JOURNAL ON EDUCATION, SOCIAL SCIENCES AND LINGUISTICS

IJESLi

http://internationaljournal.unigha.ac.id/ - ISSN 2775-4928 (Print) ISSN 2775-8893 (Online)

Expert System of Blood Fever Disease Using Case Based Reasoning (CBR) Method

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Doi :

Keywords :

Expert System, Case Based Reasoning, Dengue Fever.

Abstract

This study discusses the creation of an expert system that can be used to diagnose dengue fever. The method used is the Case Base Reasoning (CBR) method. CBR is a method that uses an artificial intelligence (Artificial Intelligent) approach and focuses on problem solving based on the knowledege of previous cases. The cases used were obtained from records of case handlers for diagnosis of dengue fever from an old case dengue fever specialist and provided one new case to calculate the value of its proximity to the old case. The results of this study provide output in the form of possible diseases and treatment suggestions based on the similarity of new cases to the knowledge that the system has. The test results based on manual calculations and system calculations obtain appropriate results so that the system is able to diagnose clinically and the system is able to provide information and solutions about dengue hemorrhagic fever based on the knowledge and abilities of doctors.

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ISSN 2775-4928 (Print) ISSN 2775-8893 (Online)
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1.Introduction

The development of science and technology which is increasingly complex is able to influence the human mindset. This progress has encouraged humans to try to overcome all the problems that arise around them. In general, the use of technology supports database processing into a system whose presence is needed by various institutions and companies. With a system, an organization or company can guarantee the quality of the information presented and can make decisions based on that information, the need for fast, precise and accurate information is needed. Web-based systems can perform two-way direct communication on the spot (realtime) between users.

Expert systems began to be developed by artificial intelligence computer experts, experts in certain fields, language experts and psychologists who deal with solving problems about human thinking.

The development of computerized tools and techniques based on human-made intelligence has eventually led to a new branch of computer science, namely artificial intelligence. Artificial Intelligence is divided into three relatively independent development areas, one of which is in the field of software development that uses symbolic knowledge to mimic the behavior of an individual or group of experts and this type of software is known as an expert system.

Dengue fever or dengue fever is an infectious disease caused by the dengue virus and is transmitted through the bites of Aedes Aegepty and Aedes albopictus mosquitoes. This disease is a type of health disorder that interferes with the productivity of everyone and is a contagious disease that often causes epidemics and causes death. Therefore this disease often causes public panic. A person who has dengue fever will initially suffer from a high fever. In this fever, the body lacks fluids due to the evaporation that is more than usual. Symptoms of dengue fever have been diagnosed by the general public based on known characteristics without facts and other medical considerations. So that people or sufferers find it difficult to distinguish from common fever diseases in general. As a result, the disease is handled in the wrong way. So that there are no misdiagnoses and to make it easier for the public or sufferers to know early on the illness they are suffering from and so that they don't get treatment too late because a doctor or expert has limited time. So a system is built that can help solve these problems in the form of an expert system using the Case Based Reasoning (CBR) method. So that there are no misdiagnoses and to make it easier for the public or sufferers to know early on the illness they are suffering from and so that they don't get treatment too late because a doctor or expert has limited time. So a system is built that can help solve these problems in the form of an expert system using the Case Based Reasoning (CBR) method. So that there are no misdiagnoses and to make it easier for the public or sufferers to know early on the illness they are

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suffering from and so that they don't get treatment too late because a doctor or expert has limited time. So a system is built that can help solve these problems in the form of an expert system using the Case Based Reasoning (CBR) method.

Case based reasoning(CBR) uses an artificial intelligence approach which focuses on problem solving based on knowledge from previous cases. If there are new cases, it will be stored in the knowledge base so that the system will learn and the knowledge held by the system will increase (Kusuma, et al, 2014).

From some of the explanations above, there are many problems, so how to make an expert system for diagnosing Dengue Hemorrhagic Fever (DHF) accurately and accurately which can be implemented from this expert system so that it can diagnose dengue which can provide information that can be understood by the public.

SExpert system is a branch of AI (Artificial Intelligence) which makes special extensions to specialization of knowledge to solve a problem for Human Expert. Human Expert is someone who is an expert in a certain field of knowledge, this means that the expert has a special knowledge or skill that is owned by other people. An expert can solve a problem that cannot be solved by other people in an efficient manner.

Secara general, expert system (expert system) is a system that tries to adopt human knowledge to the computer, so that the computer can solve problems as usually done by experts. A good expert system is designed to be able to solve a certain problem by imitating the work of the experts. With this expert system, awampun people can solve quite complex problems which in fact can only be solved with the help of experts. For experts, this expert system will also assist their activities as highly experienced assistants.

There are several definitions of expert systems, including:

1. According to Durkin: An expert system is a computer program designed to model the problem-solving abilities of an expert. (Sri Kusumadewi, 2003)
2. According to Ignizio (1991): Expert system is a model and related procedures, in a particular domain, where the level of expertise can be compared with the expertise of an expert.
3. According to Giarratano and Riley: An expert system is a computer system that can match or imitate the abilities of an expert (Fadli, 2010).

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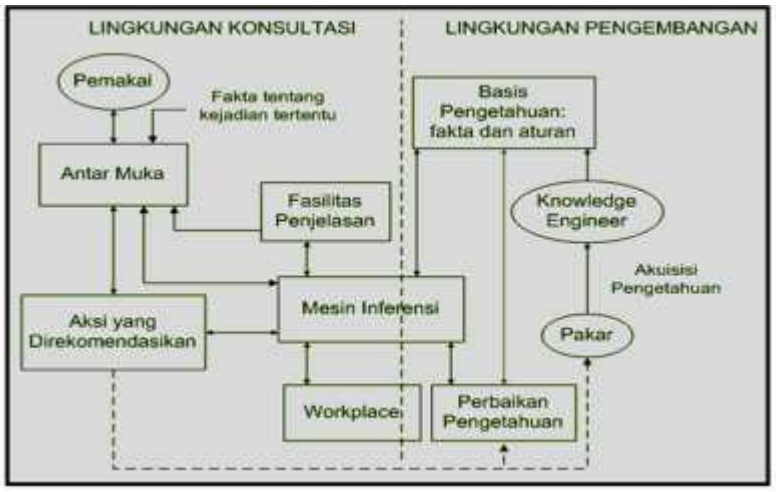
Expert System Structure

Sthe expert system consists of several main parts:

1. Lthe development environment used in expert systems to build on its components and place knowledge on their basis.
2. Lingkungan consultation used by users to obtain information or knowledge from experts.

LThe development environment is used as an expert system both in terms of component development and knowledge base. The consulting environment is used by someone who is not an expert to consult.



Gambar 2.1 Components of an Expert System (Turban 1995)

PeDescription of the Image:

1. Knowledge Acquisition

SThis ubsistem is used to enter knowledge from an expert by engineering the knowledge so that it can be processed by a computer and put it into a knowledge base with a certain format. Sources of knowledge can be obtained from experts, books, multimedia documents, databases, special research reports and information on the web.

2. Basis of knowledge (Knowledge Base)

Basis of knowledge is a component that contains knowledge that comes from experts who contain knowledge in solving problems. There are two forms of approach in the knowledge base that are very commonly used, namely:

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a. PeRule Based Reasoning.

PaIn rule-based reasoning, knowledge is represented using the following rules: IF-THEN. This form is used when we have some expert knowledge on a particular problem and an expert can solve the problem sequentially.

b. PeCase Based Reasoning.

PaIn case-based reasoning, the knowledge base will contain previously achieved solutions, then a solution will be derived for the current situation (existing facts). This form is used when the user wants to know more in almost the same (similar) cases.

3. Inference Engine (Inference Engine)

An inference engine is a program that functions to guide the process of reasoning against a condition based on the existing knowledge base, manipulating and directing the rules, models and facts stored in the knowledge base to reach a solution or conclusion. There are two approaches used in drawing conclusions, namely:

a. *Forward Chaining*

Forward Chaining is an inference method that makes reasoning from a problem to its solution.

b. *Backward Chaining*

Backward Chaining ais an inference method that works backwards to the start. The process begins with the hypothesis, then a search is started to match whether the facts match the hypothesis.

4. Work Area (Blackboard)

To record temporary results that will be used as decisions and to explain a problem that occurs, the Expert System requires a blackboard, which is an area in memory that functions as a database. Three types of decisions can be recorded on the blackboard, namely:

1) Planna: Bagawhere to solve the problem.
2) Agenda: Potential actions waiting to be executed
3) Solusi: C alon of action to be raised

5. User Interface (User Interface)

Used as a communication medium between the user and the Expert System. In this section there will be a dialog between the Expert System and the user.

6. Subsistem Explanation (Explanation Subsystem)

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Berfungsi provides an explanation to the user, how a conclusion can be drawn. This ability is very important for users to know the process of transferring expert expertise and in problem solving.

7. SKnowledge Refining System

The ability to improve knowledge (Knowledge Refining System) from an expert is needed to analyze knowledge, learn from past mistakes, then improve their knowledge so that it can be used in the future.

8. Peuse (User)

PaIn general, an Expert System user is not an expert (non-expert) who needs solutions, advice or training to various existing problems.

Advantages of Expert System

There are many advantages to using an expert system, including:

1. Make knowledge and advice more accessible.
2. Increase output and productivity.
3. Save the abilities and expertise of an expert.
4. Promotes solving specific problems.
5. Provide fast response (answer).
6. Can work with incomplete and uncertain information.

Lack of Expert System

Seother advantages above, expert systems like other systems, also have weaknesses.

1. Bthe costs required to build, maintain, and develop them are very expensive
2. Sulit was developed
3. Sexpert system is not 100% correct.
4. Lack of user trust can hinder the use of expert systems.

Case-Based Reasoning

Case-based reasoning(CBR) is a problem-solving technique, which adopts a solution to previous problems that are similar to the new problem being faced, to find a solution (Riesback and Shank, 1998). Past cases are stored with features that describe the characteristics of the case and its solutions. Some definitions related to CBR include:

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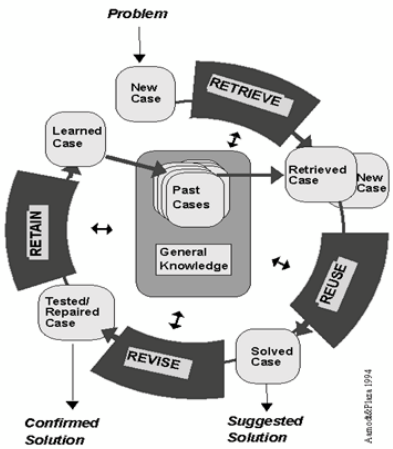
1. A case-based reasoner solves new problems, by adapting the solutions used to solve old problems (Riesbeck and Schank, 1989).
2. CBR is the way people use cases to solve problems and the way we can make machines use them (Kolodner, 1993).
3. CBR is a new approach to problem solving and learning (Aamodt and Plaza, 1994).
4. CBR is reasoning with remembering (Leake, 1996).

CBR cycle

CBR can be represented as a process cycle which is divided into four sub processes (Aamodt and Plaza, 1994), namely:

1. *Retrieve* that is, looking for previous cases that are most similar to new cases.
2. *Reuse* namely reusing the most similar cases to find solutions to new cases.
3. *Revise* namely making adjustments to the solutions of previous cases so that they can be used as solutions for new cases.
4. *Retain* ie using the new solution as part of the new case, then the new case is updated on a case basis.

Figure 2.2 describes the stages of the CBR process, where new cases are matched with existing cases in the case storage database and find one or more similar cases (retrieve). The solution suggested through case matching is then reused for a similar case, the proposed solution may be changed and adopted (revise). If a new case does not match in the case storage database, CBR will save the new case (retain) in the knowledge database.



Gambar 2.2 The CBR cycle (Aamodt and Plaza, 1994)

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1. Retrieve

Retrieve starting with the stages regarding the problem and ending when the case that you want to find a solution to has been found to be similar to existing cases. The stages in retrieving include: problem identification, starting matching, and selection.

2. Reuse

Reuse A case in the context of a new case focuses on two aspects, namely:

1. The difference between existing cases and new cases.
2. Tracing on old cases that can be used in new cases.

There are two ways to reuse existing cases, namely:

1) Reuse solutions from existing cases (transformatial reuse).
2) Reuse existing case methods to create solutions (derivational reuse).
3) ***Revise***

If a new case is to be included in the case base, the solution obtained from the previous process must be corrected first to become the real solution. The revision process consists of two stages, namely solution evaluation, diagnosis and solution repair if necessary. The evaluation stage can be carried out in several ways, including by getting responses from experts or by testing the solution in the real world. Evaluation can also be done based on a simulation of the application of the solution (Smyth and Cunningham, 1996).

4) ***Retain***

Retain is the process of adding new cases after revisions to the case base. The more cases that are available in the case base, the better the CBR solution will be. However, this can cause the efficiency of CBR to decrease (Smyth and Cunningham, 1996).

2.2.1 Case-Based Reasoning Techniques

The techniques used in CBR are:

1. Case representation
2. *Indexing*
3. *Storage* (Storage)
4. *Retrieval*

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2.3 Dhemorrhagic dengue (DHF)

PenyaDengue hemorrhagic fever kit or abbreviated as DHF is a disease caused by the dengue virus carried by female Aedes Aegypti mosquitoes through bite saliva when sucking human blood.

SeFor a long time, the Aedes Aegypti mosquito was not contaminated with the dengue virus, so the dbd mosquito bite was not dangerous. If the mosquito sucks the blood of a dengue sufferer, the mosquito becomes dangerous because it can transmit the deadly dengue virus. For this reason, it is necessary to control the Aedes Aegypti type mosquito so that the dengue virus is not transmitted from one person to another.

Berfollowing are the symptoms found in DHF, which are as follows:

1. Pahigh nasal passages that come suddenly for 2 to 7 days with a body temperature reaching 38-40 degrees Celsius or even more.
2. The skin looks red spots.
3. Sometimes DHF sufferers experience nosebleeds.
4. There was vomiting of blood or dysentery.
5. Sometimes the midriff feels painful because of bleeding in the stomach.
6. BIf dengue fever is in a phase that can be said to be severe, the sufferer will experience anxiety. Cold sweaty hands and feet.

Things that can be done immediately when someone has dengue fever are as follows:

1. Give the sufferer to drink as much as possible.
2. Compress to reduce heat.
3. Providing fever-reducing drugs to patients with DHF.
4. Bawa immediately to the doctor if in 3 days the heat does not go down.
5. Ifollow the doctor's advice.

2.4 Understanding the Internet

Internet is a worldwide resource of information. These information resources are vast and so large that no single person, organization, or country can handle them alone. In fact, no one person is able to understand all the ins and outs of the internet.

The origins of the internet come from computer networks that were formed in the 1970's. The computer network is called Arpanet, which is a computer network formed by the United States Department

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of Defense. Subsequently, the computer network was renewed and developed, and now its successors are the global backbone for the information resource known as the internet.

The usefulness of the internet lies in the information itself, not on computer networks. The information exists because several people or groups gave their time, effort and work. They have an idea, organize it, create something useful and make it available to internet users all over the world.

2.5 Network

Network is a network of data communication systems that involve one or more computer systems that are connected by transmission lines of communication tools to form one system. With a network, one computer can use data on another computer, can print reports on another computer's printer, can provide news to other computers even though there are different areas. Networks are a very useful way to integrate information systems and channel the flow of information from one area to another.

PHP is a programming language that is open source licensed. This script can be mixed with HTML Tag Script so that because of this ability, it is called the language that is embedded in HTML tags.

2.6 Overview of the Web

World Wide Web (WWW) or commonly known as the Web, is one of the internet's rapidly growing resources. Web information is distributed through a hypertext approach, which allows a short text to become a reference for opening other documents. With this hypertext approach, a person can obtain information by jumping from one document to another. The documents that are accessed can be spread in various machines and even in various countries.

Like a spider web, the Web has stretched all over the world. Not only limited to research institutions that want to publish research results, the Web is also widely used by business companies who want to advertise products or to conduct business transactions.

2.7 History of the Web

The history of the Web began in 1989 when the Berner-Lee team who worked at the European Particle Physics laboratory or known as CERN (Consei European pour la Recherce Nuclaire) in Geneva, Switzerland, proposed a protocol (a method for communicating) the distribution system. Internet information is used for a variety of information among physicists. This protocol is hereinafter known as the World Wide Web Protocol and was developed by the World Wide Web Consortium (W3C).

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2.8 Web application

Initially, Web applications were built using only a language called HTML (HyperText Markup Language) and the protocol used was called HTTP (HyperText Transfer Protocol). In the following developments, a number of scripts and objects were developed to expand HTML capabilities, including PHP.

The Web application itself can be divided into two parts, namely:

a. *Static web*

b. *Dynamic web*

The web static formed using HTML only. The drawback of such an application lies in the need to maintain the program continuously to keep up with any changes that occur. This weakness is overcome by the dynamic Web application model.

By extending HTML capabilities, that is, by using additional software, changes to the information in Web pages can be handled through data changes, not through program changes. As an implementation, Web applications are connected to the database. Thus changes to information can be made by operators or those who are responsible for updating the data, and are not the responsibility of the programmer or the webmaster.

2.9 Web Server

Web Server is a server that serves client requests for web pages. Middleware is software that works together with a web server and functions to translate certain codes, run these codes and allow interaction with the database. A web browser is software on the client side that is used to access web information. Examples of Internet Explorer, Google Chrome, and Mozilla.

2.10 History of PHP

PHP stands for PHP Hypertext Preprocessor which is a language in the form of scripts that are placed on the server and processed on the server. The results will be sent to the client, where the user uses the browser. In contrast to Javascript, where scripts are processed by the client.

PHP was first created in the fall of 1994 by Ramus Lerdoff. It started when Ramus Lerdoff wrote a number of perl scripts that could scan anyone looking through his resume. These scripts are then packaged into a tool called the "Personal Home Page". This package is the forerunner of PHP. In 1995, Ramus created the PHP / FI (Personal Home Page / Form Interpreter) version 2.0. Since then PHP is open source.

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In November 1997, PHP / FI version 2.0 was released successfully. In this release the interpreter has been implemented in C language. Still in the same year a company called Zend rewrote the PHP interpreter to be cleaner, better and faster. In June 1998 Zend released a new interpreter for PHP and formalized the name of the release to PHP 3.0. Then in mid-1999, Zend released a new PHP interpreter called PHP 4.0. PHP 4.0 is the most popular PHP version among website programmers. The reason that version 4.0 is so popular is its ability to build complex website applications, but it remains stable in high processing speed and stability.

Starting in June 2004, PHP 5.0 was released again by Zend. This version is the latest version of PHP. This version also introduces a new object-oriented programming model to respond to the development of programming languages towards object-oriented programming.

Based on a Netcraft survey in December 1999, more than a million sites use PHP, including: Mitsubishi, RedHAt, NASA, MP3-Lycos and so on. At the beginning of January 2001, PHP has been used by 5 million domains worldwide.

2.11 PHP advantages

Among the rampant web server programming today are ASP which has evolved into ASP.NET, JSP, CFML, and PHP. When compared to the 3 biggest web server programming above, there are advantages of PHP, namely:

1. PHP is a scripting language that does not compile in use. Unlike application programming languages such as Visual Basic and the like.
2. PHP can run on a web server released by Microsoft, such as IIS or PWS as well as on Apache which is open source.
3. Due to its open source nature, changing and developing interpreters in PHP is faster and easier, because there are many mailing lists and developers who are ready to help its development.
4. When viewed from an understanding point of view, PHP has references that are very easy to understand.
5. PHP can run on 3 operating systems, namely: Linux, Unix and Windows and can also be run at runtime on a console.

Weakness of PHP

Like other application or web programming, PHP also has several weaknesses, including:

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1. Not ideal for large scale development.
2. Does not have a true object-oriented programming system (up to version 4 only). However, the PHP version 5.0 is equipped with the real OOP.

Merging PHP and HTML scripts

The PHP programming language can be combined with HTML by first giving an open tag followed by a question mark (<?) Then closing with a question mark followed by a close tag (?>). There are two types of incorporation between PHP and HTML, namely:

1. ***Embedded Script***

Namely writing PHP tags in between HTML tags. In this way, PHP tag writing is used to enclose certain parts of the document that require a PHP script for processing on the server. Embedded Script places PHP as part of the HTML script.

An example of writing an Embedded Script can be seen below:

```
<html>
    <head>
        <title> try </title>
    <head>
<body>
    <? echo "Hellow"?>
</body>
</html>
```

2. **Non Embedded Script**

Namely how to write PHP tags at the very beginning and end of the document. In this way, writing php tags is used to start and end entire sections in a document. Non Embedded Script places HTML script as part of the PHP script.

An example of writing a non-embedded script can be seen below:

```
<?
    echo '<html>';
    echo '<head>';
```

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```
        echo '<title> try </title>';

        echo '</ head> <body>';

        echo'Hellow ';

        echo '</body>';

        echo '</html>';

?>
```

2.12 MySQL

According to Nugroho (2010: 91), "MySQL (My Structured Query Language) or commonly read, ai-se-kuel is a database creation and management program or what is often called a DBMS (Database Management System). Another advantage of MySQL is that it uses the standard SQL query language. SQL is a structured query language ".

According to Madcoms in Istiansyah (2010: 367), "Data storage that is flexible and fast access is needed in an interactive and dynamic website. The database itself functions as a data storage that you input via the website form. In addition, it can also be reversed by displaying data stored in the database on a website page. The type of database that is very popular and is used on many websites on the internet as a data bank is MySQL. MySQL uses SQL and is free. In addition, MySQL can run on various platforms, including Linux, Windows, and so on ".

Based on some of the opinions stated above, it can be concluded that a website is a place on the internet, which presents information with various data formats such as text, images, and even video and can be accessed using various client applications so that it allows the presentation of more interesting and dynamic information with management organized.

2.13 *Bootstrap*

*Bootstrap*is a CSS framework library specially created for the front-end development section of websites. Bootstrap is also one of the most popular HTML, CSS and javascript frameworks among web developers which is used to develop a responsive website. So that the web page will later be able to adjust according to the size of the monitor device (desktop, tablet, cellphone) used by the user when accessing

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the website from a browser. Originally a bootstrap called "Twitter Blueprint" was developed by Mark Otto and Jacob Thornton on Twitter as a framework for encouraging consistency across internal tools.

By using Bootstrap, a developer can easily and quickly create the front-end of a website. You only need to call the necessary classes, for example, create buttons, grids, tables, navigation and others.

*Bootsrap*has provided a collection of basic interface class components that have been designed in such a way as to create an attractive and lightweight appearance. Apart from the class interface components, Bootstrap also has a grid that functions to adjust the layout on the website page. In addition, developers can also add their own classes and CSS, making it possible to create more varied designs. One example of a website that uses a bootstrapping framework is Twitter. Bootstrap itself was actually developed by a twitter developer so that bootstrap is often referred to as "twitter bootsrap".

*Bootstrap*itself is compatible with the latest versions of several browsers such as google chrome, firefox, internet explorer, and safari browser. Although some of these browsers are not supported on all platforms.

Some of the reasons why currently quite a lot of developers use Bootstrap to create a website front-end, namely because of several advantages that Bootstrap has, which include:

1. Can speed up the process of creating a front-end website.
2. The bootstrap display is quite modern.
3. Bootstrap's display is responsive, so it supports all types of resolutions, be it PCs, tablets, and smartphones.
4. *Website* becomes very light when accessed, because bootsrap is made very structured.

Entity Relationship Diagram (ERD)

Entity Relationship diagram (ERD) is a technique used to model the data requirements of an organization, usually by System Analysis in the requirements analysis stage of a system development project. While ostensibly the diagramming techniques or props provide the basis for the design of the relational database that underlies the information system being developed. ERD together with supporting details constitute a data model which in turn is used as a specification for the database.

In describing the entity relationship diagram, several notations are used. For more details, these notations can be seen in table 2.1.

No.	Notation	Explanation

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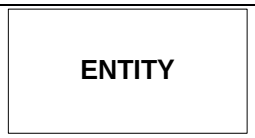
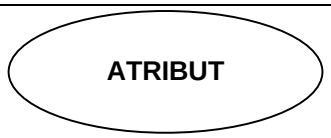
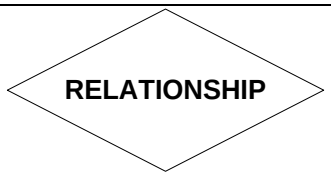
1.		Entities are objects that can be distinguished from others in the real world. Entity can be a physical object such as a person, house, or vehicle. Entity can also be an object in concept such as work, company, and so on.
2.		Attributes are characteristics of an entity or relationship, which provide a detailed description of that entity or relationship. Attribute value is an actual data or information stored in an attribute in an entity or relationship.
3.		Relationship is a relationship that occurs between one or more entities.
4	Penghubung	The line is a link between the relationship and entities or relations and entities with attributes.

Table 2.1 Entity Relationship Diagram Notation

***Data Flow Diagram* (DFD)**

According to Jacob (2012: 155) Data Flow Diagrams (DFD) are a tool for making multipurpose diagrams.

The symbols used to describe the Data Flow Diagram (DFD) can be seen in table 2.2.

No.	Data Flow Diagram symbols	Information
1.		**Process**, activities carried out by people, machines, or computers from the results of a data flow that can be input for the system.

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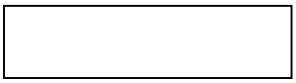
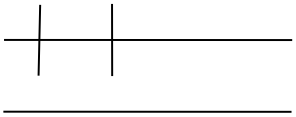
2.		**External Entity**, states the unity outside the system which can be in the form of a person, organization or other system that is in an outside environment that will provide input or receive output from the system.
3.		**Data Deposits,** savings of data which can be in the form of a file or data base on a computer system, an archive or manual record and an agenda or book.
4.		Data Flow, states the data flow that flows between process data, data storage and external unity. This data flow shows the flow of data which can be input to the system or the results of the system process.

Table 2.2 Data Store

There are several stages in making data flow diagrams, namely:

1. Context level diagram: used to describe the system globally.
2. Zero level diagram: used to describe the stages of the process in a context diagram.
3. Detail diagram (level): used to describe a more detailed data flow in the zero level diagram process.

2.Research Method

In compiling this thesis, the author tries to get and collect complete data to compile this scientific paper. The methods that the authors use in obtaining data are as follows:

1. *Library Research* (library research)
   In this case, the writer collects materials from books or theories that can support the writing of this thesis.
2. *Field Research* (Field Research)
   In this case, research is carried out in the field to obtain the necessary information and data. The techniques taken are:

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a. Observation or direct observation to the object of research in order to obtain data or description and information on the system to be designed.

b. *Interview* or interviews, namely the authors collect data face-to-face with doctors and experts at Indrajaya Health Center in order to obtain the necessary data and information.

3.Discussion

Systems that have been created and designed need an implementation. Because implementation is used as a benchmark or test and analysis of the results of the program that has been made. System implementation is also a process of making and implementing a complete system both in terms of hardware and software. And the purpose of this test is to find out whether the application that has been made is in accordance with the design. In addition, it is also to find out the details of the running of the application and the errors that exist for further development and improvement

So that the system that has been worked on can run properly or not, it is necessary to test the system that has been worked on. This requires several main components including hardware, software, and operator tools (brainware).

4.Conclusion

SeHaving gone through the design, implementation and testing stages of an expert system for dengue fever using the CBR (Case Based Reasoning) method, it can be concluded that: After the test is carried out, it is based on the results of system testing and also the test results from experts, obtained good results and in accordance which is desired. This expert system to diagnose dengue fever can be used to help users or users who want to diagnose diseases suffering from dengue fever. This expert system can be run using the Android application properly. This expert system assists hospital staff in analyzing dengue fever for an early stage. This information system makes it easier for doctors to analyze the patient's disease.

5.References

Aamodt, A., dan Plaza, E., 1994, Case-Based Reasoning: Foundational Issues, Methodological Variations, and System Approaches. *AI Communications* , Vol.7, 39-59.

Abdiansyah, 2008, **Case Based Reasoning untuk Pendukung Diagnosa Penyakit Kulit dan Kelamin pada Manusia**, *Tesis*, S2 Ilmu Komputer, FMIPA UGM, Yogyakarta.

Volume 1, No.1, February 2021, Page: 3119-3125
ISSN 2775-4928 (Print) ISSN 2775-8893 (Online)
http://internationaljournal.unigha.ac.id/

Cunningham, William H, Ramon J. 1996. Business in a Changing World. USA: South-Western Publishing Co.

Diki Andita Kusuma , Chairani. 2014. **Rancang Bangun Sistem Pakar Pendiagnosa Penyakit Paru-Paru Menggunakan Metode *Case Based Reasoning,*** Institut Teknologi Telkom, Purwokerto.

Eka Wahyudi, Sri Hartati, 2017, ***Case Based Reasoning* untuk Diagnosis Penyakit Jantung**, *Tesis*, S2 Ilmu Komputer FMIPA UGM, Yogyakarta.

Fadli, Ari, 2010. ***Sistem Pakar Dasar***. Http:// IlmuKomputer.com.

Ignizio, P. J., 1991, *Intorduction to Expert Systems: The Develpoment and Implementation of Rule-Based Expert Systems*, Mc Graw-Hill, Inc., United States of America.

Kolodner, J.L., 1993, *Case-Based Reasoning*, San Mateo, CA : Morgan Kaufmann.

Kusumadewi, Sri. 2003. *Artificial Intelligence (Teknik dan Aplikasinya)*. Graha Ilmu. Yogyakarta.

Leake, D., 1996, Case-Based Reasoning: Experiences, *Lessons and Future Directions*, AAAI Press, Menlo Park, CA.

Pramudyo, 2007, ***Case Based Reasoning* untuk Klasifikasi Mahasiswa Baru Berdasarkan Prediksi Indeks Prestasi pada Semestar I** (Studi Kasus: Program Studi Teknik Informatika Universitas Bina Darma Palembang), *Tesis*, S2 Ilmu Komputer FMIPA UGM, Yogyakarta.

Riesbeck, C., dan Schank, R., 1989, *Inside case-based reasoning*, Lawrence Erlbaum, New Jersey.

Tedy Rismawan, Sri Hartati, 2012, ***Case Based Reasoning* untuk Diagnosis Penyakit THT**, *Tesis*, S2 Ilmu Komputer FMIPA UGM, Yogyakarta.