

# Intelligent System for Diagnosing Diseases Bone Cancer Using the Forward Chaining Method

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**Abstract:-** The development of computer technology has a positive impact on all life, especially in the world of industry, education, government and small to medium enterprises. Where with computer technology, all work that is done manually can be done computerized. A well-designed information system will greatly assist an organization or company in obtaining accurate, timely and relevant information in its presentation. Likewise with the hospital which continues to experience development, which has a duty to provide information and services to the public in the health sector. In this case the authors designed an application system that can support the performance of the hospital which deals with bone cancer, namely "Intelligent System to Diagnose Bone Cancer Using Forward Chaining Method". This program allows users to work more effectively and efficiently in terms of diagnosing diseases, especially bone cancer, as well as being able to input data, delete data and change data. And all of the data has been stored in the database so that it is easy to process. This system is run on a client server basis so that it can be used by many users. With this system, it is hoped that it can support the smoothness of the work process at the hospital dealing with the problem of bone cancer.

**Keywords:-** *Intelligent System, Bone Cancer, Forward Chaining Method, Database.*

## I. INTRODUCTION

Health is a very important part of human life because it is a factor in supporting all the activities of a person. But sometimes many ignore health and underestimate the consequences of irregular lifestyle patterns and this is related to health conditions and possible diseases that can be experienced.

One fact that is often disturbing in society is physical health problems. Physical health problems can be caused by improper lifestyle, and eating the wrong food, resulting in various diseases. One of the diseases that arise is bone cancer, this disease is sometimes very difficult to detect. But medicine says the most common symptom of bone cancer is pain. People often ignore health and lack knowledge of bone

cancer so that it is not uncommon for lives to be lost because of this disease.

So far, if the patient wants to be consulted, the patient must take the time to consult and this method is less effective because the patient has to take the time to consult about the illness he is suffering from. So as to result in patients ignoring the illness that is being suffered will get worse.

The rapid advancement of science in the field of technology, especially computer information, the authors raised this problem into an information system in the form of a client server that is able to overcome the problems mentioned above with a better, more efficient and more effective system performance.

Expert System Programming is one of the software (Software) used in the field of science and technology research, the application of basic science can also be used to analyze a research fact (Research Fact). This expert system is used to solve and find a final solution to a problem in accordance with existing data and facts that can be implemented.

With the problems described above, the writer wants to raise this problem and try to provide a good solution, the title that the author created is an intelligent system for diagnosing bone cancer.

Based on the background of the existing problems, the authors can identify the existing problems, namely the symptoms of bone cancer which are so difficult to identify and the difficulty for patients to consult a specialist because the cost is quite expensive.

Some of the problems that arise in making smart systems in this study are how to design an intelligent system that can be used to diagnose bone cancer from the symptoms experienced by patients, so that patients know whether they have bone cancer or not. Then how to analyze the symptoms of the disease to find out what the disease is. How can this expert system be able to provide information in accordance with the facts and data that the user provides.

**II. LITERATURE REVIEW**

➤ *System*

The system is a collection of elements that interact to achieve a specific purpose. A system has certain characteristics or properties, namely having components (components), System boundaries (boundary), external environment of the system (environments), interfaces (inputs), inputs, outputs (output), processors (process) and targets (objectives) or goals (goal).

➤ *Intelligent System*

Intelligent systems are many found around us. Because of the increasing time, the computer also has considerable progress, especially in the field of intelligent Systems/AI. Because now the computer is not only used for counting, many equipment that can help humans are made with the computer. An example of using intelligent systems in daily life is application of expert systems in the field of pharmacology and therapy. Implementation of a system of experts in the field of Pharmacology and therapy as a support of web-based decision making is made with the following rationale: Pharmacology and therapy is a large system and complex. The pharmacological and therapeutic task is to seek the basic use of the drug rationally for proper medical action, fast and accurate at the time of need.

➤ *Born Cancer*

Osteochondroma is the most common benign bone tumor. Usually attacks the age of 10-20 years. These tumors grow on the surface of the bone as a hard lump. Sufferers can have one or more lumps. 10% of patients who have multiple osteochondromas, will experience a bone malignancy called chondrosarcoma but patients who only have one osteochondroma will not suffer from chondrosarcoma.

Benign chondroma usually occurs at the age of 10-30 years, arises in the middle of the bone. Some types of chondromas cause pain. If it doesn't cause pain, it doesn't need to be removed or treated. To monitor the progress, an X-ray was taken. If the tumor cannot be diagnosed by X-ray or if it is causing pain, it may be necessary to do a biopsy to determine whether the tumor is developing into cancer or not.

Giant Cell Tumors usually occur at the ages of 20 and 30 years. These tumors generally grow at the end of the bone and can spread to the surrounding tissue. Usually causes pain. Treatment depends on the size of the tumor. Tumors can be removed surgically and the holes that are formed can be filled with bone grafts or artificial bone cement to keep the bone structure in shape can be filled with bone grafts or artificial bone cement to maintain bone structure.

➤ *Backward and Forward Chaining Methods*

Backward chaining methods is a goal-driven approach (goal-driven) in this approach tracking starts from the goal, then looks for rules that have that goal to the conclusion. Furthermore, the tracking process uses the premise for the rule as a new goal and looks for other rules with new goals as its conclusion. The process until all continues until all

possibilities are found. The following is the backward chaining process shown in Figure I.

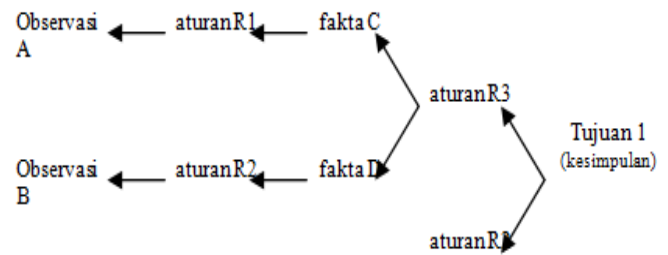


Fig 1 : - Backward Chaining Proses

The data-driven approach in this tracking approach starts from input information, and then tries to draw conclusions. Forward tracking looks for facts that comply with the IF part of the IF-THEN rules. Here is the forward chaining process shown in Figure 2:

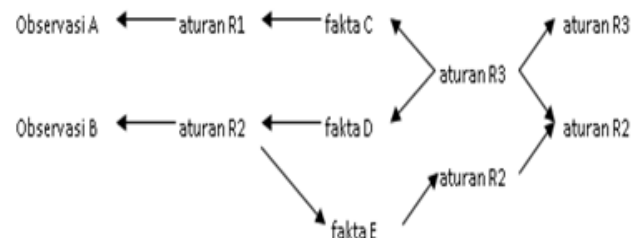


Fig 2 : - Backward Chaining Proses

**III. METHODOLOGY**

A. *Running System Analysis*

The system analysis described in this chapter is used as a comparison with the system to be designed. The author will display the consultation process to obtain information about bone cancer manually. In order to process the consultation and produce the expected outcome, experts need to know input data from patients. Data input that is given by patients to experts is still inputted manually, that is, conveying patient data directly to the expert.

B. *Stages of Research*

Broadly, the stages of the whole study are as follows:

➤ *Describing the issue*

Describing the problem clearly can help in designing and creating an intelligent system to determine bone cancer using the forward chaining method and the certainty factors to be studied must first be described, describe and determine and determine the limits of the problem to be studied. researched, it will find a good solution to the problem. So this step is an important first step in research.

➤ *Problem analysis*

The problem analysis step is a step to understand the problem that the scope or boundaries have specified. By analyzing the problems that have been determined, the research is expected to find a solution to the problem well and can be understood by the user.

➤ *Determining objectives*

Based on the understanding of the problem, it can be determined the objectives that will be achieved in this study. At this goal the specified targets are to be achieved, especially those that can address the problems that exist in this study.

➤ *System Design*

This stage is the stage of designing the tools that are made, at this stage a flowchart and DFD (Data Flow Diagram) Intelligent system is made to determine bone cancer disease..

➤ *System creation*

This stage is the stage of creating a smart system for determining bone cancer based on a website, making a smart system based on the design of the flowchart and DFD (Data Flow Diagram) that was made in the previous stage.

➤ *System Testing*

Intelligent testing System is done by reading the input data from the patient to the system so that it can be determined results based on the input.

C. *Research Plan*

To understand how the system running as a whole from the input, process and output it can be described through the image 4below.



Fig 3:- System Context Diagram of The Bone Cancer With Forward Chaining Method

The flowchart of data shown in Figure 3 gives an overview that:

- Experts enter data related to the system designed into the system.
- The system will obtain data inputted by the expert and display the expert system knowledge base interface for visitor
- Visitors who wish to consult the system must first fill in personal data on the consultation form and then select some of the symptoms provided by the expert.

Diagnosa Result Formis the result of the consultation output design for the patient. For the design, it can be seen in Figure 4 below:

Fig 4:- Diagnosa Result Form

Visistor data input form is a form that is accessed by visitors or system users who want to consult with an intelligent system for diagnosing bone cancer. Every visitor who wants to consult must first fill in his personal data in the visitor data form as data collection for patients who have used an intelligent system for diagnosing bone cancer. When going to consultations, users will enter this page to input consultation visitor data as shown in Figure 5 below.

Fig 5:- Visistor Data Input Form

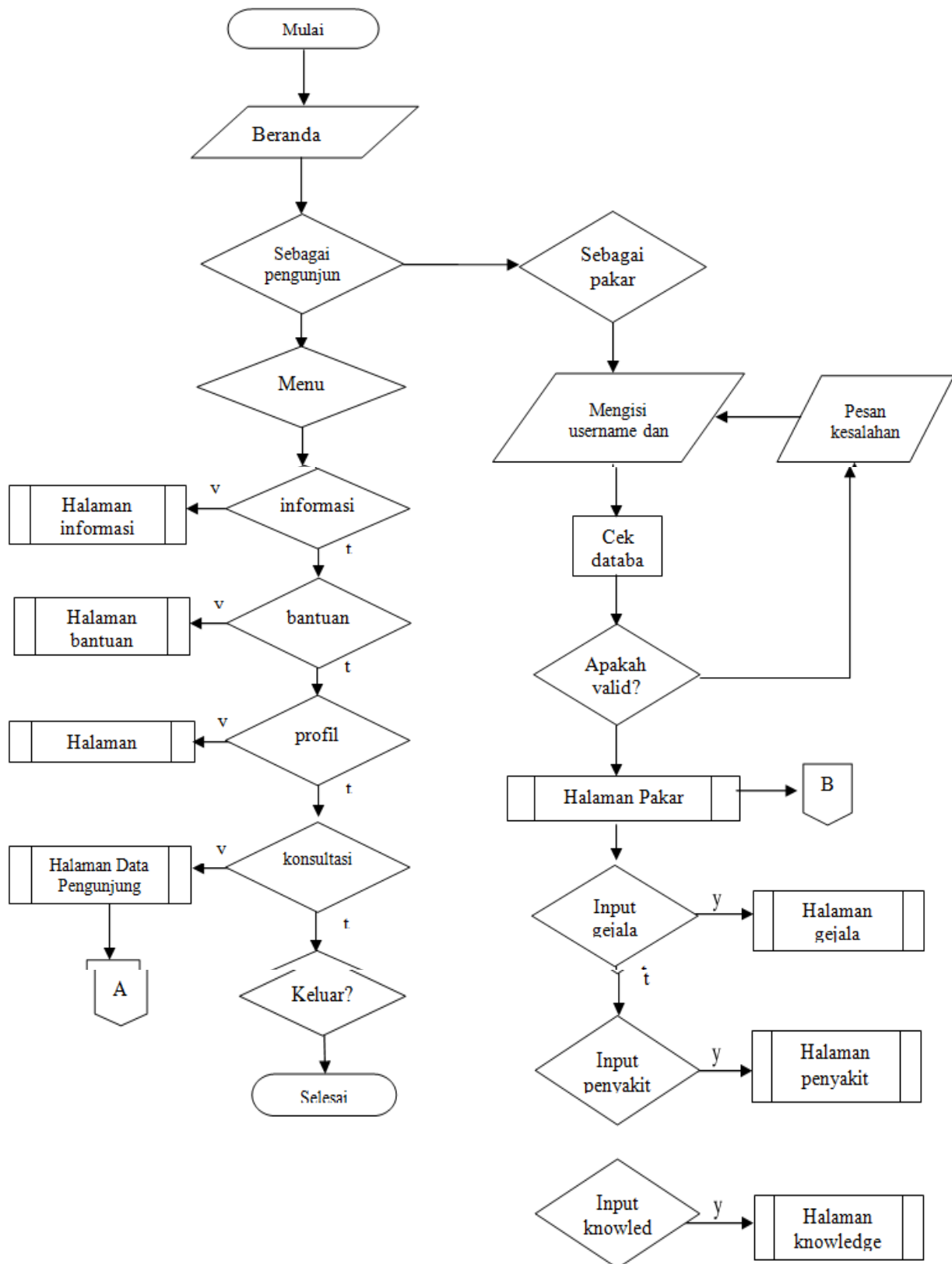


Fig 6:- Flowchart

**IV. RESULT AND DISCUSSION**

This chapter will explain the results display of applications that have been made, which are used to clarify the views that exist in the expert system application. So that the implementation results can be seen in accordance with the results of the program that has been made. Below will be explained each display in the program. This page is the initial display when the user accesses the expert system application. By pressing the enter keyboard key, it will enter the next form. All pages are accessible to the user except for the expert login page which can be used by an expert. Figure 7 below illustrates the initial image display form..



Fig 7:- Initial Display

This form is used as user authority to enter the system which will display the Login Options form. In this form, there are two choices of users, namely as Experts and Visitors.



Fig 8

- Experts, can only be used by experts, experts have full access rights to add, delete and edit the database.
- Visitors, can only use this system without changing or adding to the database in this application. Figure 8 below illustrates the form select user type.

This form is a display of disease data along with a description of the disease. In this form, all data must be filled in to complete the existing data. Figure 9 below shows the form of the disease.

**Sistem Pakar Diagnosa Penyakit Kanker Tulang**

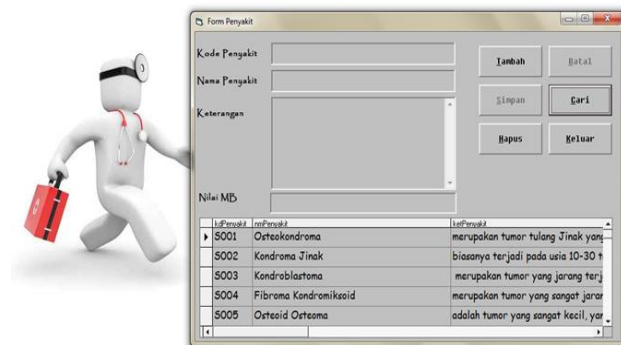


Fig 9:- Diseases Form Display

To operate the Expert System for Diagnosing Bone Cancer, it is necessary to implement the system. System implementation is the stage of implementing a system that is ready to operate, so that with this implementation it will be known whether the designed system is running well and as expected. In carrying out the implementation, there are several things that need to be prepared, especially those related to software (software) and hardware (hardware) as supporting technology infrastructure for implementation. The steps in the system implementation stage are as follows

- Prepare a database for data storage, prepare a database program for database processing, prepare a development tool program to design input and output that will produce software to detect bone cancer.
- Prepare hardware (hardware) and software (software) as supporting technology and the user in this case is the technician who will use the software.

In managing data using a computerized system, three main components are needed, namely as follows:

1. Hardware (hardware)

Hardware is all the components of the equipment that make up a computer system as data management, including calculating auxiliary machines and equipment that allows the computer to do its job.

The hardware specifications required are as follows:

- Minimum Pentium III 700 MHz micoprocessor
- 512 MB memory / RAM
- 10 GB hard drive
- VGA monitor
- Keyboard and Mouse

2. Software (software)

Software are programs that contain instructions in computer operation to help run hardware, while the software used is as follows:

- Operating System (OS) used Windows 8
- For programming, the Visual Basic 2010 Development Tool is used
- For Database using SQL Server 2008

- Anti Virus Software to prevent possible system damage caused by computer viruses.

### 3. Brainware (computer users)

Brainware is a supporting part that is very helpful in running or operating the system that has been created. The qualifications that Brainware must have are as follows:

- People who have knowledge in the field of computers or computer operators who will use the software (system).
- People who have the ability and intelligence, good morale, plus loyalty to the work at hand.

#### 1. Pros

As for some of the advantages possessed by this expert system are as follows:

- Able to provide information about bone cancer clearly and easily.
- The form is designed to be as simple as possible to minimize confusion.
- By implementing this system, doctors are very helpful in the decision-making process related to bone cancer consultation, this is because of the symptoms shown on the monitor screen.

#### 2. Disadvantages

Every system that is built certainly has flaws, the drawbacks of this system are:

- Cannot be accessed from mobile based devices such as cellphones.
- This system only addresses common problems, not special cases.
- This expert system is a design system whose storage media is in a database, so that data security is needed. In this system, there is already a low security category, because it only uses a password.
- The data is less accurate, because a more accurate examination requires several scans and bone loss processes in the hospital.

## V. CONCLUSIONS

Based on the results of the analysis and trials that have been carried out, it can be concluded:

- The system built can make it easy for people who want to know the disease they are suffering from.
- Determination of rules must be careful in order to minimize errors.
- Intelligent system that is built using the Forward Chaining method, which has combined the value of certainty factor knowledge with the value of certainty factors of disease.
- Intelligent system software for diagnosing bone cancer is implemented with the Visual Basic 2010 Development Tool, featuring simple menus so that anyone who needs it can be used, be it technicians, the general public, institutions or individuals because how to use it is very easy, no need to master expertise specifically about computers.

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