# KNOWLEDGE BASE SYSTEM IN MEDICINE WITH SPECIAL REFERENCE TO CONSULTING PHYSICIAN

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#### **Abstract**

Knowledge is the fact or condition of knowing something with familiarity gained through experience or association. A Knowledge base system is also known as expert system. It is a computer program that contains some of the subject-specific knowledge, and contains the knowledge and analytical skills of one or more human experts. This paper deals with the deals with the development of knowledge base system in medicine which is able to give an appropriate diagnosis for all the diseases with fever as one symptom. A Knowledge-based system assists in the diagnosis of diseases to doctor in some critical cases. It also improves quality of decision making and speed-up of human professional work.

Keywords: Knowledge base system, rules of diagnosis, problem description, types of fever, inference engine, knowledge base.

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I. INTRODUCTION

This paper deals with the development of knowledge base system for the diagnosis of disease with fever as one symptom. The rules are generated with the help of symptoms and physical signs. The paper is organized as follows: The domain, Traditional Process of diagnosis, factors considered for the diagnosis of disease, Statement of the Problem, and design for knowledge base system, Model Building, and conclusion

II. THE DOMAIN

The main aim of this paper is to present diagnosis of disease by studying the age, gender, physical sings and symptoms of patient. Knowledge base system is a computer program that uses encoding of human knowledge which helps to solve problem in specified domain and normally required human expertise. In this paper expert knowledge is acquired in the form of if - then rules to make predication of disease.

III. TRADITIONAL PROCESS OF DIAGNOSIS

A patient typically presents a set of complaints know as the symptoms to the physician, who then obtains further information about the patient's symptoms, previous state of health, living conditions, and so forth. The physician then makes a review of systems or systems inquiry, which is a set of ordered questions about each major body system in order: general such as weight loss, endocrine, cardio-respiratory, etc. Next come the actual physical examination and often laboratory tests, the findings are recorded, leading to a list of possible diagnosis.

Medical tests commonly performed are measuring checking the listening to the heart with a stethoscope, pulse rate, blood pressure, urine tests, blood tests, x-ray etc.

A physician's job is to know the human body and its functions in terms of normality. There are four branches of medicine, each essential for understanding homeostasis. These are 1) anatomy-the structure of the human body,

2) physiology-how the body works, 3) pathology-what can go wrong with the anatomy and physiology and 4) psychology-thought and behavior. Once the doctor knows what is normal and can measure the patient's current condition against those normal, she can then determine the patient's particular departure from homeostasis and the degree of departure. This is called the diagnosis. Once a diagnosis has been reached, the doctor is able to propose a management plan, which will include treatment as well as plans for follow-up. From this point on, in addition to treating the patient's condition, the doctor educates



the patient about the causes, progression, outcomes, and possible treatments of his ailments, as well as providing advice for maintaining health.

#### IV. FACTORS CONSIDERED FOR THE DIAGNOSIS OF DISEASE:

For the diagnosis of disease, it is necessary to consider age of patient, gender of patient, physical signs and symptoms observed. Medical science is huge branch of science. But the present paper has been confined to knowledge base system in medicine with special reference to consulting physician. Here the paper contains all the disease with fever as main symptom along with other symptom.

Fever Type	Diseases	
Fever	Meningitis, Aseptic, Lyme Disease, Rocky Mountain	
	Spotted Fever, Amebiasis, Malaria	
Fever with Chill	Atrial Myxoma, Toxic Shock Syndrome, Tonsillitis,	
1/2/07	Mononucleosis, Diphtheria, Lymphoma	
Fever with Swollen	Mumps, Salivary Gland Infection, Dental Abscess,	
Lump	Thyroiditis,	

So consulting physician must first decide which type of fever patient having. Then again disease wise there are number of other symptoms. So consulting physician must carefully ask the symptoms.

#### V. STATEMENT OF THE PROBLEM

To diagnosis patients, knowledge of symptoms that are provided by patient, history of patient, signs and symptoms that are observed by the doctor are important. To treat a patient having different symptoms is really a challenge to the doctor. Hence different types of clinical data which contains symptoms and disease of that symptom is main part of knowledge based system.

India's population is very high. The ratio of expert physicians in proportion with population is very small. Expert physicians are not available in rural and remote places. To overcome this problem the best solution is capture the knowledge from the experts and prepare the rule based expert system which is a new diagnosis technique to solve the problem. It is observed that almost 70 % patient that approach to consulting physician are having very basic disease. In this case the rule based expert system helps to minimize the delay in the treatment of

the patient .This system is helpful for the medical students, junior doctors and doctors who are practicing at remote places.

#### VI. DESIGN FOR KNOWLEDGE BASE SYSTEM

To design the knowledge based system following components are to be considered.

- A) User Interface: User interface is very important part of KBS system. User Interface must be Friendly, self Intelligent, easy to handle.
- B) Databases: Any system is intelligent if and only if database contain perfect information of problem. One important feature of knowledge based system is the way they (usually) separate domain specific knowledge from more general purpose reasoning and representation techniques. For Knowledge based system in medicine the database contains huge number of signs and symptoms along with disease, personal information and history of patient.

Sample database structure of KBS in medicine for consulting physician contain following information

- 1) Patient's personal information like case paper number, name, gender, age, blood group
- 2) Patient's diagnosis information like case paper number, symptoms, diagnosis
- 3) Knowledge base information includes disease information along with it's all symptoms divided into three tables 1) symptom1, symptom2, symptom3.
  - 1) Symptom1 table contains symptom number and main symptom

Symptom Number	Description
1	Fever
2	Fever with Chill
3	Fever with swollen
. · ·	lump

2) Symptom2 table contains sub major symptom number and group of symptoms. Some example are as follows.

Rule number	Symptom1
S1.1	constipation or diarrhea, abdominal pain, tenderness,
	fatigue, joint pain, sore throat, weakness
S1.2	recent sore throat, chest pain, shortness of breath, joint
	pain, jerking movements



S2.1	red, sore throat, painful swallowing, difficulty swallowing,
	painful lumps in the neck
S2.2	severe sore throat, difficulty in swallowing, difficulty in
	speaking, painful lumps in the neck, difficulty in breathing
S3.1	headache, neck stiffness, sensitive to light, tenderness
	over sinuses, pain above eyes or over cheeks, nasal discharge
S3.2	tenderness over sinuses, pain above eyes or over cheeks,
	nasal discharge, headache

3) Symptom3 table contain symptoms of particular disease along with disease name.

Sympto	Symptoms	Dieses
m no		
S1.1.1	Cough ,nausea, vomiting, fever usually higher in the	Typhoid
	evening, exhausted, a roseis spots rash may develop on	Fever
	the chest, abdomen and the back, complications can lead	
	to gastrointestinal bleeding	
S2.1.1	tender, headache, pain may radiate to the ear,	Tonsillitis
	young children may refuse to eat or occasionally develop	
	vomiting, the tonsils appear red, swollen, may have	
	small white patches on them	A
S3.1.1	middle ear infections typically produce earache, a	Meningitis
	feeling of fullness in the ear, dizziness, irritability	

C) Inference Engine: The purpose of the inference engine is to seek information and relationships from the knowledge base and to provide answers, predictions, and suggestions in the way a human expert would. The inference engine must find the right facts, interpretations, and rules and assemble them correctly. Two types of inference methods are commonly used Backward chaining is the process of starting with conclusions and working backward to the supporting facts. Forward chaining starts with the facts and works forward to the conclusions.

Expert-system shell provides customizable inference engine In medical science every disease has huge number of symptoms. So inference engine must use heuristic search method for



perfect diagnosis. Forward chaining inference method is used to for this system. Here to develop knowledge base system in medicine for consulting physician

D) Knowledge Base system It contains much of the problem solving knowledge. Rules are of the form IF condition THEN action. Condition portion of the rule is usually a fact - If some particular fact is in the database then perform this action. Action portion of the rule can include actions that affect the outside world (print a disease name on the terminal). Rules can be specific. Rules can be heuristics (e.g. If fever AND constipation or diarrhea AND abdominal pain and tenderness AND fatigue AND joint pain AND sore throat AND weakness AND cough AND nausea AND vomiting AND fever usually higher in the evening AND exhausted AND a roseis spots rash may develop on the chest, abdomen and the back AND complications can lead to gastrointestinal bleeding Then Diagnosis is Typhoid Fever ). That means depending upon the symptoms ,KBS will provide the perfect diagnosis.

#### VII. MODEL BUILDING:

The implementation stage takes as its primary input. Model includes menus, dialogs, and data management forms, data reporting formats, and specialized procedures and functions. Appropriate test cases will be developed for each set of functionally related model, and an online help system will be developed to guide users in their interactions with the model.

When user select patient information option from menu following screen will appear on screen. To add new patient information press new button.

KRANTI-KBS IN MEDICINE	×
Patient Information	
Case Paper No   8 Date   11/10/2008 ▼	
Name RAHUL PATIL Age 53 Gender € Male € Female	
SYMPTOM 1	
● Fever with rash ● Fever with swollen lymph glands ● Fever with Chill	
New	
Save	
Report	
Home	

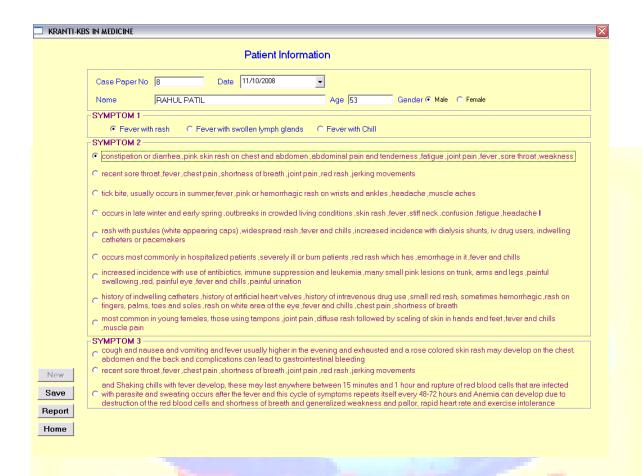
Here user must enter Name of patient age and gender. Next is symptoms selection. By using normalization symptoms are divided into three groups. Kranti knowledge based system covers all the diseases in which fever is one symptom. So first stage user can select type of fever i.e whether the patient is suffering from 1) only fever 2) fever with chill or 3) fever with swollen lump.

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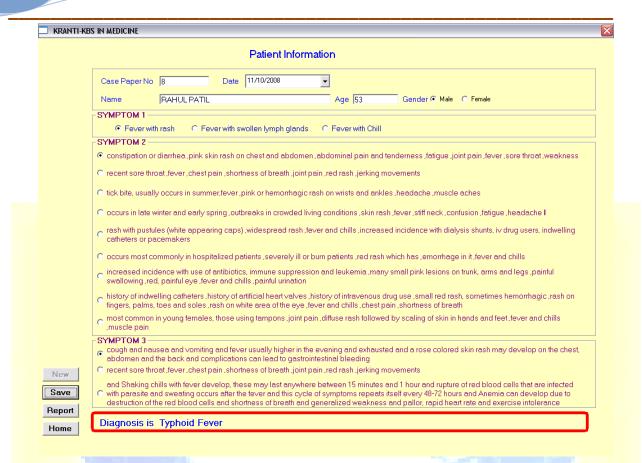


Symptom selection



After selecting the symptom1, depending upon symptom selected in symptom1 system can display list of symptom2. Symptom2 contains group of symptoms. Select one group. Again depending upon group selected in symptom2, system will display symptom3. Again select one group. Now system will display disease name.





#### VIII. INTEGRATION AND TEST STAGE

Kranti model is tested in the hospital. This model is implemented into number of hospitals for testing, where the expert doctors are present. The diagnosis made by doctor is exactly same as by model. This model produced proper result.

#### IX. CONLUSIONS

- In KBS knowledge is collected from different consulting physician. So it is more expert.
- Improved quality of decision making.
- A speed-up of human professional work.
- Within hospital, major internal cost saving is possible using KBS.
- Preservation of scarce expertise in the medical science.
- It assists in the diagnosis of diseases to doctor in some critical cases.
- Experts were trust more on of KBS advice than novices.

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- Novices relied more heavily on the KBS than experts.
- KBS in medicine is more useful in villages where doctors are not available. One Personal computer and trained operator can make initial diagnosis.
- A large database of knowledge can be added to and kept up-to-date it can store more knowledge than a person.
- The system cannot 'forget' or get facts wrong.
- It survives forever. There is no loss of knowledge as in case of doctor.
- The computer can access specialist knowledge that a doctor may not have.

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#### X. SUGGESTIONS

To create a rule-based system for a given problem, you must have (or create) the following:

- A set of facts to represent the initial working memory. This should be anything relevant to the beginning state of the system.
- A set of rules. This should encompass any and all actions that should be taken within the scope of a problem, but nothing irrelevant. The number of rules in the system can affect its performance, so you don't want any that aren't needed.
- A condition that determines that a solution has been found or that none exists. This is necessary to terminate some rule-based systems that find themselves in infinite loops otherwise.



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