fully available. Application development uses a waterfall model and uses Android Studio and SQLite software. To test the application, the researcher chose to use several geometry terms in English from <http://www.mathwords.com/>. The term geometry was chosen because of its application in other majors, for example in the department of information systems, geometry is studied by students while studying AutoCad, UI / UX Design, and others. Validation is done online by a programming expert. Furthermore, application trials were also carried out online to 20 students on campus. The mean yield for both is 90,27%. So according to the Likert scale, "AnyWord" application is feasible and can be used by the public.

Keywords: android; dictionary; open-source; bilingual;

I. INTRODUCTION

The Covid-19 virus in Indonesia is currently impacting the entire community. The impact of the Covid-19 virus occurs in various fields such as social, economic, tourism, and education [1]. A letter issued by the Indonesia government on March 18th, 2020, all activities (indoor and outdoor) in all sectors are temporarily postponed to reduce the spread of corona, including the education sector. On March 24th, 2020 the Minister of Education and Culture of the Republic of Indonesia [2] issued Circular Number 4 of 2020 concerning Implementation of Education Policies in an Emergency for the Spread of Covid-19, it was explained that the learning process is carried out at home through online learning to provide a learning experience meaningful to students. Studying at home can focus on life skills education, among others, regarding the Covid-19 pandemic [3].

The learning process carried out in private institutions also uses online learning through the guidance of lecturers and monitoring by parents at each student's home. Online learning utilizes internet networks in the learning process [4][5]. With online learning, students have the flexibility to study time, can study anytime and anywhere [6]. Students can interact with the teacher using several applications such as google classroom, video conference, telephone or live chat, zoom, google meet, or via WhatsApp group. This learning is an educational innovation to answer the challenges of the availability of varied and innovative learning resources [7][8][9]. The success of a model or

learning media depends on the characteristics of the students. This is due to the learning environment and the characteristics of students [10][11].

In current conditions, the Covid-19 pandemic, the use of information technology is a major need in carrying out all life activities. For example, a student who wants to find reference books for study materials. Usually, he will come to his school library to look for the book. However, in the current condition where all activities are limited, these students will seek learning resources from home using internet-connected devices. With the aim of not having students lose their learning direction, of course, the teachers prepare the learning resources according to the online curriculum. So that students will get learning resources that are truly valid from their teachers and can be accessed anywhere and anytime [12].

Access to information using the internet is getting easier, so it raises the possibility of the student learning resources are in languages other than Indonesian. This often makes students overwhelmed in studying the material because students are prevented from interpreting the meaning first, then understanding the definition. In the information systems study program, mathematical terms in English often confuse students with their meanings. In its application, for example, in a course that uses AutoCad software, students are required to already understand geometric shapes, how to calculate area, volume, and so on. Often students only search from free search sites and get generic results. This will not solve student problems, so we need an alternative solution to solve that problem. A bilingual dictionary can be an alternative solution to the above problems. In general, the dictionary contains terms and their meanings. The term dictionary usually contains terms that are not unusual. The dictionary also provides specific explanations of the main search terms.

Some Android app dictionaries that have been developed provide example sentences when the dictionary is about the language of a region [13][14]. There have been many dictionaries for learning for higher education that has been developed and most of them only display the meaning [14][15][16], can only be used when the conditions are online or offline only [17][18], and only display pictures and/or formulas [19][20][21]. All applications that have been mentioned did not have the feature to save terms and not open source.

The purpose of this research is to provide an open source application that is lightweight, easy to use, and of course the community concerned can reuse the application. Apart from that, the functionality of this AnyWord application must match the essence of a digital dictionary. Where the AnyWord application is able to provide appropriate information. So that this application when developed by others can be utilized properly and correctly.

II. APPLICATION DEVELOPMENT METHOD

AnyWord application is only for mobile phones with the Android operating system and is created using the Android Studio software and SQLite database. The minimum target for the Android operating system is Lollipop or 5.0. The target was made because based on data from the website developer.android.com, mobile phone users with a minimum Lollipop operating system reached 89%. It means if the source code has been opened to the public, it is hoped that many users will use this application.

Applications made by researchers use the waterfall model [22]. The model was chosen because the system development model is carried out systematically or sequentially [23], in other words, to minimize errors that might occur while developing the application [24]. In the waterfall model integration and test phase, the development model is modified by adding application validation, revision, testing, and product revisions (if any) steps. Integration and testing activities in the waterfall model are tested on developers and users without any validation by people who understand programming. So that researchers feel the need to validate first before testing to the user. So that the waterfall model will change as Figure 1.

The AnyWord application consists of 3 main parts, the start page (search), the search results page, and the preferred word storage page. Figure 2 shows the flowchart of the AnyWord application.

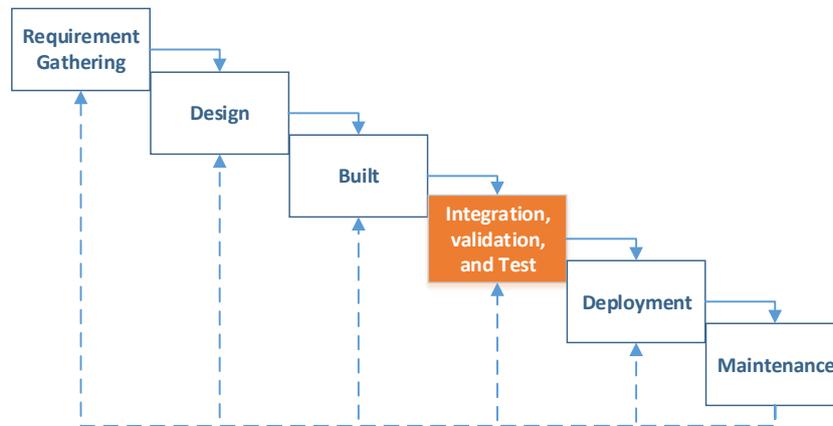


Fig. 1. SDLC waterfall model with the addition.

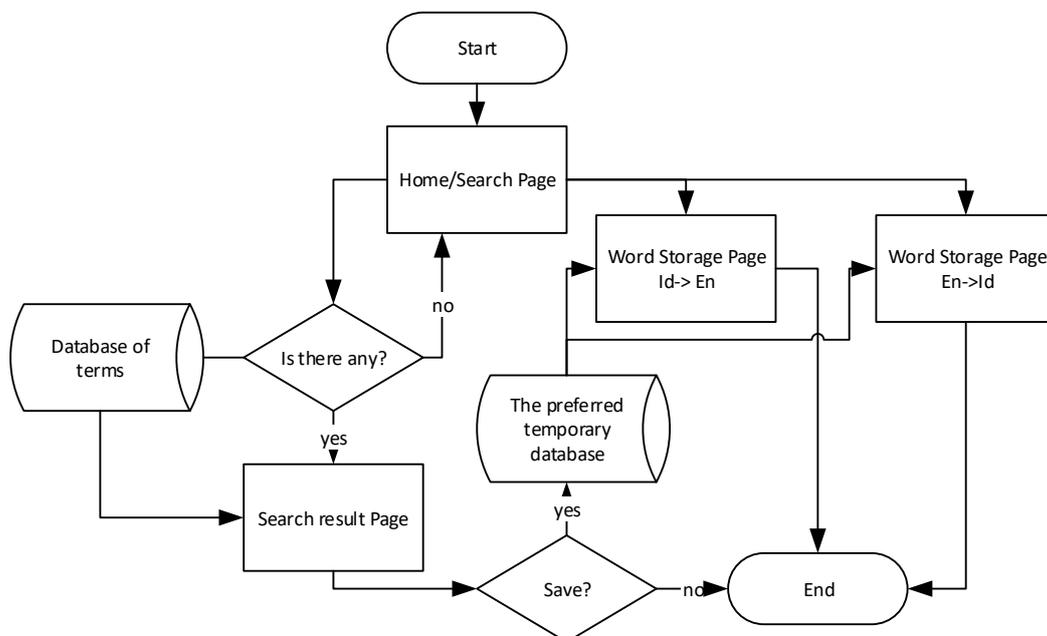


Fig. 2. Flowchart AnyWord application based on Android.

A. Word Search Method

To make fastest the application, a simple and quick searching method was the Linear Search algorithm [25]. Linear Search is working on sequences of text which unordered or ascending [26]. It searches data by comparing one by one the element of a set, write in a table or array, by starting the search on the first element in the sequence of a set. While comparing the element find the equality, then the linear search is stopped and the program shows the result [27][28].

In this application, the authors' plan use a database of geometric terms from <http://www.mathwords.com/>. The authors translated the terms into Bahasa by paying attention to the appropriate Indonesian rules. For example, the word “plane”, in plane geometry, will be translated in Indonesian with “datar”, not “pesawat”. The meaning of the word depends on where it is used. The following are the pseudocode of the Linear Search method.

```
/**
 * terms[0:n-1] is an array of n elements.
 * word is the element being searched.
 */
```

```
LinearSearchMethod(terms, n, word)
Begin
```

```

for i = 0 to n-1 by 1 do
    if terms[i] == word then
        return i;    //returning index of the array or
    print terms[i]; //print the word
    endif
endfor
return -1; //word does not found
End

```

B. Design and Implementation on Android Studio

This sub-section describes the user interface design and its implementation in Android Studio. The user interface design is made as easy as possible for the user to operate. Starting from the color selection, button layout, and font size. The version of Android Studio that is used is 4.0 which supports the creation of an Android application version of Android 11. This application is designed for mobile phones with a minimum version of Android 5 or Lollipop. This is done by the author to target users with cellphones that have not been updated with the latest Android operating system. Table 1 shows the user interface design implemented into Android Studio so that a friendly and easy-to-use user interface is obtained. Dark mode implementation can be seen in the favorite screen in Table 1, is also applied to this application to reduce the possibility of damaging the eyes when using the device.

III. RESULT AND DISCUSSION

In this section, we discuss how word searches are carried out in Android Studio using the linear search method and field trials. The first subsection explain an illustration of how the word search process. The second sub-section explain advantages of the linear search algorithm. The last sub-section explain the results of the field trial by program experts and 20 students.

A. Illustration of Linear Search Method

This application looks for words in the existing word column in the database to make the search time as fast as possible. Suppose there is a database in a column of words formed in a set $K = \{\text{area of a circle, area of a square, block, cube, triangle, angle, surface area}\}$. The words in the set K in the other columns contain meanings, definitions, pictures, and formulas. The following illustrates the linear search method in finding a word.

$K = \{\text{area of a circle, area of a square, block, cube, triangle, angle, surface area}\}$
word = block (Data searched)
P = the position of the data compared against X
N = number of data
F = boolean variable (true or false)
W (P) = Data with the 1st position

First iteration
word = block, P = 1, N = 7, F = False, W(1) = area of a circle
While (1 <= 7) And Not (False) -> True, Search resumed.
If (block = area of a circle) -> False
P = P + 1 = 1 + 1 = 2
...

Third iteration
word = block, P = 3, N = 7, F = False, W(3) = block
While (3 <= 7) And Not (False) -> True, Search resumed.
If (block = block) -> True
F = True

Fourth iteration
word = block, P = 3, N = 7, F = False, W(3) = block

While ($3 \leq 7$) And Not (True) -> False, Search stoped.
Print W(3) and position of W(3)

From the illustration above, it is obtained that the word "block" is located on the 3rd row. So that the meaning, definition, picture, and formula of the word can be obtained by calling in the desired column on the 3rd row. Figure 3 shows the search results in the application.

B. Advantages of Linear Search Method

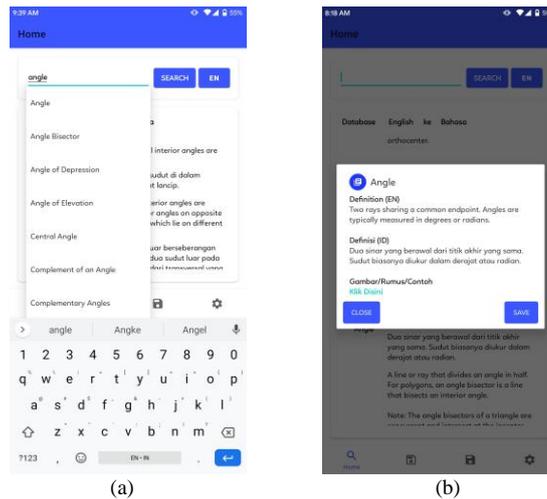


Fig. 3. The word search process. (a) The user is typing the word and press the Search button, (b) Search result.

Linear search, also known as sequential search is the simplest search algorithm. It looks up the value specified in the list by checking each element in the list. The binary search method is also a method used to find a specified value in an ordered list. The complexity of linear search is $O(n)$, while binary search is $O(\log n)$ [28]. In other words, the binary search speed is faster than the linear search method. As explained in the previous subsection, the search method used in the AnyWord application is a linear search method. This method was chosen because its implementation is easier than the binary search method. And for tests with a small number of databases, the linear search method is faster than the binary search [25].

C. Validation and Field Trials

Before Beta testing into students, this application is validated by an independent programming expert. We call it Alpha testing. Several aspects become benchmarks in this validation, namely aspects of the application, graphic aspects, and the feasibility of the content and material [29]. There are eighteen statements grouped into application aspects, graphic aspects, and the appropriateness of content and material.

Programming experts in the application aspect give a percentage of 90% with a valid category. The validation process uses a Likert scale with indicators including the ease of installing the application on a mobile device, the application is easy to use, each button works correctly, the input given gives the correct output, the database can be updated easily, and the code can be read easily. Consecutively obtained scores of 5, 4, 5, 5, 4, 4 with the maximum value is 5 per indicator.

Graphic aspects with indicators include color selection, layout design, layout settings, font usage, image display, application icons, and composition between letters and background. Consequently, media experts gave ratings of 4, 5, 5, 5, 5, 5, 4. In the form of a percentage, 94,3% were obtained with a valid category. The aspect of the feasibility of content got a percentage of 89,5%.

After correcting the expert's suggestions, the next trial was carried out on 20 students randomly. Compilation of a list of statements based on research conducted by Ming-Chang Lee [028]. The result show in Table 2.

TABLE I
 THE IMPLEMENTATION OF USER INTERFACE DESIGN INTO ANDROID STUDIO

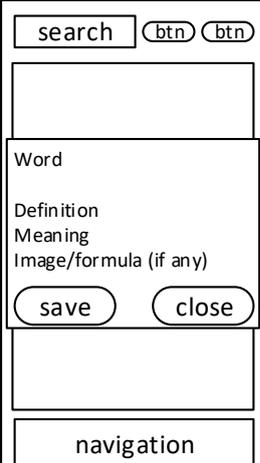
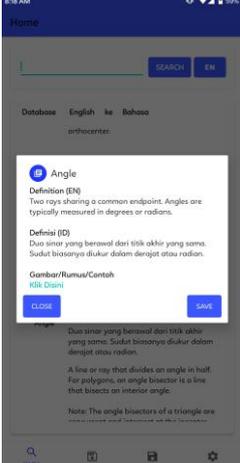
Screen Name	User Interface Design	Android Studio Design	Friendly User Interface
Main screen			
Favorite screen			
Search screen		<p>Using the alert dialog script</p>	

TABLE 2
TEST RESULTS TO 20 STUDENTS RANDOMLY

Indicators	Average (%)
Ease of application (6 sub indicators)	91%
Usability of the application (8 sub indicators)	86%
Ease of learning (6 sub indicators)	88%
User satisfaction (6 sub indicators)	92%

Based on Table 2, it can be concluded that the average validation result is 89,25%. This value is described as "Very Good" on a Likert scale [30], [31]. This illustrates if the AnyWord application meets indicators of ease of use, application functionality, makes it easier for users to learn, as well as indicators of user satisfaction based on experience when using the application with their own devices.

The response of the trial participants, namely students on the indicator "ease of application" obtained the highest score of 91%. This shows that the application is generally easy to use. The "application usability" indicator gets a score of 86%. This score illustrates if the application is in accordance with the expectations of researchers and user expectations. The results of the trial questionnaire on the indicator "ease of learning" get an average score of 88%. This indicator emphasizes more on the independent learning model carried out by students. The indicator "user satisfaction" obtained an average score of 92%. This shows that the application created creates an interesting and memorable experience for the user.

Based on Lee's research and according to the indicators provided by him [29], the AnyWord application has quality programming and content during the trial. In other words, this application deserves to be published in its source code in general. So that anyone can modify either add or subtract from the original application template.

IV. CONCLUSION

This application has two basic uses as a dictionary, being able to translate a word or term from English to Indonesian and vice versa. Second, this application provides meanings, definitions, formulas, and examples of usage (if any). This application is also able to save words/terms that the user likes and can be seen on the favourite tab so that if the user wants to see it again, there is no need to search for the word again. This application is also equipped with a dark mode feature so that when reading in a dark state, it reduces the risk of eye damage.

The application has been validated by programming experts and has been tested on 20 students. The validation carried out by programming experts give a percentage of 91,3% and were declared valid. The results of the trial for students give a percentage of 89,25% and were declared valid. Thus, the application is valid and suitable for learning geometry.

In the future, this application will be developed to be able to perform CRUD from the user side. This is done to allow users to have independent dictionaries that are not completely dependent on the developer. Besides, it is possible to add a dictionary database that does not only discuss geometry.

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