

# An Expert System for Diagnosing Throat Problems Using Clips

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**Abstract:** There are many throat problems that have similar symptoms, so the most important goal - In order to prescribe the appropriate treatment - it is the correct diagnosis of the disease. In this paper, we proposed an expert system that was designed and implemented to help laryngologists diagnose some throat problems symptoms (scratchy, burning, raw, dry, tender, irritated). An overview of throat diseases is presented; the cause of diseases is determined and treats of the disease whenever possible. CLIPS and Delphi languages were used as the main tools for designing our expert system.

**Keywords:** Artificial Intelligence, Expert Systems - CLIPS, Throat problems

## 1- INTRODUCTION

The throat (pharynx and larynx) is a ring-like muscular tube that acts as the passageway for air, food and liquid. It is located behind the nose and mouth and connects the mouth (oral cavity) and nose to the breathing passages (trachea [windpipe] and lungs) and the esophagus (eating tube). The throat also helps in forming speech. Figure 1 show The Side View of Internal Throat Structure [1].

The throat contains the:

- Tonsils and adenoids - made up of lymph tissue. Tonsils are located at the back and sides of the mouth and adenoids are located behind the nose. They both help to fight infections.
- Pharynx  
The muscle-lined space that connects the nose and mouth to the larynx and esophagus (eating tube).
- Larynx  
The upper opening into the windpipe (trachea), the passageway to the lungs.
- Epiglottis  
A flap of soft tissue and cartilage above the vocal cords. The oboe folds over the vocal cords to help prevent food and irritants from entering the lungs.
- Subglottic space  
The space immediately below the vocal cords. It is the narrowest part of the upper airway

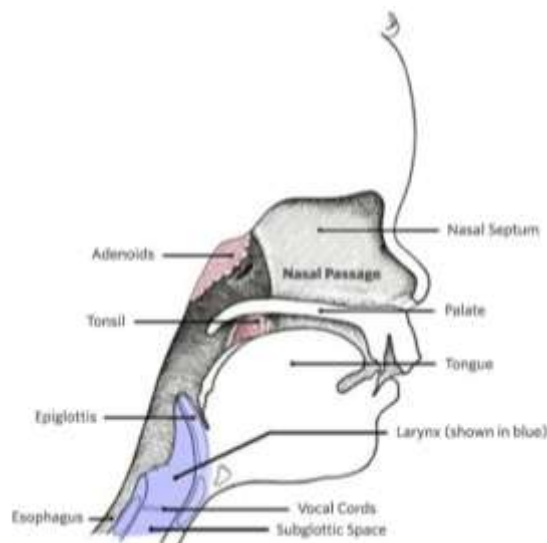


Figure 1: The Side View of Internal Throat Structure [1]

Throat diseases are very common these days. They are simple and easy to recover from, and others are very harmful and may not have a cure. Therefore, the diagnosis of throat diseases is particularly complicated, so we developed a system that helps laryngologists diagnose some diseases related to throat diseases in order to prescribe the appropriate treatment.

## 2. LITERATURE REVIEW

Despite the fact that, there are numerous expert systems that are produced for diagnosing plants diseases and human diseases[05-47] such as Problems of Teeth and Gums, Skin Diseases, Rickets and other types of Illness. But there is no expert system for diagnosing throat diseases available free of charge. The proposed expert system was planned and developed explicitly to help specialists in diagnosing throat problems.

There are numerous kinds of sicknesses that can influence the throat and its capacities. Some have fruitful medications while others don't. Examples of common conditions that influence the throat include:

- Infection caused by viruses or bacteria entering these areas, as these viruses and bacteria may cause infections and various diseases in the throat. Figure 2

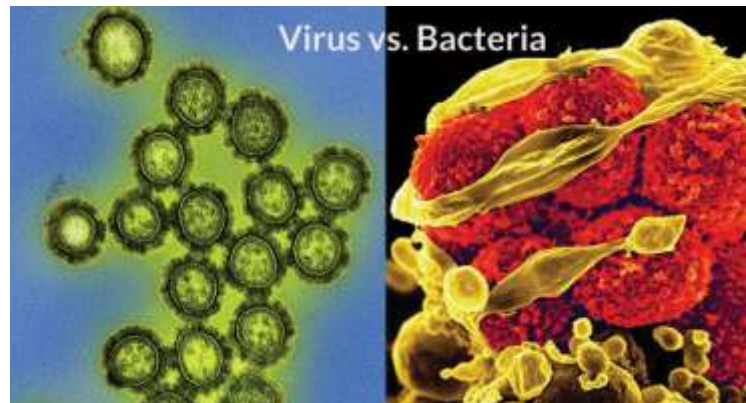


Figure 2: viruses or bacteria [2]

- Allergy to certain things, whether from foods or from the atmosphere and external conditions such as dust and pollen.
- Inhale dry and cold air, or inhale polluted air, such as cigarette smoke, factory and auto smoke.
- Excessive eating of spices and spices.
- Speak loudly for extended periods of time, constantly.
- Excessive smoking.
- Cancer of the throat and cavity.

For all the previously mentioned reasons, we have built up this expert system to help specialists in diagnosing throat illness so as to prescribe the suitable treatment. Symptoms of a throat disease can vary depending on the cause.

Expert system is a computer application of Artificial Intelligence (AI) [3]; which contains knowledge base inference engine, and User Interface as in Figure 3.

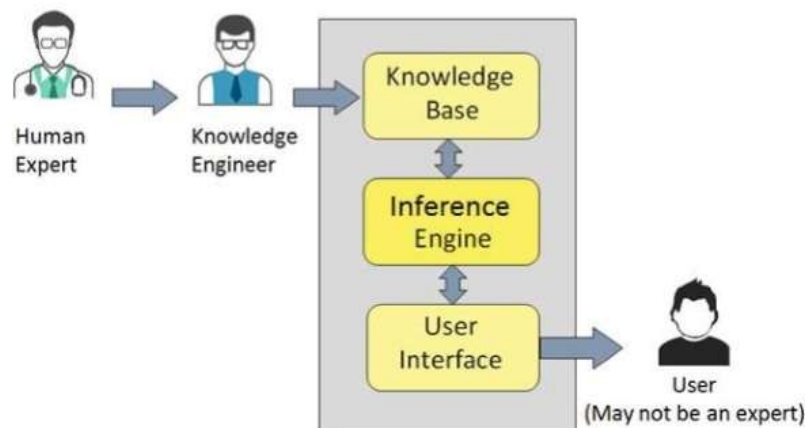


Figure 3 show the Main Components of an Expert System [3]

### 3. MATERIALS AND METHODS

The proposed expert system performs diagnosis for nine throat diseases by presenting all symptoms. The proposed expert system will ask the user to choose the type of problem symptoms. At the end of the dialogue session, the proposed expert system provides diagnosis and recommendations for the user. Figure 4 shows the main interface of the system and the user system. Figure 5 shows symptoms disease, Figure 6 Obtain diagnosis and recommendation.

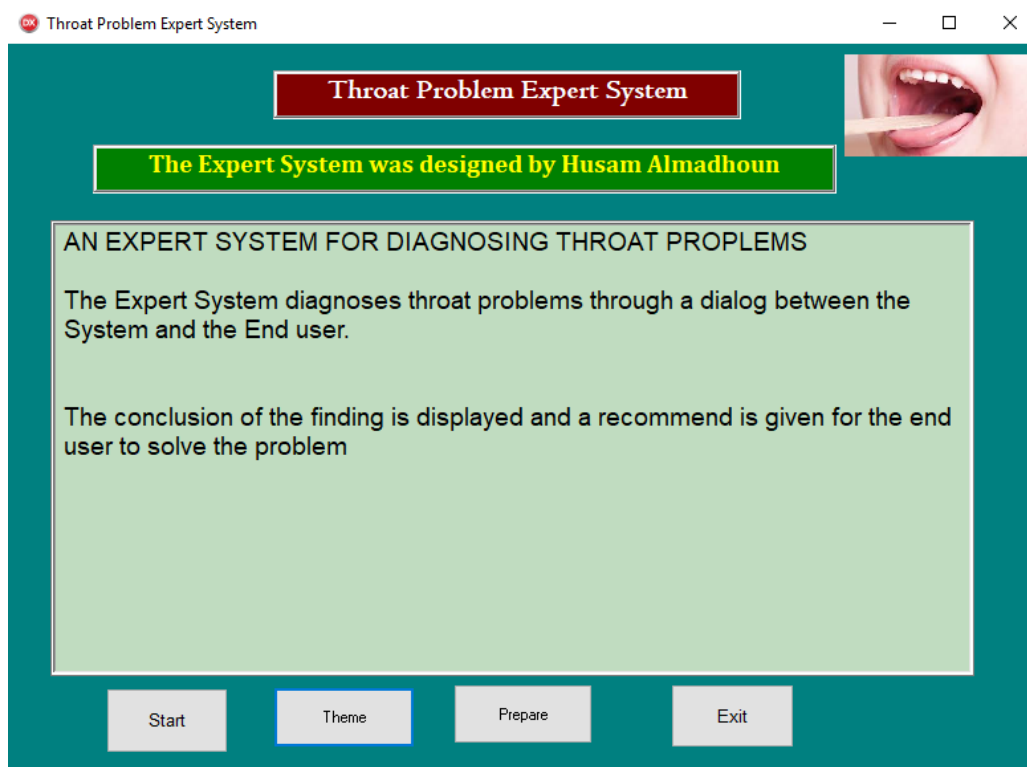


Figure 3 shows the main interface of the system

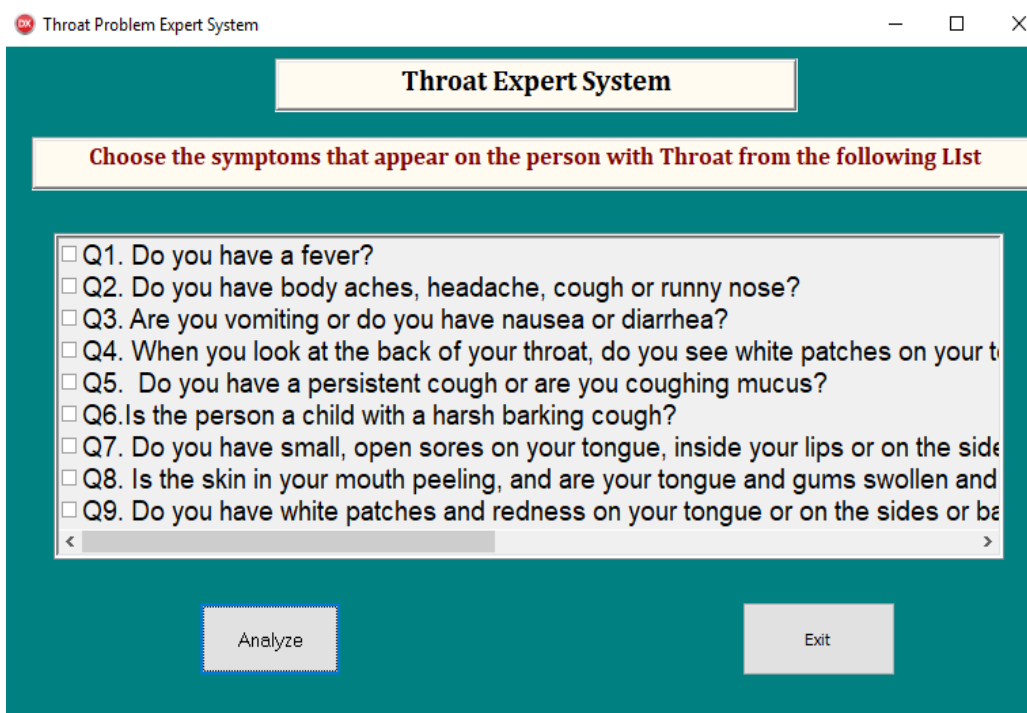


Figure 4 shows symptoms disease

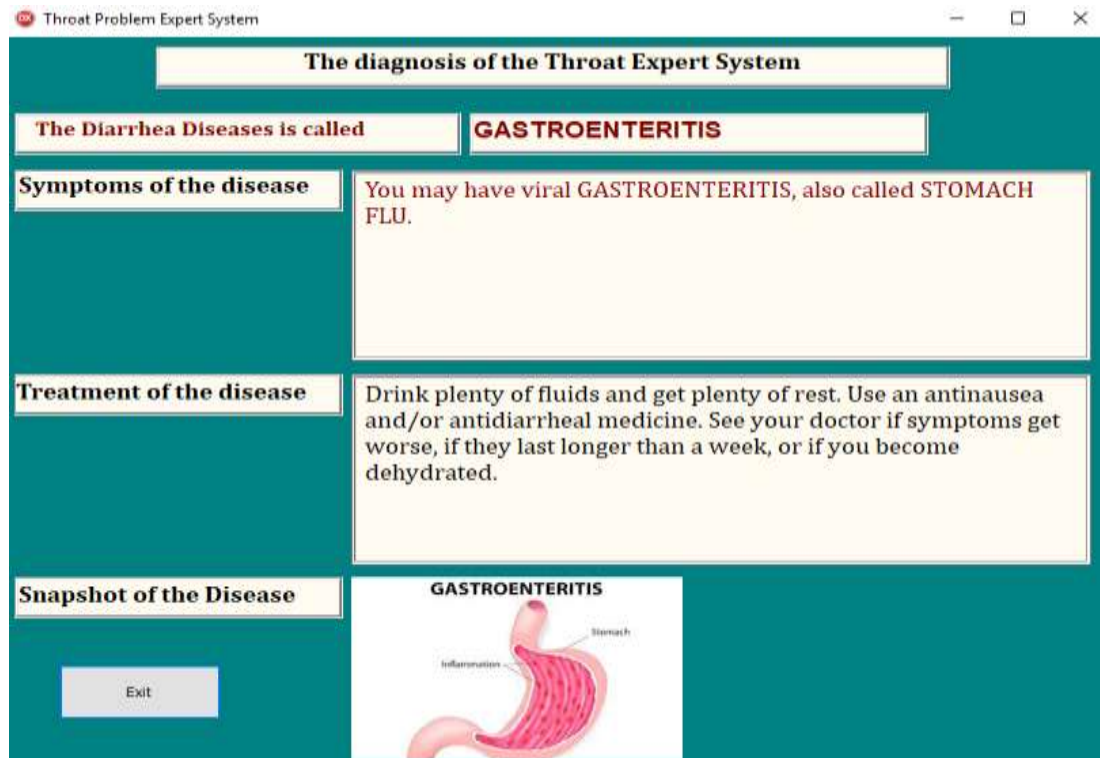


Figure 5 Obtain diagnosis and recommendation

#### 4. KNOWLEDGE REPRESENTATION

The medical knowledge of a specialist doctor is required to develop the expert system, this knowledge is collected by a set of rules is created where each rule contains in IF part that has the symptoms and in THEN part that has the disease that should be realized. The inference engine (forward reasoning) is a mechanism through which rules are selected to be fired. It is based on a pattern matching algorithm whose main purpose is to associate the facts (input data) with applicable rules from the rule base. Finally, the throat problems are produced by the inference engine. This expert system defined the symptoms for problems of the throat. The scope of our expert system is the following throat problems: COLD or FLU, STOMACH FLU, BRONCHITIS, PNEUMONIA, A dry barking cough, CANKER SORES, TRENCH MOUTH, an infection of the gums, teeth and other tissues. A rare drug reaction, STEVENS-JOHNSON REACTION, may also cause this. ORAL THRUSH, a yeast infection in your mouth

Signs and symptoms might include:

- High temperature.
- Difficulty swallowing.
- Feeling pain in the throat.
- Breathing difficulties.
- Headaches and pain in the head
- White spots appear on the tonsils, redness and swelling.
- Stomach ache.
- Diarrhea.
- Nausea and vomiting.
- Loss of appetite and unwillingness to eat.
- General fatigue and extreme fatigue.

The proposed expert system will diagnose the nine throat problems by employing the knowledge obtained from a specialized site [4] to the user in the form of a question and will be asked to answer, and through it the proposed expert system will provide the diagnosis and recommendations to the user.

In this present paper the problem of the throat diseases are implemented by methodology of rule based systems. One of the well-known methods of representation of knowledge in the expert systems is the productive representation as the CLIPS (production system). CLIPS keep in memory a fact list, a rule list, and an agenda with activations of rules. Facts in CLIPS are simple expressions consisting of fields in parentheses. Groups of facts in CLIPS, usually follow a fact-template, so that to be

easy to organize them and thus design simple rules that apply to them. The proposed expert system contains 11 CLIPS rules. Below, we present the rules for throat problems.

```
(defrule disease1
(Q1. Do you have a fever?)
(Q2. Do you have body aches, headache, cough or runny nose?)
(not (disease identified))
=>
(assert (disease identified))
(printout fdatao "1" crlf )
)
(defrule disease2
(Q1. Do you have a fever?)
(Q3. Are you vomiting or do you have nausea or diarrhea?)
(not (disease identified))
=>
(assert (disease identified))
(printout fdatao "2" crlf )
)
(defrule disease3
(Q1. Do you have a fever?)
(Q4. When you look at the back of your throat, do you see white patches on your tonsils?)
(not (disease identified))
=>
(assert (disease identified))
(printout fdatao "3" crlf )
)
(defrule disease4
(Q1. Do you have a fever?)
(Q5. Do you have a persistent cough or are you coughing mucus?)
(not (disease identified))
=>
(assert (disease identified))
(printout fdatao "4" crlf )
)
(defrule disease5
(Q1. Do you have a fever?)
(Q6. Is the person a child with a harsh barking cough?)
(not (disease identified))
=>
(assert (disease identified))
(printout fdatao "5" crlf )
)
(defrule disease6
(Q7. Do you have small, open sores on your tongue, inside your lips or on the sides or back of your mouth?)
(not (disease identified))
=>
(assert (disease identified))
(printout fdatao "6" crlf )
)
(defrule disease7
(Q8. Is the skin in your mouth peeling, and are your tongue and gums swollen and red?)
(not (disease identified))
=>
(assert (disease identified))
(printout fdatao "7" crlf )
)
(defrule disease8
(Q9. Do you have white patches and redness on your tongue or on the sides or back of your mouth?)
(not (disease identified))
=>
```

```

(assert (disease identified))
(printout fdatao "8" crlf )
)

(defrule endline
(disease identified)
=>
  (close fdatao)
)

(defrule readdata
  (declare (salience 1000))
  (initial-fact)
  ?fx <- (initial-fact)
=>
  (retract ?fx)
  (open "data.txt" fdata "r")
  (open "result.txt" fdatao "w")

  (bind ?symptom1 (readline fdata))
  (bind ?symptom2 (readline fdata))
  (bind ?symptom3 (readline fdata))
  (bind ?symptom4 (readline fdata))
  (bind ?symptom5 (readline fdata))
  (bind ?symptom6 (readline fdata))
  (bind ?symptom7 (readline fdata))
  (bind ?symptom8 (readline fdata))
  (bind ?symptom9 (readline fdata))

  (assert-string (str-cat "(" ?symptom1 " "))
  (assert-string (str-cat "(" ?symptom2 " "))
  (assert-string (str-cat "(" ?symptom3 " "))
  (assert-string (str-cat "(" ?symptom4 " "))
  (assert-string (str-cat "(" ?symptom5 " "))
  (assert-string (str-cat "(" ?symptom6 " "))
  (assert-string (str-cat "(" ?symptom7 " "))
  (assert-string (str-cat "(" ?symptom8 " "))
  (assert-string (str-cat "(" ?symptom9 " "))

  (close fdata)
)

```

## 5. FUNCTION OF THE SYSTEM

The proposed system performs many functions. It will conclude the throat problems diagnosis based on answers of the user to specific question that the system asks the user. The questions provide the system for explanation for the symptoms of the patient that helps the expert system for diagnosis the disease by inference engine. It stores the facts and the conclusion of the inference of the system, and the user, for each case, in data base. It processes the data base in order to extract rules, which complete the knowledge base.

## 6. LIMITATIONS

The current proposed expert system is specialized in the diagnosis only the following nine throat diseases: COLD or FLU, GASTROENTERITIS, STREP THROATBRONCHITIS, PNEUMONIA, A dry barking cough, BACTERIAL DIARRHEA, TRENCH MOUTH, ORAL THRUSH.

## 7. CONCLUSION

The application of expert systems in medicine is very interesting and has created considerable importance systems of diagnosis. The proposed system can help doctors and patients in providing decision support system, interactive training tool and expert advice. The system constitutes part of intelligent system of diagnosis of throat problems. This expert system does not need intensive training to be used; it is easy to use and has user friendly interface. It was developed using CLIPS Expert System language and Delphi Language. An initial evaluation of the expert system was carried out and a positive feedback was received from the users. As future work we will constitute the expert system to cover all throat problems.



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