Expert System of Personality Analysis Based on Android Mobile Application

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Abstract: Personality is a characteristic behavior that a person has that differentiates a person from other people. Information about personality is no less important than other information. By knowing one's own personality and character, a person can determine steps to develop their strengths and manage their weaknesses as well as interact and adapt to their environment. Personality tests are divided into various types according to the method of classifying human personality used. In this research, the method for classifying human personality that will be used is the Hippocrates-Galenus Typology where personality types are classified into four, namely: Choleric, Sanguine, Melancholic, and Phlegmatic. The classification of personality types is based on dominant body fluids. This application uses an expert system, namely a knowledge-based program that provides expert quality solutions to problems in a specific domain and uses a forward chaining method to collect facts from the personality characteristics of application users which will later be used to determine conclusions at the end of the consultation.

Introduction

The development of information technology is currently growing very rapidly. New technology is created and developed to make human life easier. Artificial intelligence is a part of computer science that can make computers do work like humans do. Human activities that are imitated include reasoning, vision, learning, problem solving, understanding natural language, and so on. The fields of artificial intelligence technology include: expert systems, computer vision, robotics, natural language processing, pattern recognition, artificial neural networks, and speech recognition.

One area of artificial intelligence is expert systems. An expert system is a knowledge-based program that provides expert quality solutions to problems in a specific domain. In general, an expert system is a computer system that can match or imitate the ability of an expert's thinking process in solving a specific problem. One area of application of expert systems is in the field of psychology. One example of the application of an expert system in the field of psychology is personality analysis.

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There are many theories that can be used to understand personality type. One theory that is often used and continues to be developed is the Hippocrates-Galenus typology personality theory. According to the Hippocrates-Galenus Typology, personality types are classified into four, namely: Choleric, Sanguine, Melancholic, and Phlegmatic. The classification of personality types is based on dominant body fluids.

Psychological testing is a method used to analyze one's personality which is done by consulting a psychologist and of course requires a lot of time and money. Apart from consultations with psychologists, many psychological tests are presented in the form of books so that they can save time and money, but the system for implementing psychological tests in books is still manual, namely by answering psychological test questions then participants have to calculate the total score and carry out an analysis referring to the guidelines. Calculations in the book as a reference to determine the type of personality he has. Of course, this is felt to be less efficient and takes quite a long time in the process which is likely to make someone feel bored and can have an impact on the resulting less accurate conclusions.

The forward chaining method has been widely used in people's lives because this method is very simple, namely drawing conclusions based on the facts collected. In making applications, this method is widely used, for example in making decisions or for classification. In the personality test application, this method will be used to

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determine a person's personality type according to Hippocrates-Galenus' typology. To make personality analysis easier, a Personality Analysis Expert System Application Based on an Android Mobile Application was built. It is hoped that this application can help someone to get personality test results more easily using the Hippocrates-Galenus Typology personality theory.

Literature Review

Expert System is a system designed to be able to imitate an expert in answering questions and solving problems. With the help of an expert system someone who is not an expert or expert can answer questions, solve problems and make decisions that are usually made by an expert. There are two important parts of the expert system, namely the development environment and the consultation environment. The development environment is used by expert system makers to build its components and introduce knowledge into the knowledge base. The consultation environment is used by users to consult so that users get knowledge and advice from the expert system like consulting an expert.

In a rule-based expert system, the knowledge domain is represented in a collection of rules in the form of IF-THEN, while the data is represented in a collection of facts about current events. The inference engine compares each rule stored in the knowledge base with the facts contained in the database. If the IF (condition) part of the rule matches the facts, then the rule is executed and the THEN (action) part is placed in the database as new facts are added.

Forward Chaining is a search technique that starts with known facts, then matches these facts with the IF part of the IF-THEN rules. If there is a fact that matches the IF section, then the rule is executed. When a rule is executed, a new fact (THEN section) is added to the database. Every time a match starts from the top rule. Each rule can only be executed once. The matching process stops when there are no more rules that can be executed.

This application was made on the Android platform so that it can only be run on Android smartphones. Reasoning expert systems use the Forward Chaining calculation method. The typology that will be used in the application is based on the Hippocrates-Galenus Typology personality theory. Personality parameters used in the application are: Choleris, Sanguins, Melancholis, and Phlegmatic.

Method

To develop this research system using the ESDLC (Expert Software Development Life Cycle) method which includes:

1. Stages of Situation Assessment. At this stage, the problem and general objectives of the system to be built are defined. After the problem and objectives have been defined, it is verified between the expert system that will be created and the problem and objectives.

2. Knowledge Acquisition Stages. At this stage, the first thing to do is determine the source of knowledge, so first determine where the knowledge can be obtained. For example: knowledge from books. The next step is to gain knowledge by meeting directly with experts.

3. Design Stages. At this stage, what needs to be done is to build a design concept for the expert system that will be created and choose the programming language that will be used.

4. Testing Stages. At this stage, the personality test application was tested on several respondents which was used to modify system knowledge.

5. Documentation Stages. At this stage, documentation will be carried out on the results of the analysis and implementation of the Hippocrates-Galenus Typology using the forward chaining method and looking at the effects arising from its application on personality tests.

6. Maintenance Stages. This stage is also called the maintenance stage, where the system will be maintained according to user needs.

In a rule-based expert system, the knowledge domain is represented in a collection of rules in the form of IF-THEN, while the data is represented in a collection of facts about current events. The inference engine compares each rule stored in the knowledge base with the facts contained in the database. If the IF (condition) part of the rule matches a fact, then the rule is executed and the THEN (action) part is placed in the database as a new fact added.

Forward Chaining is a search technique that starts with known facts, then matches these facts with the IF part of the IF-THEN rules. If there is a fact that matches the IF part, then the rule is executed. When a rule is executed, a new fact (THEN part) is added to the database. Each time you match, start from the top rule. Each rule can only be executed once. The matching process stops when there are no more rules that can be executed. The search methods used are Depth-First Search (DFS), Breadth-First Search (BFS), or Best First Search. The operation of the Forward Chaining system begins by entering a set of known facts into working memory and then deriving new facts based on rules whose premises match the known facts.

Results and Discussion

Android is an operating system for Linux-based mobile devices that includes an operating system, middleware and applications. Android provides an open platform for developers to create their applications. Android is a new

generation of mobile platform, a platform that gives developers the freedom to carry out development according to their wishes.

The knowledge base in this application is obtained based on data obtained from literature studies in the form of books, journals and articles from the internet related to expert systems regarding personality psychology. To build an expert system, both small and large scale, careful thought is needed to form a number of rules from the results of knowledge acquisition in the domain discussed. The speed and accuracy with which an expert system performs reasoning to provide output depends largely on the rules stored as a knowledge base and the inference mechanism that selects the appropriate rules to produce output.

In analyzing a problem, an expert system uses an inference engine. This machine is the part that contains the thinking function mechanisms and system reasoning patterns used by an expert. The inference engine begins its tracking by matching the rules in the knowledge base with the facts in the database. Expert systems have two inference techniques, namely Backward Chaining, which starts reasoning from the conclusion of a hypothesis to the facts containing that hypothesis. And the second is Forward Chaining which is the opposite of backward Chaining, namely starting from a set of data towards a conclusion. The method that will be used in making this application is the Forward Chaining method. The Forward Chaining method is very suitable for applications that produce trees that are wide and not deep. In the Forward Chaining method, searches can be carried out using two events, namely:

1. Input all data into the expert system in the consultation session. This method is appropriate and useful in expert systems where the processes in them are automated and directly receive data from the system.

2. Provide specific elements of the data obtained during the consultation session in the expert system. This method reduces the amount of data requested, so that the data requested is only the data that is really needed by the expert system which will later be used to make decisions.

The steps that must be taken in creating a rule-based Forward Chaining system are:

1. Problem definition. This stage includes problem domain selection and knowledge acquisition.
2. Defining Input Data. Forward Chaining systems require initial data to start inference.
3. Defining Data Control Structure. Complex applications require additional premises to help control the activation of a rule.
4. Writing Initial Code. This stage is useful for determining whether the system has captured the knowledge domain effectively in a good rule structure.
5. System Testing. System testing is carried out with several rules to test the extent to which the system runs correctly.
6. Interface Design. Interfaces are important components of a system. Interface design is created together with the creation of a knowledge base.
7. System Development. System development includes adding interfaces and knowledge according to the system prototype.
8. System Evaluation. At this stage, system testing is carried out with actual problems. If the system is not running well then development will be carried out again.

Unified Modeling Language (UML) Modeling is the stage of designing software before carrying out the program creation (coding) stage. In this research, system design was carried out by modeling the problem in the form of Unified Modeling Language (UML) diagrams as follows.
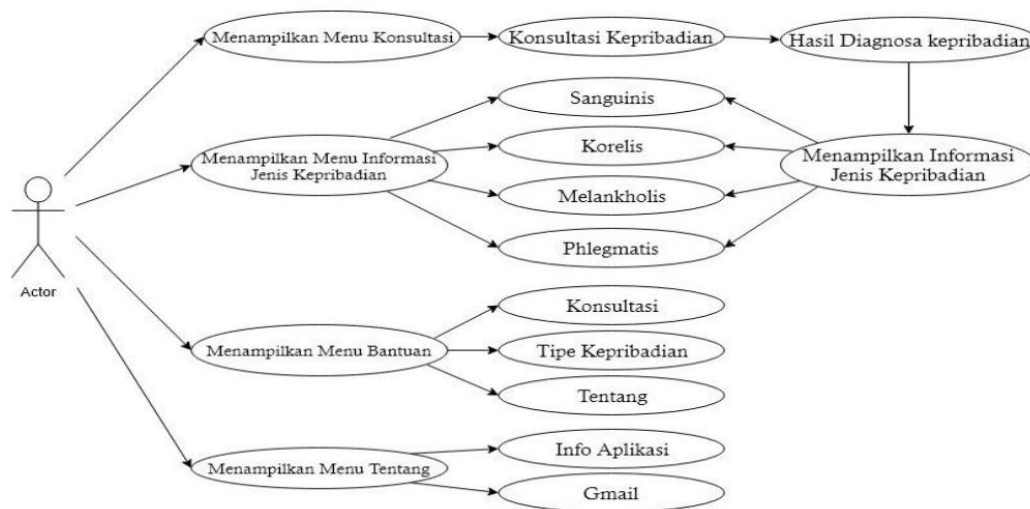
Fig 1. *Use Case Diagram of Expert System Personality Test*

Personality has been divided into several types, one of which is the personality type developed by Galenus based on Hippocrates. Hippocrates stated that in every person's body there are four kinds of fluids which have properties like the four natural elements, namely:

1. The dry nature of Chole or yellow bile,

2. The wet nature of Melanchole or black bile,

3. Cold properties are found in Phlegma or mucus,

4. Sanguins or blood have the hot nature.

According to Hippocrates, these four types of fluids exist in the body in proportions that are not always the same from one individual to another. The dominance of one of these fluids causes distinctive characteristics to appear in each person. Galenus agreed with Hippocrates, that in every person's body there are four kinds of fluids. Galenus further stated that these fluids are present in the human body in certain proportions. The dominance of one fluid over the other fluid results in distinctive psychological characteristics. Galenus calls temperament the unique psychological traits that exist in a person as a result of the dominance of one of the bodily fluids (Suryabrata, 2018).

According to Immanuel Kant's theory, a philosopher (1724-1804) in Suryabrata (2018) classifies the personality types possessed by an individual as follows:

1. The Sanguine Character Type is:

a.   His mood is always full of hope, he considers everything important at one time, but soon he doesn't think about it anymore. Sanguines often promise something but rarely fulfill it, because what they promise they don't think deeply about whether they can fulfill it or not;
b.   Enjoys helping others, but cannot be used as a support;
c.   Friendly and cheerful company;
d.   Generally he is not a coward, but if he is guilty it is difficult to repent, he regrets it, but that regret quickly disappears.

2. The Melancholic Character Type is:

a.   He views everything related to himself as important and is always accompanied by doubt;
b.   His attention was chiefly drawn to the aspect of his difficulties;
c.   It is not easy to make promises, because he tries to always keep the promises he has made, but this is not done based on moral considerations but because if he does not keep the promise it will really worry his soul, this also causes him to lack trust and not easily accept hospitality. others;
d.   His mood generally also contradicts his sanguine mood, this causes him to be less satisfied with his situation and less able to see the joy of other people.

3. The Choleric Character Type is:

a.   Get burned quickly but also calm down quickly, without hating;
b.   The actions are rapid, but not constant;
c.   Always busy, but in his busyness he preferred to command rather than do it himself; d) His main desire is to pursue honor, likes to be busy in the eyes of many people and likes to be openly praised;
d.   Likes pseudo and formal attitudes;
e.   Likes to be generous and protective, but he does this not because he loves other people, but because he loves himself, because by doing so he will get appreciation;
f.   When dressed, he is always careful and neat, because in this way he appears more intelligent than he really is.

The Phlegmatic Character Type is:

a.   Doesn't like to rush (calm);
b.   Not easily angered;
c.   Loyal.

Apart from that, the characteristics of each personality type in the Hippocrates-Galenus Typology (Rakhma, 2018) are:

1.   Sanguine Character: popular, inconsistent, happy to receive praise, fun, sociable, enthusiastic, relaxed, forgetful, friendly, egoistic.
2.   Melancholic Character: likes to be alone, vengeful, difficult to joke with, easily offended, always suspicious, difficult to get along with, willing to make sacrifices, has high concentration, free and independent.
3.   Choleric Character: likes to work, likes to push, competitive, straightforward, does not want to compromise, resourceful, able to lead, confident.
4.   Phlegmatic Character: tolerant, good listener, slow to react, self-satisfied, likes to look for safety, quiet, friendly, forgiving, indifferent, obedient, likes to postpone or hang up on problems.

According to Nurul Chomaria, a psychologist in his book entitled "Who Am I (Explore Potential to Achieve Achievement)" published in 2018, classifies the personality types possessed by an individual as follows:

1. Sanguine Sanguine has characteristics

a.   They tend to be popular and liked by people
b.   His life is full of color
c.   They love to talk
d.   His emotional turmoil was surging and open
e.   Easy to be happy and easy to be sad
f.   Enjoys helping others but cannot be a support
g.   Somewhat forgetful, has difficulty concentrating, tends to think short and his life is completely disorganized

h.	Lack of discipline with time, often forgetting promises and making plans

Sanguine Strength:

a.	Likes to talk
b.	Emotional and demonstrative
c.	Enthusiastic and expressive
d.	Cheerful and full of curiosity
e.	Live in the present
f.	Easy to change (many desires)
g.	Be sincere and childish
h.	Nice to get together
i.	Generally great on the surface
j.	Easy to make friends and like other people
k.	Enjoys praise and wants to be noticed
l.	Pleasing and being envied by others
m.	Easy to forgive
n.	Avoid boring things
o.	Likes spontaneous things

Sanguine Weaknesses:

a.	Loud voices and laughter
b.	Exaggerating an incident
c.	It's hard to keep quiet
d.	Easily followed or controlled by circumstances or other people
e.	Often asks for approval, including trivial things
f.	Short concentration span
g.	When working, he prefers to talk and forgets about obligations
h.	Some are too happy
i.	Easy to get angry
j.	Seems fake to some people
k.	Likes to complain
l.	Easy to change
m.	It's hard to arrive on time
n.	Activity priorities become confused
o.	Likes to interrupt and has difficulty listening completely
p.	Often takes on other people's problems, becoming as if they were the problem
q.	Selfish
r.	Often makes excuses and repeats the same stories
s.	Concentrate on how to spend money rather than how to save money

2. Korelis has the following characteristics:

a.	Likes to manage other people
b.	Due to his boss-like nature, he doesn't have many friends
c.	Likes to control and doesn't want to give in
d.	Happy with challenges, likes adventure
e.	Thinking that if he weren't there, everything would fall apart

f.	Goal oriented
g.	Firm, strong, fast and agile in doing things
h.	There is no such thing as impossible
i.	Not easily give up

Choleric powers are:

a.	Enjoys leading, making decisions, dynamic and active
b.	Really needs change and must correct mistakes
c.	Strong willed and determined to achieve targets
d.	Free and independent
e.	Dare to face challenges and problems
f.	Look for practical solutions and move quickly
g.	Delegating work and onboarding focuses on productivity
h.	Create and determine goals
i.	Driven by challenges and challenges
j.	Not so necessary friends
k.	Willing to lead and organize
l.	Usually correct and have a vision for the future
m.	Excel in emergencies

The weaknesses of Choleric are:

a.	Impatient and quick to anger
b.	Happy to rule
c.	Too excited and hard to relax
d.	Likes controversy and quarrels
e.	Too stiff and strong
f.	Dislikes tears and unsympathetic emotions
g.	Dislikes triviality and too much detail
h.	Often makes decisions hastily
i.	Manipulates and demands others, tends to use others
j.	Justifies any means to achieve the goal
k.	Workaholic
l.	It's very difficult to apologize
m.	Maybe it's always right but not popular
n.	Many demands on other people

3.	Melancholy Melancholy has the following characteristics:

a.	Somewhat the opposite of sanguine
b.	Tends to be orderly, neat, scheduled, arranged according to a pattern
c.	Likes facts, data, figures and often thinks about everything in detail
d.	Always want everything to be perfect

Melancholy's strengths are:

a.	Analytical, deep and thoughtful
b.	Serious and purposeful, and schedule oriented
c.	Artistic, musical and creative
d.	Sensitive
e.	Willing to sacrifice oneself and be idealistic
f.	High standards and perfectionist

g. Likes details, diligent, orderly and organised
h. Economical
i. Seeing problems and looking for solutions
j. Creative
k. If you have started, finish it
l. Make friends carefully
m. Content behind the scenes, avoiding attention
n. Willing to hear complaints, loyal and devoted
o. Very considerate of others

Melancholy's weaknesses are:

a. Tends to see problems from the negative side
b. Remembering the negative and vengeful
c. It's easy to feel guilty and have a low image
d. More emphasis on methods than achieving goals
e. Stressed in imperfect and changing situations
f. Spending a lot of time analyzing and planning
g. Standards that are too high make it difficult for other people to reach and please them
h. Difficulty socializing
i. Have great suspicion

4. Phlegmatic has characteristics

a. Doesn't like conflict, can do anything even if it's something he doesn't like
b. For him peace is everything
c. If a problem or quarrel arises, he will provide the best peaceful solution without causing a fight
d. Be willing to lose so that the problem does not persist
e. Less enthusiastic, less organized and completely cold
f. Quiet, calm and generally very enjoyable when solving problems
g. Good listener

Phlegmatic powers are:

a. Sociable, relaxed, calm and determined
b. Patient, balanced, and a good listener
c. Not much to say, discreet
d. Sympathetic and kind
e. Good problem mediator
f. Tends to try to find the easiest way
g. Good under pressure
h. Fun and doesn't like to offend
i. Sharp sense of humor
j. Nice to see and supervise
k. Be compassionate and caring
l. Easy to get along with in harmony and peace
m. Wise

Phlegmatic weaknesses are:

a. Lack of enthusiasm, especially for changes or new activities
b. Scared and worried

c. Avoid conflict and responsibility
d. Stubborn, difficult to compromise
e. Too shy and quiet
f. Dry, mocking humor
g. Less goal oriented
h. Difficulty moving and lack of self-motivation
i. Prefer to be a spectator rather than involved
j. Doesn't like being pushed around
k. Procrastinating or hanging on to problems

The front page or splash screen is the layout that is displayed at the beginning when the application or program is run. The splash screen will appear for a split second when you first open the personal personality analysis expert system application.

Fig 2. Application Splash Screen

The main menu contains menu options that can be used by users. The menus on the main menu include: consultation menu, information menu, help menu, and application menu.

Fig 3. Application Main Menu

On the consultation sheet display there are 3 types of buttons, namely the back button, yes button and no button.

The following is a display of one of the consultation layouts with the file name "K001".

Fig 4. Application Consultation Display

In the consultation results display, users can see the results of the consultations that have been carried out.

Fig 5. Application Consultation Result Display

Conclusion

Based on the discussion regarding the design of an Android-based personal analysis expert system application using the Forward Chaining method, the final conclusion can be drawn as follows: An Android-based personality analysis expert system application has been designed and developed using the Forward Chaining method. The Forward Chaining method is used as a calculation rule in drawing conclusions in the system. The use of criteria established by experts in their book entitled "Who Am I (Explore Potential to Achieve Achievement)" is the main basis for decision making rules. This application helps users determine steps to develop their strengths and manage their weaknesses as well as interact and adapt to their environment. With this application, users get information about personality types based on the Hippocrates-Galenus Typology. By using this expert system application users can save time because users who use this application feel as if they are talking to an expert.

Recommendations for further research in the field of Android-based personality test applications, namely: In this study the application used one type of yes and no choice test questions. It is recommended that in further research it be developed so that the application can use several types of personality test questions. This research uses the forward chaining method to determine the user's personality type. It is recommended that further research use other methods and also focus research on calculating the weight of answers in determining personality. In this research, the main focus is creating an application for personality testing. Future research is recommended to focus on other methods, and more complete output of personality traits.

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