Application of Mental Health Android-based using Forward Chaining Method

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Abstract

Someone who is experiencing mental disorders must carry out medical consultations and seek experts in the psychiatric field and this requires a lot of funds. Doing a self-diagnosis of mental health can result in mishandling, because you will carelessly take drugs that are not recommended by doctors, while going to a doctor requires a lot of money. This research was carried out to develop an android-based expert system to determine mental health using forward chaining method. This application was developed using the Kodular web operating system. Meanwhile, for supporting the application development, the data were gathered through direct observation, interviews, and library research. The final product of the research was Android-based mental health diagnosis application that makes it easier for someone to do an early analysis. By using this application, users are able to take action from the initial treatment suggestions displayed. In addition, as proof that this application runs well, the black box test has been carried out.

Keywords: Android, Diagnosis, Forward Chaining, Mental Health,.

1 Introduction

Diagnosing mental conditions on their own is an activity that is often carried out by individuals with knowledge and information obtained independently [1]. Carrying out mental health self-diagnosis will result in wrong treatment, carelessly consuming drugs that are not recommended by doctors, and can result in the risk of developing a more serious mental illness. Someone who has a mental disorder must carry out medical consultations and seek experts in the psychiatric field and this requires a lot of funds [2]. Even though most research has been in relation to amphetamines, cannabis and alcohol, comorbid mental health symptoms are probably also the case for the more severe forms of SUD like opioid dependence. However, less is known about the prevalence, predictors and change over time of mental health symptoms in these patient groups, limiting optimal clinical care [3].Mental health issues remain underdiagnosed and undertreated among adolescents and young people (aged 10-24 years). A number of systematic reviews and meta-analyses have been conducted over the past 10 years on the use of digital technology to enhance mental health among adolescents and young people [4]. The American College Health Association (ACHA) conducts an annual national survey that examines the health of college students. From their 2016 survey of 5099 graduate and professional students across 34 schools, the ACHA reports that within the last 12 months, 41.5% of students "felt things were hopeless," 51.8% "felt very lonely," 55.3% "felt overwhelming anxiety," and 33.5% "felt so depressed that it was dif-

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ficult to function." The results are even more alarming for undergraduate students who reported 52.7%, 67.3%, 61.9%, and 39.1% respectively for the same questions [5].

Meanwhile, it has been found in Palangka Raya, especially at the Joint Adulam Ministries Foundation, there are 36 patients who suffer from mental disorders due to lack of treatment and attention from family or closest people so that the patients are taking longer to be treated.

Based on the previous observation, the researchers offered a solution for this problem by utilizing existing technology to find out symptoms, causes, or treatment known as an expert system that makes it easier for people to detect mental health symptoms in those closest to them [6].

Expert systems are a branch of Artificial Intelligence that uses knowledge to solve problems at the expert level in their field [7]. Experts are people who have expertise in a particular field, namely an expert who has special knowledge or skills that cannot be understood by other people except in the field they have [6]. The expert system is software designed specifically based on Artificial Intelligence, where the system seeks to adopt human knowledge to the computer so that the computer can solve a particular problem by imitating work of the experts. Expert system development requires knowledge acquisition from people, involving both knowledge engineers and application domain experts in specialist interactions with computing systems [8]. The expert system designed using the forward chaining method that can be used as a consultation tool for person who needs early diagnosis to reduce treatment delayed.

Forward chaining method is data-driven because information starts from existing information and then draws a conclusion. Forward chaining makes use a set of condition- action rules [9]. In addition, forward chaining is data tracking that starts from existing symptoms and is then processed towards results or conclusions about disease information [10] [11]. Because the use of this application is to identify symptoms, then these symptoms provide disease results, using the forward chaining method is the right method.

In Hendra's research (2020), it discusses Web- based Expert Systems For The Diagnosis Of Mental Diseases By Using Bayes Theorem Method [12]. The result of his research is less efficient because it is not easy to open using a smartphone. Therefore, in this next research, the researchers developed an Android-based application to make it easier for people to access it without the internet.

Android is an operating system for mobile devices based on Linux that includes an operating system, middleware and applications. Android provides an open platform for developers to create their applications [13].

Based on the background that has been stated, the focus of the problem to be discussed is how to develop an Android-based mental health therapy expert system that can provide diagnostic results in the form of initial information and advice for each type of mental disorder based on the symptoms experienced by the patient (the user) using the Forward Chaining method. Symptoms and disease that exist in this expert system were obtained through interviews with psychiatrists at the Joint Adulam Ministries Foundation. Final system of the application is tested using Black Box testing. Once the application is created,

then the testing phase is next. Black Box testing is a software testing technique that works on the functional specifications of the software [14]. Testing the software is done to determine whether the information system made can run in accordance with expectations or not. System testing is useful for verification and validation of compliance with user requirements [15].

2   Data and Methodology

A. Data Analysis

From the results of the interviews conducted with informants, about how the expert process diagnoses mental health disorders, the doctor asked the patient or the closest family about the complaints and symptoms felt. The symptom data would be analyzed and used as material for conclusions about the mental illness suffered by the patient. The data obtained would be compiled based on the directions and information from the informants.

Symptoms are things that are seen or felt by the user which are then processed to become the result of the disease. In this study, there were 30 symptoms of mental disorders which can be seen from table 1.

Table 1: Disease Symptoms Table

ode	Symptoms
G01	Lack of focus or difficulty concentrating
G02	Difficulty sleeping or waking up easily or sleeping too much
G03	Easily tired
G04	Feelings often change
G05	Loss of interest and excitement or always seems moody
G06	Lack of self respect or lack of self confidence
G07	Always feeling guilty and useless
G08	Feeling that the future is bleak or has no future
G09	Hurt themselves or feel suicidal
G10	Appetite too much or less
G11	Excessive anxiety, fear, avoidance for 6 months
G12	Overthinking that is not necessarily the case
G13	Easily irritated, restless, nervous, and cornered
G14	Difficult in making decisions
G15	Headache
G16	Shaking
G17	Excessive sweating
G18	Nauseous
G19	Stomach ache
G20	Diarrhea
G21	Easy to get angry
G22	Isolate themselves from the surrounding environment and other people
G23	Cannot differ reality and unreality
G24	Hear, see, smell and feel something that isn't there

ode	Symptoms
G25	Mind feels chaotic
G26	Unusual behavior change
G27	Lacks emotion or monotony
G28	It's hard to feel happy or satisfied
G29	Don't care about appearance and personal hygiene
G30	Doesn't want to start conversation and uncomfortable around other people

The types of diseases in table 2 are obtained from the selection of symptoms in accordance with what is experienced by the patient or the user.

Table 2: Type of Disease

Code	Type of Disease
P01	Mild Depression
P02	Moderate Depression
P03	Major Depression
P04	Mild anxiety disorder
P05	Moderate anxiety disorder
P06	Severe anxiety disorder
P07	Schizophrenia Early symptoms
P08	Negative Schizophrenia
P09	Positive Schizophrenia

The decision tree designed according to the forward chaining method consists of 30 symptoms (G01 - G30) and 11 diseases (P01-P11), which can be seen in Figure 1.
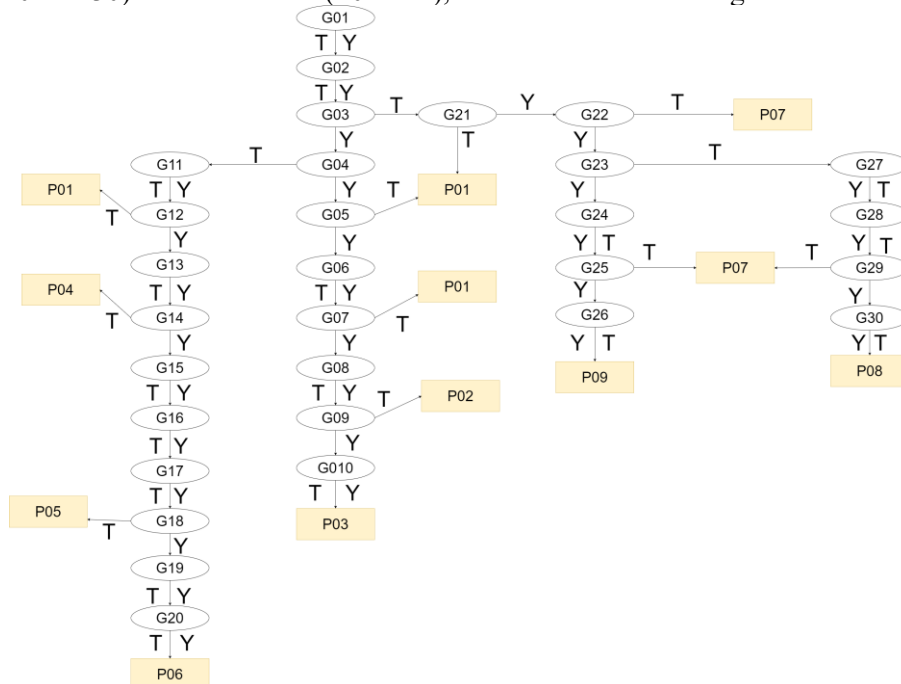

Figure 1: Decision tree Diagnosis Based on Forward Chaining Method

Based on Table 1 and Table 2, Figure 1 explained about rules with forward chaining experts are explained as follows

First Rule :

If "lack of focus" (G01) = Yes or No
And Difficulty sleeping or waking up easily or sleeping too much (G02) = Yes or No
And Easily tired (G03) = Yes
And Feelings often change (G04) = Yes
And Loss of interest and excitement or always seems moody (G05) = No
   Then Mild Depression (P01)

Second Rule :

   If lack of focus (G01) = Yes or No
   And Difficulty sleeping or waking up easily or sleeping too much (G02) = Yes or No
   And Easily tired (G03) = No
   And Easy to get angry (G21) = No
   Then Mild Depression (P01)

Third rule :

   If lack of focus (G01) = Yes or No
   And Difficulty sleeping or waking up easily or sleeping too much (G02) = Yes or No
   And Easily tired (G03) = Yes
   And Feelings often change (G04) = Yes
   And Loss of interest and excitement or always seems moody (G05) = Yes
   And Lack of self respect or lack of self confidence (G06) = Yes or No
   And Always feeling guilty and useless (G07) = No
   Then Mild Depression (P01)

Fourth rule :

   If lack of focus (G01) = Yes or No
   And Difficulty sleeping or waking up easily or sleeping too much (G02) = Yes
   And Easily tired (G03) = Yes
   And Feelings often change (G04) = Yes
And Loss of interest and excitement or always seems moody (G05) = Yes
   And Lack of self respect or lack of self confidence (G06) = Ya atau No
   And Always feeling guilty and useless (G07) = Yes
   And Feeling that the future is bleak or has no future (G08) = Yes or No
   And Hurt themselves or feel suicidal (G09) = No
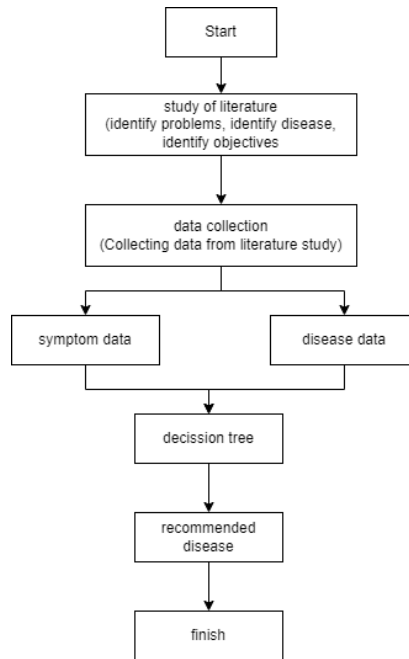   *Then* Moderate Depression (P02)

B. Methodology

Figure 2: The Research Process

Figure 2 explains the process of the research conducted.
Literature study conducted is to identify disease problems from existing symptoms.
Data collection are obtained from book knowledge and information from experts.
Symptoms and diseases are analyzed and made in the form of a decision tree using the forward chaining method so that diseases that match the patient's diagnosis are obtained

C. System Process Design

Use case is a picture of the relationship between the user and the object in the application. The use cases in this study are designed for accessing and using applications which can be seen in Figure 3.
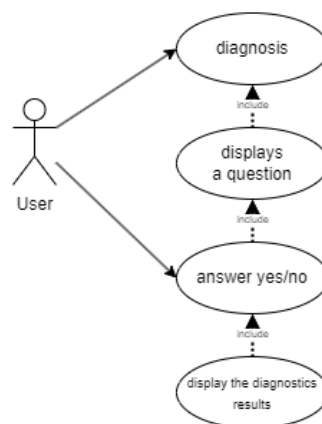

Figure 3: Use Case Diagram

D. *Making Algorithms*

Visual Block Scratch Programming is a programming language designed to introduce simple computer programming concepts to beginners to learn write programs without having to think about writing them wrong syntax [16].

1) Homepage Block Programming

In Figure 4 is a block programming from the start page, explaining about when the diagnosis button is clicked it will enter the statement page, then when the info button is clicked it will open the info page, finally when the exit button is clicked, the application will be closed.
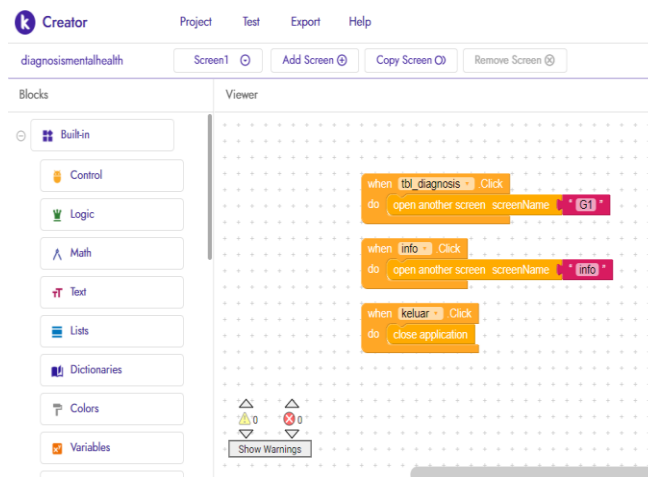

Figure 4: Homepage Block Programming

2) Block Programming on the Statement Page

In Figure 5 it is explained that when the yes button is clicked by the user other symptoms will appear, likewise when the button is not clicked by the user other symptoms will appear, when the back button is clicked it will return to the previous statement page and must choose yes or not to go to the next page.
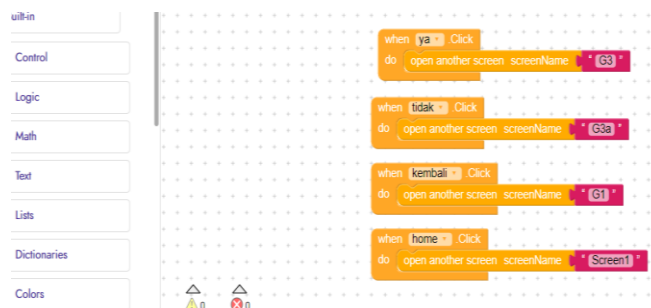

Figure 5: Block Programming on the Statement Page

3) Block Programming on Results Page

In Figure 6 it is explained that when the exit button is clicked the application will close, then when the home button is clicked it will return to the start page (home).
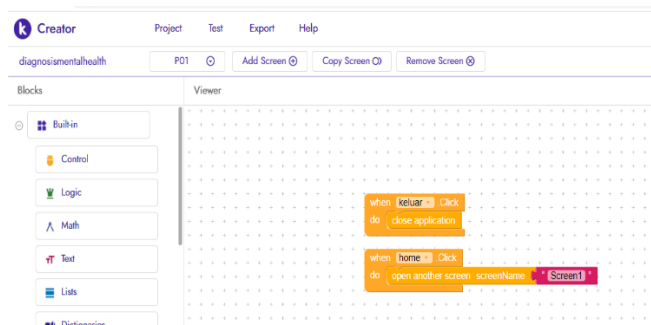
Figure 6: Block Programming on Result Page

3   Result and Discussions

With the rapid development of technology, as well as with the existence of the Kodular web operating system, it is possible for developing Android application using block programming.

The researchers developed an Android-based mental health diagnosis application using a codular web operating system. The mental health diagnosis application tested using a companion application downloaded first on a smartphone and then connected to the code displayed on the Kodular web. After the application has been successfully developed according to the designed concept, this application is exported as apk. file.

A. Implementations
1) Initial Appearance of the Application
In the initial view there is a "welcome" homepage, then the sentence "Let's do your mental health check", and there is a "Diagnosis" button, as shown in figure 7.
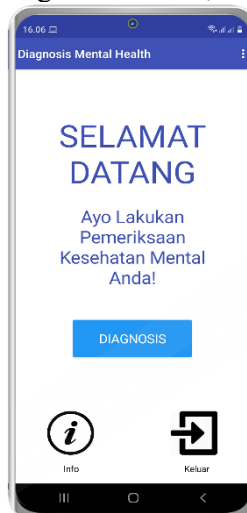

Figure 7: Display of the Mental Health Application Start Page

2) Display of Statement Page
On the statement page, a symptom question will appear, the user is asked to answer by clicking the yes or no button according to the symptoms experienced, which can be seen in figure 8

Figure 8: Display of Statement Page

3) Display of Result Page

This page will display the results of the initial diagnosis and suggestions for users, as shown in Figure 9.
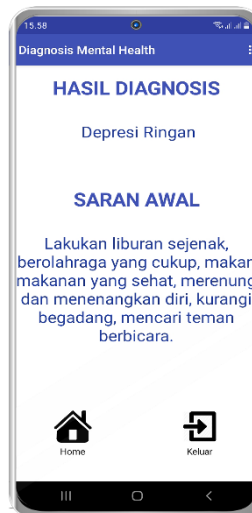

Figure 9: Display of Diagnostic Results and Suggestions Page

B. Black Box Testing

Black box testing is a software quality test that focuses on software functionality. Black box testing aims to find incorrect functions, interface errors, data structure errors, performance errors, initialization and termination errors. *[17] [18]*.

1) Homepage Testing

Tests on the home page include the diagnosis button leading to the statement page, the info button displays information about the application, the exit button to close the application, as shown in table 3.

Table 3: Table of Black Box Testing Home Page

Testing	Expected results	Result
Homepage	Displays a page with the word "welcome", the sentence "Let's do your mental health check", the diagnosis button, the info button, the exit button.	appropriate
Diagnosis Button	When clicked displays the statement page.	appropriate

2) Statement Page Testing

Testing the statement page can be seen in the following table 4

Table 4: Table Typt of Black Box Testing Statement Page

Testing	Expected results	Result
Statement Page	Displays statement, yes button, no button, back button, home button.	appropriate
Yes button	When clicked it displays the next statement page.	appropriate
No button	When clicked it displays the next statement page.	appropriate
Back button	When clicked it will return to the previous statement page.	appropriate
Home button	When clicked it returns to the home page.	appropriate

3) Result Page Testing

Testing the results page can be seen in the following Table 5.

Table 5: Table of Black Box Testing Result Page

Testing	Expected results	Result
Result page	Displays the results of the initial diagnosis and suggestions for the user, the home button, the exit button.	appropriate
Home button	When clicked it returns to the home page	Appropriate
Exit button	When clicked it will exit the application	Appropriate

4   Conclusions

The mental health diagnosis application is useful in providing initial diagnosis and advice on mental health. Based on the results of the black box test, the application is declared to function properly, this is evidenced by the average answer "appropriate", it means the application runs as expected.

For further development, the next researcher can add or improve the user interface to make it more comfortable to use, and provide an attractive appearance. Since in this research there are only few symptoms and disease names in the application, for further development, it would be possible to add more symptoms and disease names to the application.

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