DISEASE IDENTIFICATION AND SUGGESTION SYSTEM

A PROJECT REPORT

Submitted by

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in partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

in

COMPUTER SCIENCE AND ENGINEERING

RAJALAKSHMI ENGINEERING COLLEGE

ANNA UNIVERSITY, CHENNAI

NOVEMBER 2022

RAJALAKSHMI ENGINEERING COLLEGE, CHENNAI

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ABSTRACT

The disease identification and suggestion system are used to diagnose the diseases among the patients. The diagnosis is made considering the symptoms that can be seen or felt. This disease identification and suggestion system helps the doctor or expert in making the appropriate diagnosis of the patient. The diseases have many common symptoms and some of them are very much alike. This creates many difficulties for the doctor to reach a right decision or diagnosis. This system can remove these difficulties and it has knowledge of common diseases. This disease identification and suggestion system is implemented in SWI Prolog, Prolog is a logic programming language associated with artificial intelligence and computational linguistics. In Prolog, program logic is expressed in terms of relations, and a computation is initiated by running a query over these relations. The information obtained from this disease identification and suggestion system is like the information given by a doctor or expert in that area. In this system the user or patient is asked to answer with YES or NO with the help of whether a particular symptom appears or not. In the end, based on the user's or patient’s answers, the name of the disease is displayed on the screen with the suggestions and advice.

ACKNOWLEDGMENT

First, we thank the almighty god for the successful completion of the project. Our sincere thanks to our chairman **Mr. S. Meganathan B.E., F.I.E.,** for his sincere endeavor in educating us in his premier institution. We would like to express our deep gratitude to our beloved Chairperson **Dr. Thangam Meganathan Ph.D.,** for her enthusiastic motivation which inspired us a lot in completing this project and Vice Chairman **Mr. Abhay Shankar Meganathan B.E., M.S.,** for providing us with the requisite infrastructure.

We also express our sincere gratitude to our college Principal, **Dr. S. N. Murugesan M.E., PhD.,** and **Dr. P. KUMAR M.E., PhD, Director computing and information science , and Head Of Department of Computer Science and Engineering** and our project guide **Mrs. Susmita Mishra MTech.,** for her encouragement and guiding us throughout the project towards successful completion of this project and to our parents, friends, all faculty members and supporting staffs for their direct and indirect involvement in successful completion of the project for their encouragement and support.

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ATHISH.B.S

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CHAPTER 1

INTRODUCTION

Artificial Intelligence is defined as brainpower exhibited by an artificial unit. It is a division of computer science dealing with sharp behavior, knowledge. An expert system is a computer program which encapsulates the intelligence of a human expert and utilizes this intelligence to solve issues in a manner analogous to the expert. Such a system can help the expert by investigating, analyzing, or operating in the place of the expert when proficiency is deficient. Expert systems have been progressive in such diverse fields as medicine, engineering, and business. In each case, expert systems have enhanced the worth, competence, and economic power of individuals, corporations, and intelligence-driven entities. Despite modern advancement, much research is still required to achieve optimal application of these technologies. Specifically, the medical industry needs accurate, yet adaptive, medical diagnostic program system. Based on the nature of illness, traditional, imperative languages have proven insufficient to meet this demand. Prolog Inductive Logic Programming has a unique potential to return ongoing, progressive responses to patient queries. This inductive approach to logic programming in medicine explores potential for successful implementation of Prolog Medical Diagnosis interface.

Recently, computer engineers have enlisted the help of computer software to diagnose and treat disease. Medical examinations are now performed with the assistance of highly developed computer-based systems. Computer-assisted surgery (CAS) is also a rapidly growing area. Complex surgeries can now be executed with fewer risks and greater accuracy. To provide swift, efficient and more precise surgical outcomes, CAS merges medical proficiency with computer intelligence.

Medicine is based on a set of guidelines rooted in statistical theory. Each day, physicians use scientific reasoning to diagnose the circumstances affecting patients and render the appropriate cure. Physicians apply their expertise as well as prior

experience with diverse disease processes to form a differential analysis which they subsequently use to find out which syndrome or illness the patient likely has. This is the basis of scientific reasoning.

There are two types of scientific reasoning: deductive and inductive. Physicians rely upon these methods to conduct medical research and respond to queries concerning particular groups of patients. In general, deductive reasoning is conducted when physicians utilize general theory to reach a specific conclusion, whereas inductive reasoning involves collecting observations to form a broader theory.

In our project we use a set of programs that manipulate knowledge to solve problems in a specialized domain that requires human expertise. This system is also called knowledge-based system. It is a computer program that contains some of the subject specific knowledge of one or more human experts. The proposed system provides an interactive and adaptive environment through which symptoms are linked with illness. Each new patient is asked a yes/no question concerning his or her symptoms, and responses are recorded. The diagnosis works by matching symptoms of known illness with trained rules. Inductive reasoning (in the form of generalization) is used to match the illness symptoms.

1.1 PROBLEM STATEMENT

To meet a growing demand for computer diagnostic aids, appropriate and efficient programs must be developed. Under traditional (imperative) programming languages, declarative specifications for solving problems can be generated, but inferred causes of problems may not. This limitation is especially confining to the field of medical diagnosis, which is, by nature, inferential. Thus, doctors will require a different programming approach to medical diagnosis.

To create a model that is trained with the disease , symptoms and suggestions where the model should accept the symptoms from the user and give the disease faced by the user accurately with suggestions and advice. The input from the user should be in the form of yes or no.

1.2 SCOPE OF THE WORK

The scope of this system is the Knowledge base and Inference engine like., **Knowledge base** contains the domain knowledge needed to solve the problems in the form of rules .

Inference engine is the code at the core of the system which derives conclusions from the knowledge base through inference or reasoning.

1.4 AIM AND OBJECTIVES OF THE PROJECT

The main aim of this disease identification and suggestion system is to diagnose and treat diseases. The disease identification and suggestion system are built up of programs and medical knowledge base.

The information obtained from this disease identification and suggestion system is like the information given by a doctor or expert in that particular area.

In this system the user or patient is asked to answer with YES or NO with the help of whether a particular symptom appears or not. In the end, based on the user's or patient’s answers, the name of the disease is displayed on the screen with the suggestions and advice.

1.5 RESOURCES

This project has been developed through widespread secondary research of accredited manuscripts, standard papers, business journals, white papers, analysts' information, and conference reviews. Significant resources are required to achieve an efficacious completion of this project.

The following prospectus details a list of resources that will play a primary role in the successful execution of our project:

>.A properly functioning workstation (PC, laptop, net-books etc.) to carry out desired research and collect relevant content.

>. Unlimited internet access.

>. Unrestricted access to the university lab in order to gather a variety of literature including academic resources (for e.g. Prolog tutorials, online programming examples, bulletins, publications, e-books, journals etc.), technical manuscripts, etc. Prolog development kit in order to program the desired system and other related software that will be required to perform our research.

1.6 MOTIVATION

In recent years, people have become highly circumspect toward their health. In response to a growing number of distinct diseases, people want to count on each and every one of their body's functioning cells and resulting behaviors. Many websites and forums are intended to provide meaningful information about health related issues for their visitors. However, only a few of them provide authentic details about the symptoms of a certain disease. Additionally, many physicians and doctors use predictive tools and methods to evaluate and diagnose an evolving disease. The proposed system is intended to service those individuals who wish to determine and diagnose emerging disease against expressed indications by means of concise yet accurate questionnaires

CHAPTER 2

LITERATURE SURVEY

2.1 SURVEY

A disease identification and suggestion system is a set of programs that manipulate knowledge to solve problems in a specialized domain that requires human expertise. This system is also called knowledge-based system. It is a computer program that contains some of the subject specific knowledge of one or more human experts. The **rules** are a popular paradigm for representing knowledge.
The main components of this system are knowledge base and inference engine.
1.Knowledge base contains the domain knowledge needed to solve the problems in the form of rules.
2.Inference engine is the code at the core of the system which derives conclusions from the knowledge base through inference or reasoning.

2.2 PROPOSED SYSTEM

Here the proposed project is implemented in SWI-Prolog.

Initially, the code starts with a initialization by getting the name from the user and the system starts when we give "go." Then the user start to answer to the agent with yes(y.) or no(n.) based on the symptom faced by them ,then the agent gives suggestions and advices like what tablet should be taken or whether the user should see the doctor immediately or not. If the agent is unable to detect the disease from the knowledge trained by the programmer , it will print the disease as unknown ..

Users who can use this expert are:

1. The doctors can easily predict the disease using this expert system.
2. The common people can use this system and can take self-medication without any consult from doctor.

2.3 INFERENCE MECHANISM

The mechanism that is used in this project is forward chaining. forward chaining is a data driven approach, that starts with facts and further it sees what rules is applied. Here in this mechanism fact acts as a symptoms and suggestion and disease are send to the user from the rules.

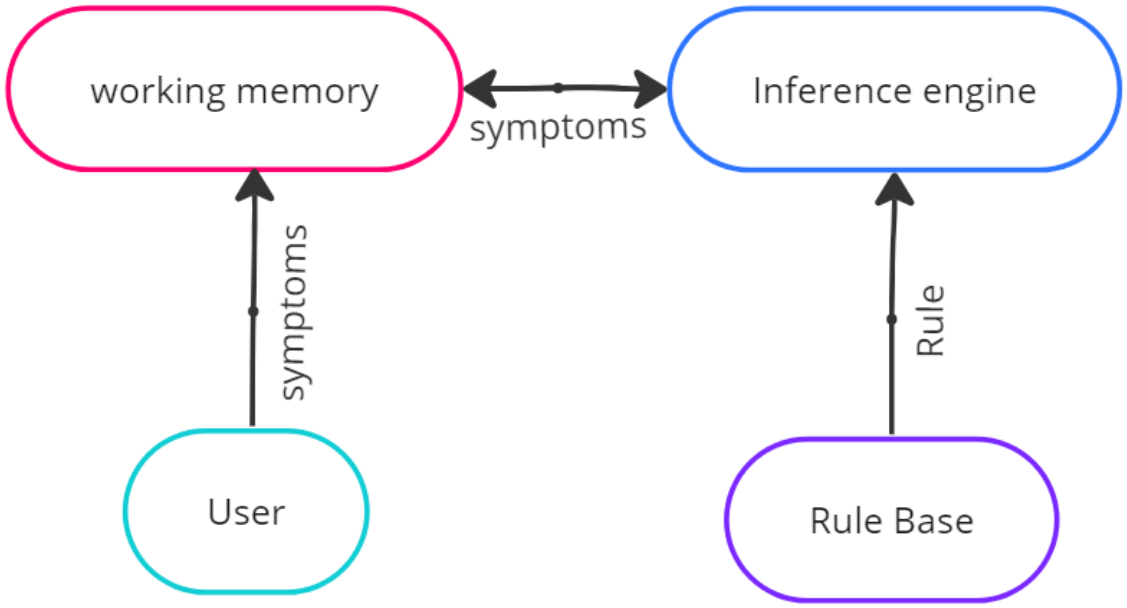

Fig 2.3 Inference diagram

2.4 PROLOG

Logic Programming and Prolog are related to one another. This is evidenced by their uses of identical terminology such as “true”,” predicates”, ”proof”, etc. Not only is Prolog applicable to the systems that inherit logical reasoning, but its entire query resolution process is also the product of a logical deduction system.

Programming in Prolog is primarily based on three objectives:

 Identifying “Facts” about objects and their relationships

- Defining certain “Rules” about objects and their relationships
- Requesting “Queries” about objects and their relationships

In logic programming, a program is comprised of a set of statements defined in terms of formulae in symbolic logic. The rules of inference cause new formulae to be generated when cross-referenced against old ones. Expressing these rules of inference in terms of symbols is said to have symbolic manipulation processed by computer. This is the main methodology working behind execution of certain logic by a computer. A computer processes new formulae from old ones to provide a solution to the proposed problem. If the old formulae in the program behave as “true”, then the derived formulae will replicate them, resulting in accurate and precise results. To verify if the program produces correct outcomes, a developer checks that the running program contains only true statements and that if it is being executed in the correct manner. The developer may also be concerned with the response time of the program to ensure that the results can be fetched quickly.

Logic programming and Prolog are closely related as logic programming is the backbone of Prolog. The major benefit of Prolog is the way in which it can provide a clearer knowledge of the underlying concepts and act as a medium to develop new methods as defined by the prototypes.

CHAPTER 3

SYSTEM DESIGN

3.1 GENERAL

In this section, we would like to show how the general outline of how all the components end up working when organized and arranged together. It is further represented in the form of a flow chart below.

3.2 SYSTEM ARCHITECTURE DIAGRAM

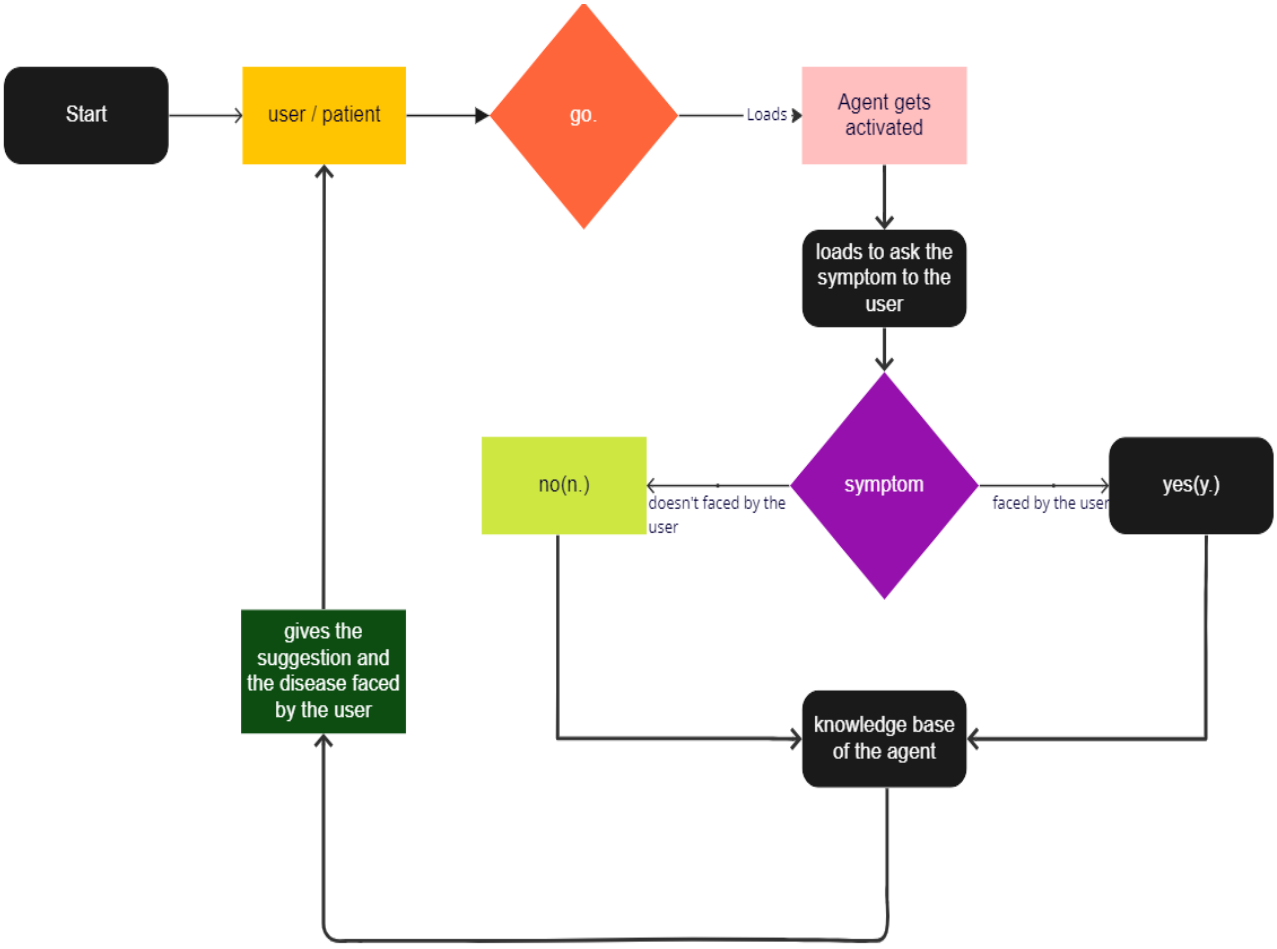

Fig 3.1: System Architecture

3.3 DEVELOPMENTAL ENVIRONMENT

3.3.1 HARDWARE REQUIREMENTS

The hardware requirements may serve as the basis for a contract for the system's implementation. It should therefore be a complete and consistent specification of the entire system. It is generally used by software engineers as the starting point for the system design.

Table 3.1 Hardware Requirements

COMPONENTS	SPECIFICATION
PROCESSOR	Intel Core i5
RAM	8 GB RAM
GPU	NVIDIA GeForce GTX 1650
MONITOR	15" COLOR
HARD DISK	512 GB
PROCESSOR SPEED	MINIMUM 1.1 GHz

3.3.2 SOFTWARE REQUIREMENTS

The software requirements document is the specifications of the system. It should include both a definition and a specification of requirements. It is a set of what the system should rather be doing than focus on how it should be done. The software requirements provide a basis for creating the software requirements specification. It is useful in estimating the cost, planning team activities, performing tasks, tracking the team, and tracking the team's progress throughout the development activity.

SWI-Prolog, and **chrome** would all be required.

3.4 DESIGN OF THE ENTIRE SYSTEM

3.4.1 ACTIVITY DIAGRAM

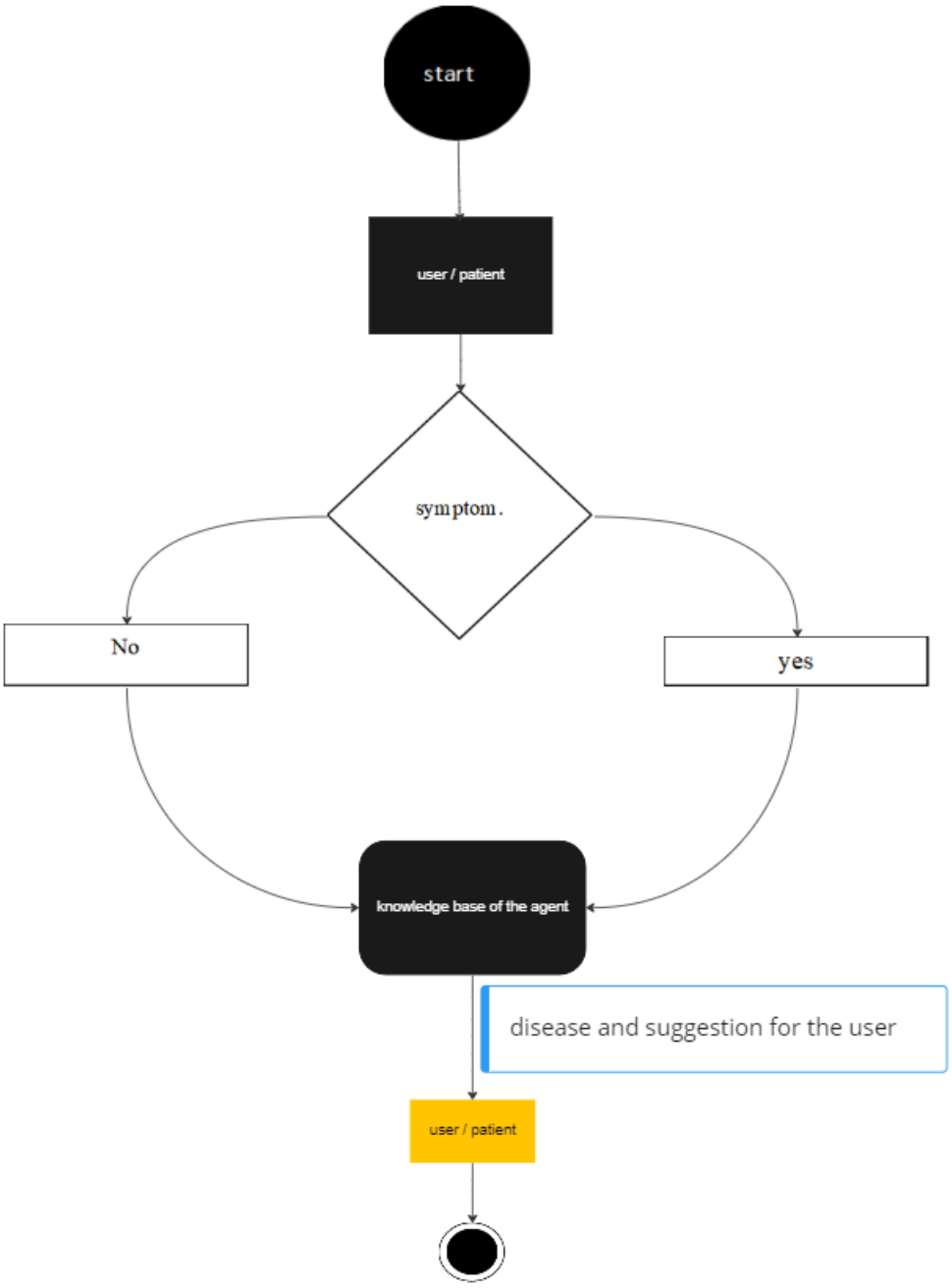

Fig 3.2 Activity Diagram

3.5 THE STRUCTURE OF MEDICAL EXPERT SYSTEMS

A medical expert system has the following components The Knowledge Base encloses information with reference to diseases which are characterized as a set of if-then production rules. The knowledge base is analogue to the long-standing human memory. The whole sorting of product rules is prepared in the knowledge base. You may understand it with the help of example. Tuberculosis is a lung disease whose symptoms are persistent cough, constant fatigue, weight loss, loss of appetite, fever, coughing up blood, night sweats. So it will be stored in knowledge base in the form of a rule which is as follow:-

Disease (Patient, tuberculosis):-

Symptom (Patient, persistent_cough),

Symptom (Patient, constant_fatigue),

Symptom (Patient, weight_loss),

Symptom (Patient, loss_of_appetite),

Symptom (Patient, fever),

Symptom (Patient, coughing_up_blood),

Symptom (Patient, night_sweats)

Similarly in this way you can store maximum possible rules in the knowledge base.

2) The Fact Base contains facts which are applied to match in opposition to the antecedent part of rules stored in the knowledge base. The fact base is analogue to the instant human memory.

3) The foremost job of Inference Engine is to bring out the reasoning by connecting the rules with facts and deducing new facts.

4) The User Interface is used to correspond among user and expert system.

5) The Explanation Module permits the user to inquire the expert system how a finicky conclusion is reached and why a specific fact is desired.

6) The Developer Interface is used to alter the knowledge base

CHAPTER 4

STUDY & CONCEPTUAL DIAGRAM'S

4.1 CONCEPTUAL DIAGRAM

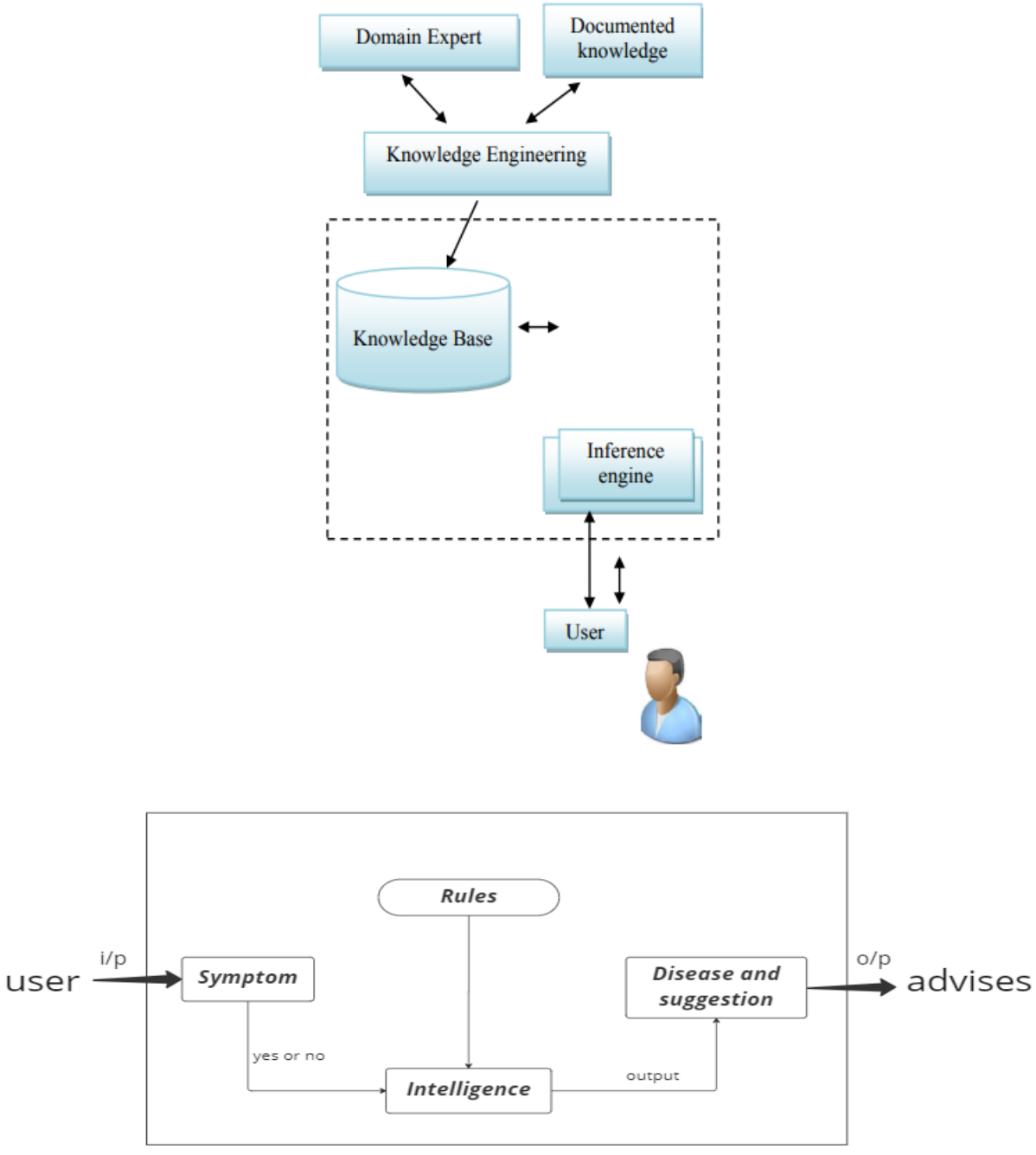

Fig 4.1: conceptual architecture

4.2 PROFESSIONAL VALUE OF THE STUDY

Many valuable studies have recently been carried out with a corresponding rise of logic programming intensive trends within the field of medical science. Researchers intend to find more developed patterns in the desired field to make accurate assumptions for the newly evolved diseases and assign specific cures for them.

4.3 HIERARCHY OF DEVELOPMENT PROCESS

The class structure of the development process that we carried out in this project is clearly shown in Figure 4.2.

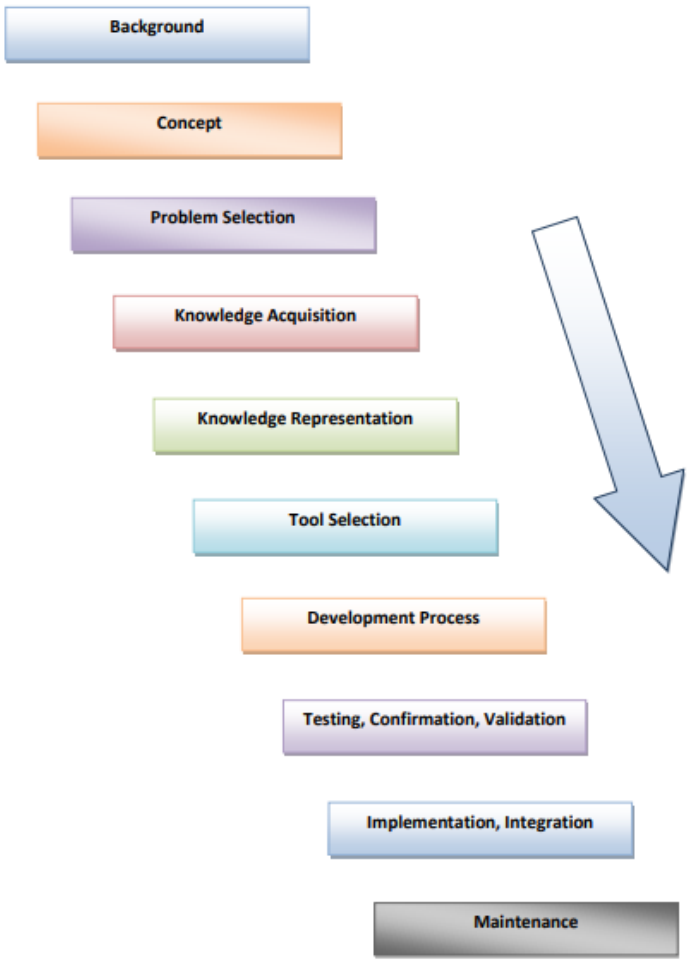

Fig 4.3: Hierarchy of development process

CHAPTER 5

PROGRAM

CODE:

```
name(X):-
write('WELCOME TO THE DISEASE IDENTIFICATION AND SUGGESTION SYSTEM,Enter your name:'),
read(X).
go:-
hypothesis(Disease),
write('I believe that the patient have '),
write(Disease),
nl,
write('TAKE CARE'),
undo.
/*Hypothesis that should be tested*/
hypothesis(cold)     :- cold, !.
hypothesis(flu)      :- flu, !.
hypothesis(typhoid)  :- typhoid, !.
hypothesis(measles)  :- measles, !.
hypothesis(malaria)  :- malaria, !.
hypothesis(covid)    :- covid, !.
hypothesis(tuberculosis):- tuberculosis, !.
hypothesis(pneumonia):- pneumonia, !.
hypothesis(diabetes):- diabetes, !.
hypothesis(unknown). /* no diagnosis*/
/*Hypothesis Identification Rules*/
cold :-
verify(headache),
verify(runny_nose),
verify(sneezing),
verify(sore_throat),
write('Advices and Sugestions:'),
nl,
write('1: Tylenol/tab'),
nl,
write('2: panadol/tab'),
nl,
```

```
write('3: Nasal spray'),
nl,
write('Please weare warm cloths Because'),
nl.
flu :-
verify(fever),
verify(headache),
verify(chills),
verify(body_ache),
write('Advices and Sugestions:'),
nl,
write('1: Tamiflu/tab'),
nl,
write('2: panadol/tab'),
nl,
write('3: Zanamivir/tab'),
nl,
write('Please take a warm bath and do salt gargling Because'),
nl.
typhoid :-
verify(headache),
verify(abdominal_pain),
verify(poor_appetite),
verify(fever),
write('Advices and Sugestions:'),
nl,
write('1: Chloramphenicol/tab'),
nl,
write('2: Amoxicillin/tab'),
nl,
write('3: Ciprofloxacin/tab'),
nl,
write('4: Azithromycin/tab'),
nl,
write('Please do complete bed rest and take soft Diet Because'),
nl.
measles :-
verify(fever),
verify(runny_nose),
verify(rash),
```

```
verify(conjunctivitis),
write('Advices and Sugestions:'),
nl,
write('1: Tylenol/tab'),
nl,
write('2: Aleve/tab'),
nl,
write('3: Advil/tab'),
nl,
write('4: Vitamin A'),
nl,
write('Please Get rest and use more liquid  Because'),
nl.
malaria :-
verify(fever),
verify(sweating),
verify(headache),
verify(nausea),
verify(vomiting),
verify(diarrhea),
write('Advices and Sugestions:'),
nl,
write('1: Aralen/tab'),
nl,
write('2: Qualaquin/tab'),
nl,
write('3: Plaquenil/tab'),
nl,
write('4: Mefloquine'),
nl,
write('Please do not sleep in open air and cover your full skin Because'),
nl.
covid :-
verify(headache),
verify(fever),
verify(sore_throat),
verify(runny_nose),
write('Advices and Sugestions:'),
nl,
write('1: Azithromycin 250mg(child) or 5oomg(adult)'),
```

```
nl,
write('2: Azcroil syrup'),
nl,
write('3: crocin'),
nl,
write('4: xyzol'),
nl,
write('Please quarantine yourself for 1 week and take rest, wear mask if you go out'),
nl.
tuberculosis :-
verify(fever),
verify(constant_fatique),
verify(weight_loss),
verify(sweating),
verify(poor_appetite),
write('Advices and Sugestions:'),
nl,
write('1: Rifampin (RIF)'),
nl,
write('2: Isoniazid (INH)'),
nl,
write('3: Pyrazinamide (PZA)'),
nl,
write('4: Ethambutol (EMB)'),
nl,
write('Please consult doctor immediately and then take the tablets based on his
advise'),
nl.
pneumonia:-
verify(cough),
verify(fever),
verify(chills),
verify(shortness_of_breath),
write('Advices and Sugestions:'),
nl,
write('1: Azithromycin'),
nl,
write('2: Clindamycin '),
nl,
write('3: Delafloxacin'),
```

```
nl,
write('Please consult doctor immediately and then take the tablets based on his advise'),
nl.
diabetes:-
verify(headache),
verify(frequent_urination),
verify(tiredness),
verify(blurryvision),
verify(thirsty),
verify(constant_fatique),
write('Advices and Sugestions:'),
nl,
write('1: Insulin'),
nl,
write('2: Metformin'),
nl,
write('3: Glimepiride'),
nl,
write('Please consult doctor immediately and then take the tablets based on his advise'),
nl.
/* how to ask questions */
ask(Question) :-
write('Does the patient have following symptom:'),
write(Question),
write('? '),
read(Response),
nl,
( (Response == yes ; Response == y)
->
assert(yes(Question)) ;
assert(no(Question)), fail).
:- dynamic yes/1,no/1.
/*How to verify something */
verify(S) :-
 (yes(S)
  ->
   true ;
 (no(S)
```

```
  ->
    fail ;
 ask(S))).
/* undo all yes/no assertions*/
undo :- retract(yes(_)),fail.
undo :- retract(no(_)),fail.
undo.
```

CHAPTER 6

RESULTS AND DISCUSSIONS

5.1 OUTPUT

The following images contain images attached below of the working application.

The following image in Fig 5.1 shows the interaction between user and the expert system in the Application.

```
?-
% d:/REC/SEM5/ai pro/disease.pl compiled 0.00 sec, 0 clauses
?- name(X).
WELCOME TO THE DISEASE IDENTIFICATION AND SUGGESTION SYSTEM,Enter your name:BATHRI.

true.

?- go.
Does the patient have following symptom:headache? y.

Does the patient have following symptom:runny_nose? |: y.

Does the patient have following symptom:sneezing? |: n.

Does the patient have following symptom:fever? |: y.

Does the patient have following symptom:chills? |: n.

Does the patient have following symptom:abdominal_pain? |: n.

Does the patient have following symptom:rash? |: n.

Does the patient have following symptom:sweating? |: n.

Does the patient have following symptom:sore_throat? |: y.

Advices and Sugestions:
1: Azithromycin 250mg(child) or 5oomg(adult)
2: Azcroil syrup
3: crocin
4: xyzol
Please quarantine yourself for 1 week and take rest, wear mask if you go out
I believe that the patient have covid
TAKE CARE
true.
```

Fig 5.1: Output

5.2 RESULT

This Prolog expert system is successfully implemented, and results are taken. It is applied on many patients and its results are 70% correct. For example Asthma is a disease whose symptoms are wheezing, cough, chest tightness, shortness of breath. In this Prolog expert system, First the user or patient enters his or her name (suppose name is Jimmy) then the user or patient is asked to answer with YES (y) or NO (n), If a particular symptom appears or not. (Here user or patient will reply YES (y) to the symptoms wheezing, cough, chest tightness, shortness of breath.) In the end, based on user's or patient's answers, the name of the disease is displayed on the screen (Asthma).

CHAPTER 7

CONCLUSION AND FUTURE ENHANCEMENT

7.1 CONCLUSION

So, in this paper, we would like to conclude by saying that we have built a basic disease identification and suggestion system where everyone can now can be diagnosed with a lot of ease. This medical expert system is dealing with person's health and an approximate diagnosis of a certain disease is established, this system has a great risk. There may be more lung diseases which are not considered in the system's knowledge base. So, this knowledge base is incomplete but it can be updated any time with new symptoms and diseases. Symptoms already available in knowledge base are not 100% correct because different doctors have different opinions and there are anomalies in medicines. Prolog is formulated in terms of relation, and its computations are performed by executing a set of queries over a relation. Prolog is preferred by many analysts because of its modular and flexible approach to tasks and its ability to greatly facilitate applications involving AI problems. The primary difference between Prolog and other programming languages is logical reasoning. While Prolog works logically in the presence of only some rules, others don't.

The conventional programming languages like C++ and Java are object oriented by nature while Prolog works on a declarative programming paradigm.

Therefore, we have successfully implemented or trained the expert system such that the system will be able to find the disease that is faced by the user and will be able to give appropriate suggestion for the disease

FUTURE ENHANCEMENT

This system can be even updated or advanced such that it will be able to diagnose using the test report that is taken by the patient, i.e., when the patient uploads the test reports in the system, the agent will be able to detect and diagnose the disease based on the rules and facts trained by the programmer.

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