

A Proposed Expert System for Cold and Flu Diseases Diagnosis

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Abstract: Background: Flu and the common cold are both respiratory illnesses but they are caused by different viruses. Because these two types of illnesses have similar symptoms, it can be difficult to tell the difference between them based on symptoms alone. In general, flu is worse than the common cold, and symptoms are more intense. Colds are usually milder than flu. People with colds are more likely to have a runny or stuffy nose. Colds generally do not result in serious health problems, such as pneumonia, bacterial infections, or hospitalizations. Flu can have very serious associated complications. **Objectives:** The main goal of this expert system is to get the appropriate diagnosis of disease and the correct treatment. **Methods:** In this paper the design of the proposed Expert System which was produced to help Medical Practitioner in diagnosing Cold and Flu diseases. The proposed expert system presents an overview about Cold and Flu diseases are given, the cause of diseases are outlined and the treatment of disease whenever possible is given out. CLIPS and Delphi languages were used for designing and implementing the proposed expert system. **Results:** The proposed Cold and Flu diseases diagnosis expert system was evaluated by in-house Trials. **Conclusions:** The Proposed expert system is very useful for Medical Practitioner, patients with cold and flu diseases and newly graduated practitioners.

Keywords: Artificial Intelligence, Expert Systems, CLIPS, Cold and Flu diseases, Language.

1. INTRODUCTION

The fact that colds and flu share many symptoms, it can be difficult (or even impossible) to tell the difference between them based on few symptoms. The symptoms of flu can include fever or feeling feverish/chills, cough, sore throat, runny or stuffy nose, muscle or body aches, headaches and fatigue (tiredness). Cold symptoms are usually milder than the symptoms of flu. People with colds are more likely to have a runny or stuffy nose. Colds generally do not result in serious health problems. [1]

Diagnosis of Cold and Flu diseases is complex because the two diseases shares a commons signs and symptoms. [2]

Table 1: Signs and Symptoms of Cold and Flu

Signs and Symptoms	Cold	Influenza (Flu)
Symptom onset	Gradual	Abrupt
Fever	Rare	Usual; lasts 3-4 days
Aches	Slight	Usual; often severe
Chills	Uncommon	Fairly common
Fatigue, weakness	Sometimes	Usual
Sneezing	Common	Sometimes
Chest discomfort, cough	Mild to moderate; hacking cough	Common; can be severe
Stuffy nose	Common	Sometimes
Sore throat	Common	Sometimes
Headache	Rare	Common

For all the aforementioned reasons and complex common sign and symptoms, we have developed this expert system to help Medical Practitioner in diagnosing Cold and Flus diseases, in order to prescribe the appropriate treatment.

Expert System is a computer application of Artificial Intelligence (AI) [2,4,6]; which contains a knowledge base and an inference engine [3]; the main components and details are represented in figure 1.

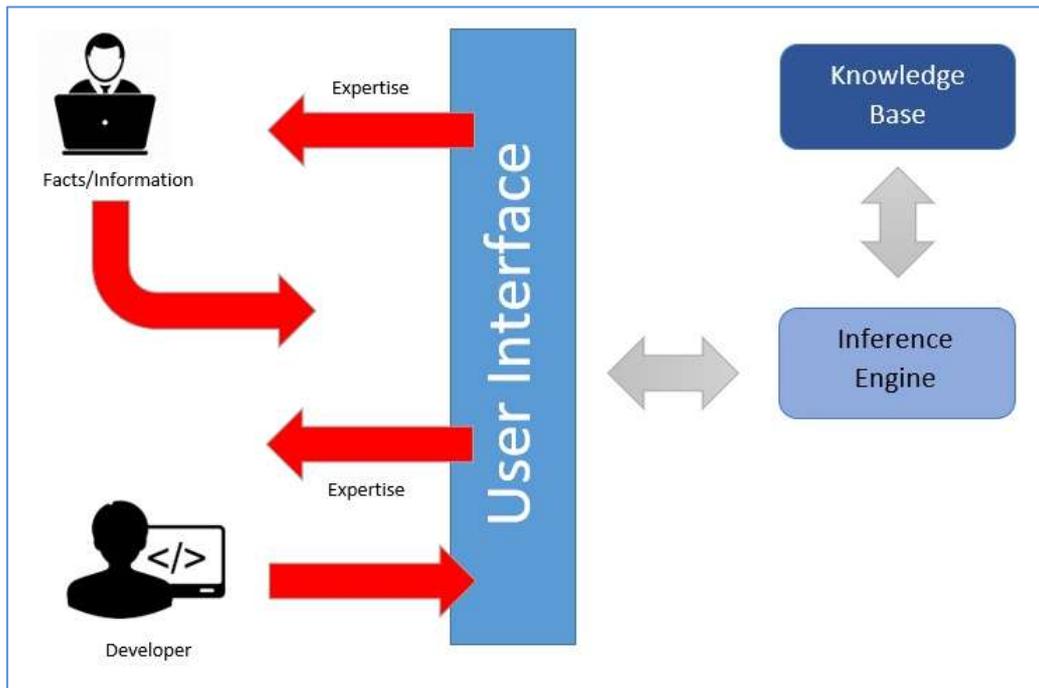


Figure 1: Main Components of an Expert System, Designed by the authors

The proposed Expert System for Foot Diseases Diagnosis was implemented using, *CLIPS and Delphi languages* [7]. It is a forward chaining reasoning expert system that can make inferences about facts of the world using rules, facts and take appropriate actions as a result. It's easy for the knowledge engineer to build the Expert System and for the end users when they use the system.

2. MATERIALS AND METHODS

The proposed expert system performs diagnosis for Cold and Flu diseases. The proposed expert system will ask the user to choose the correct answer in each screen. At the end of the dialogue session, the proposed expert system provides the diagnosis and recommendation of the disease to the user.

Figure 2 shows main screen of the Expert System

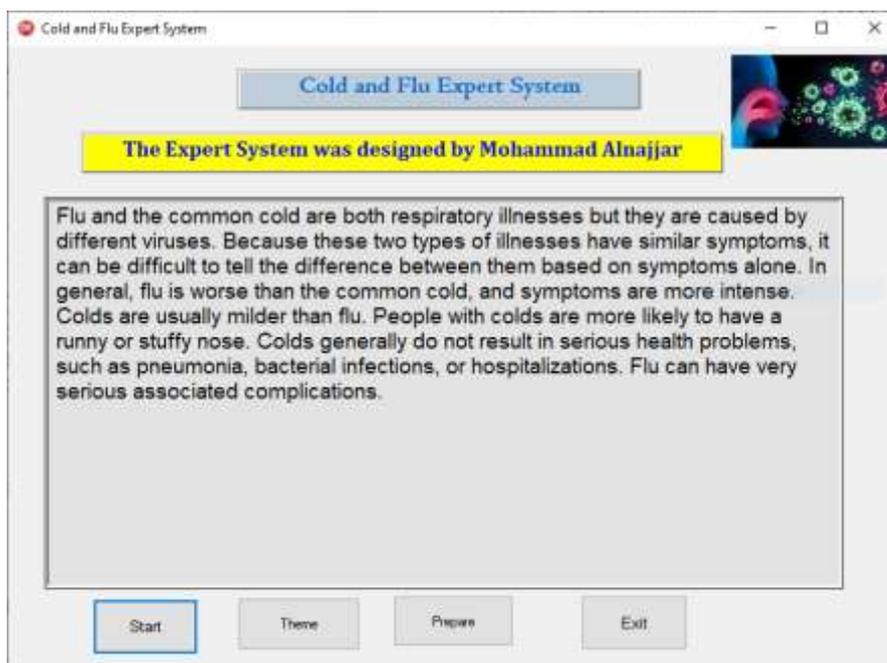


Figure 2: Main screen of the Expert System

Figure 3 shows a sample dialogue between the expert system and the user.

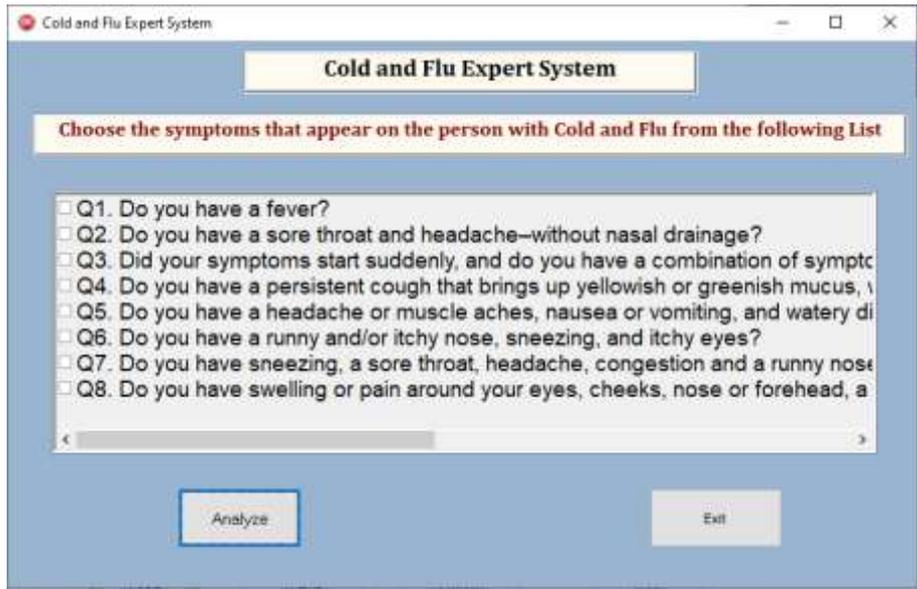


Figure 3: Dialogue between the expert system and the user

Figure 4 shows how the users get the diagnosis and recommendation

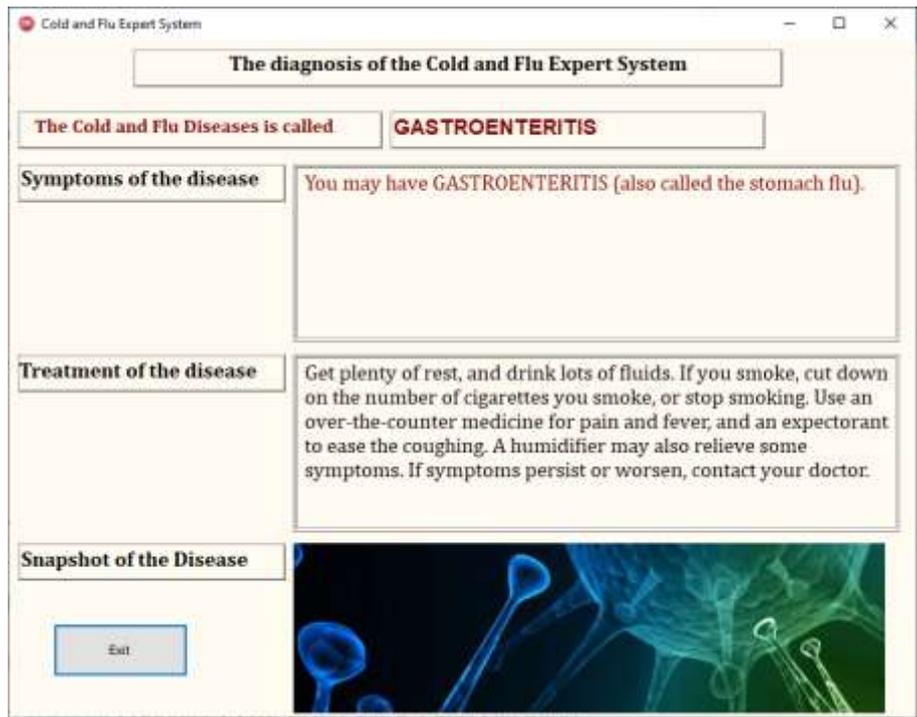


Figure 4: Diagnosis and recommendation

3. LITERATURE REVIEW

There is a lot of Expert System that were designed to diagnose human and Plant Diseases [11-43]. But there is no specialized expert system for diagnosis of Cold and Flu diseases available free and Use a language CLIPS Linked with Delphi. This expert system was characterized to be easy to use by specialists and People concerned. This is due to the coordinated application interface.

Some of these Expert Systems are specialized in one specific disease and others in 3 diseases. But the current proposed expert system is specialized in the diagnosis of 10 Cold and Flu diseases.

4. KNOWLEDGE REPRESENTATION

The main source of the knowledge for this expert system is based on Family Doctor website. [3] The diagnosis is based on the Decision Tree in figure 4.



Figure 4: Decision Tree for Cold and Flu Diagnosis

List of questions for Decision Tree listed in Table 2

Table 2: List of Questions for Decision Tree

#	Question
1	Do you have a fever?
2	Do you have a sore throat and headache–without nasal drainage?
3	Did your symptoms start suddenly, and do you have a combination of symptoms including muscle aches, chills, a sore throat, runny nose or cough?
4	Do you have a persistent cough that brings up yellowish or greenish mucus, wheezing and shortness of breath?
5	Do you have a headache or muscle aches, nausea or vomiting, and watery diarrhea?
6	Do you have a runny and/or itchy nose, sneezing, and itchy eyes?
7	Do you have sneezing, a sore throat, headache, congestion and a runny nose?
8	Do you have swelling or pain around your eyes, cheeks, nose or forehead, a headache, a dry cough, and/or discharge from the nose?

The captured knowledge has been converted into CLIPS Knowledge base syntax (Facts and Rules).

5. LIMITATIONS

The current proposed expert system is specialized in the diagnosis of normal cold and flu diseases.

6. SYSTEM EVALUATION

Internal evaluation was done by Prof. Dr. Samy Abu Naser concerning functionality, performance, efficiency, user interfaces and eases of use.

7. CONCLUSION

In this paper, a proposed expert system was presented for helping Medical Practitioner in diagnosing patients with Cold and Flu diseases. Medical Practitioner, Cold and Flu diseases patients can get the diagnosis faster and more accurate than the traditional diagnosis. 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 with Delphi language for the user interface.

8. FUTURE WORK

This expert system is considered to be a base of future ones; more Flu diseases are planned to be added and to make it more accessible to users from anywhere at any time.

9. EXPERT SYSTEM SOURCE CODE

```
(defrule disease1
(Q1. Do you have a fever?)
(Q2. Do you have a sore throat and headache–without nasal drainage?)
(not (disease identified))
=>
(assert (disease identified))
(printout fdatao "1" crlf )
)

(defrule disease2
(Q1. Do you have a fever?)
(Q3. Did your symptoms start suddenly, and do you have a combination of symptoms including muscle aches, chills, a sore throat, runny nose or cough?)
(not (disease identified))
=>
(assert (disease identified))
(printout fdatao "2" crlf )
)

(defrule disease3
(Q1. Do you have a fever?)
(Q4. Do you have a persistent cough that brings up yellowish or greenish mucus, wheezing and shortness of breath?)
(not (disease identified))
=>
(assert (disease identified))
(printout fdatao "3" crlf )
)

(defrule disease4
(Q1. Do you have a fever?)
(Q5. Do you have a headache or muscle aches, nausea or vomiting, and watery diarrhea?)
(not (disease identified))
=>
(assert (disease identified))
(printout fdatao "4" crlf )
)

(defrule disease5
(Q1. Do you have a fever?)
(Q6. Do you have a runny and/or itchy nose, sneezing, and itchy eyes?)
(not (disease identified))
=>
(assert (disease identified))
(printout fdatao "5" crlf )
)

(defrule disease6
(Q1. Do you have a fever?)
(Q7. Do you have sneezing, a sore throat, headache, congestion and a runny nose?)
(not (disease identified))
```

```
=>
(assert (disease identified))
(printout fdatao "6" crlf )
)

(defrule disease7
(Q1. Do you have a fever?)
(Q8. Do you have swelling or pain around your eyes, cheeks, nose or forehead, a headache, a dry cough, and/or discharge from
the nose?)
(not (disease identified))
=>
(assert (disease identified))
(printout fdatao "7" 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))
(bind ?symptom10 (readline fdata))
(bind ?symptom11 (readline fdata))
(bind ?symptom12 (readline fdata))
(bind ?symptom13 (readline fdata))
(bind ?symptom14 (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 "))")
(assert-string (str-cat "(" ?symptom10 "))")
(assert-string (str-cat "(" ?symptom11 "))")
(assert-string (str-cat "(" ?symptom12 "))")
(assert-string (str-cat "(" ?symptom13 "))")
(assert-string (str-cat "(" ?symptom14 "))")

(close fdata)
)
```

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