

An Expert System for Hair Loss Diagnosis and Treatment Using CLIPS

Mohammed Hazem M. Hamadaqa and Samy S. Abu-Naser

Department of Information Technology,
Faculty of Engineering & Information Technology,
Al-Azhar University, Gaza, Palestine

Abstract: Background: Hair loss is often a concern for women, men and children. It is normal to lose between 50 and 100 hairs a day, without us noticing it. Usually hair loss is a sign of a medical condition, some of them are hereditary, and some of them are temporary due to disease, stress, cancer treatment, weight loss, and iron deficiency. **Objectives:** The main goal of this expert system is to obtain an appropriate diagnosis of the cause of hair loss. **Methods:** In this paper, the proposed expert system that was produced is designed to assist the physician in diagnosing hair loss disease such as seborrhea, lichen planus, ringworm, alopecia areata, thyroid disease and male-pattern baldness. The proposed expert system presents an overview about hair loss diseases are given, the cause of diseases are outlined and the treatment of disease whenever possible is given out. Clips Expert System language was used for designing and implementing the proposed expert system. **Results:** The proposed hair loss diseases diagnosis expert system was evaluated by Medical students and they were satisfied with its performance. **Conclusions:** The Proposed expert system is very useful for hair loss treatment physician, patients with hair loss problems and newly graduated physician.

Keywords: Artificial Intelligence, Expert Systems, Clips, Hair loss.

INTRODUCTION

Most cases of hair loss do not need treatment, some of them are temporary and will grow again, and some are normal due to aging, and some are indicative of a disease condition or due to taking certain medications.

Causes of hair loss[1]

1. Hereditary hair loss
2. Age
3. Alopecia areata
4. Cancer treatment
5. Childbirth, illness, or other stressors
6. Hair care

EXPERT SYSTEM

The expert systems are the computer applications developed to solve complex problems in a particular domain, at the level of extra-ordinary human intelligence and expertise.[2]

Components of Expert Systems

1. Knowledge Base

It contains domain-specific and high-quality knowledge.

Knowledge is required to exhibit intelligence. The success of any ES majorly depends upon the collection of highly accurate and precise knowledge.

What is Knowledge?

The data is collection of facts. The information is organized as data and facts about the task domain. Data, information, and past experience combined together are termed as knowledge[2].

2. Inference Engine

Use of efficient procedures and rules by the Inference Engine is essential in deducting a correct, flawless solution.

In case of knowledge-based ES, the Inference Engine acquires and manipulates the knowledge from the knowledge base to arrive at a particular solution.

In case of rule based ES, it –

- Applies rules repeatedly to the facts, which are obtained from earlier rule application.
- Adds new knowledge into the knowledge base if required.
- Resolves rules conflict when multiple rules are applicable to a particular case[2].

3. User Interface

User interface provides interaction between user of the ES and the ES itself. It is generally Natural Language Processing so as to be used by the user who is well-versed in the task domain. The user of the ES need not be necessarily an expert in Artificial Intelligence.

It explains how the ES has arrived at a particular recommendation. The explanation may appear in the following forms –

- Natural language displayed on screen.
- Verbal narrations in natural language.
- Listing of rule numbers displayed on the screen.

The user interface makes it easy to trace the credibility of the deductions[2].

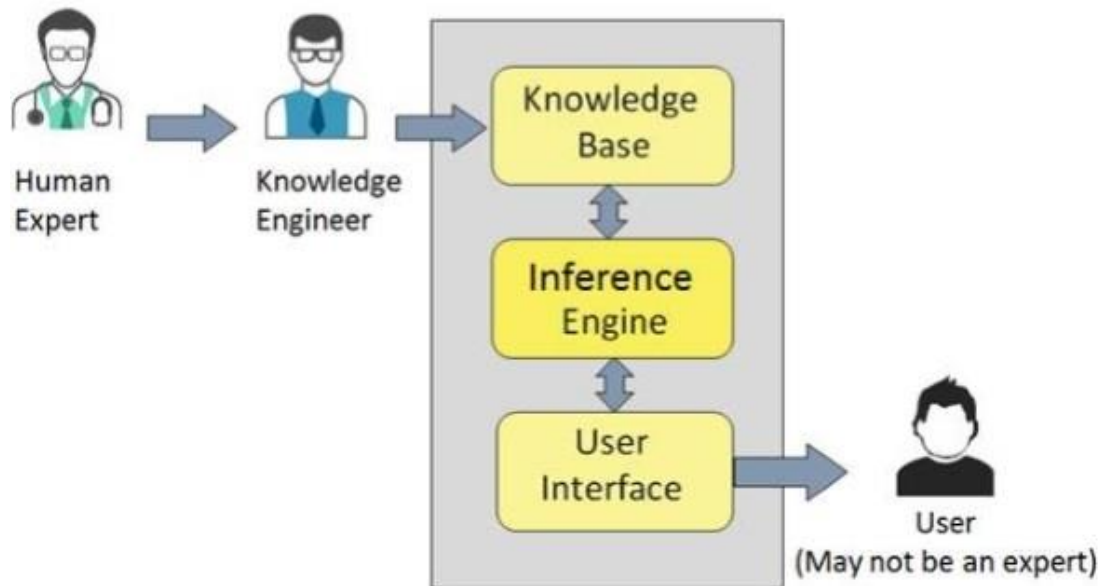


Figure 1: Components of Expert Systems

MATERIALS AND METHODS

The proposed expert system performs diagnosis for six hair loss diseases by asking yes or no questions. The proposed expert system will ask the user to choose the correct answer in each screen. At the end of the session, the proposed expert system provides the diagnosis and recommendation of the disease to the user. Figure 2 shows a sample dialogue between the expert system and the user. Figure 3 shows how the users get the diagnosis and recommendation.

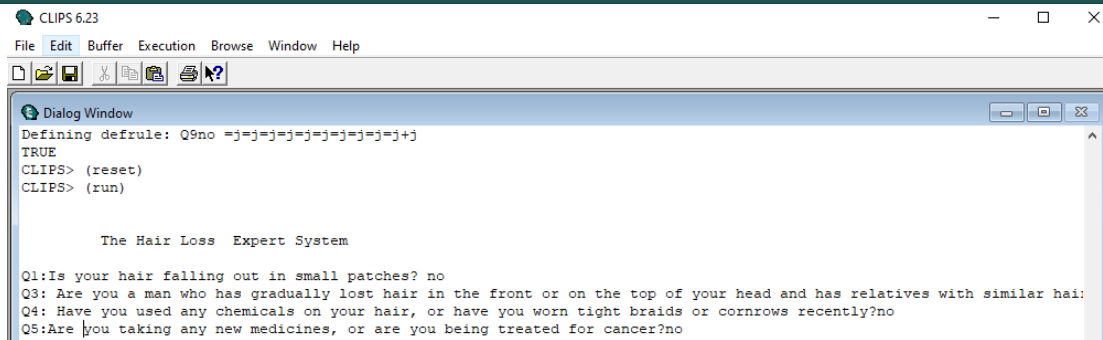


Figure 2: The figure presents shows when the system asks the user.

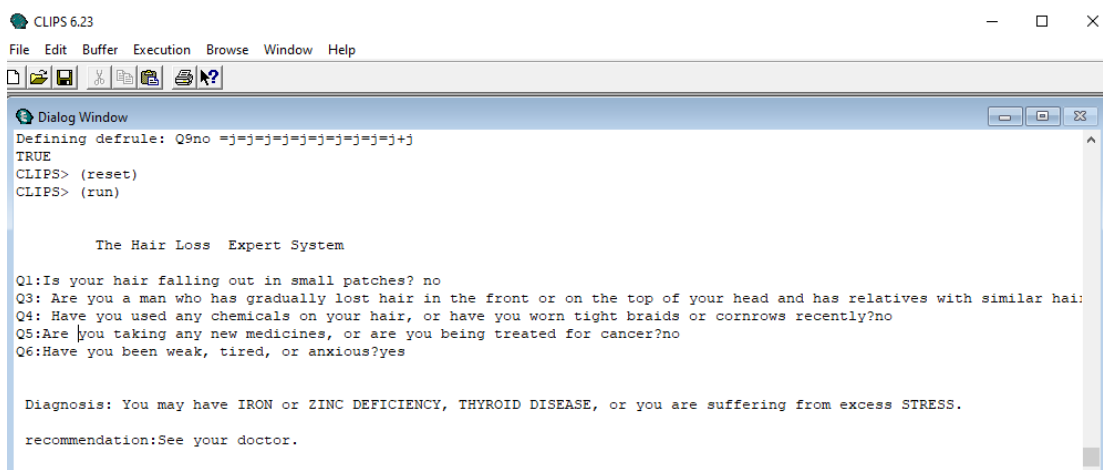


Figure 3: The figure shows diagnosis and recommendation of the expert system

LITERATURE REVIEW

There are a lot of expert systems that are designed to diagnose diseases such as diarrhea, chest pain, eye problems and other types of diseases. But there is an expert system for diagnosing hair loss in children and adults that has been programmed with SL5 Language but it did not talk about some diagnoses[3].

Hair loss problems have been associated with going directly to a specialist doctor, most people are worried about this, so we have created an expert system that relieves this anxiety and makes the diagnosis, there are many expert systems that specialize in diagnosing many diseases such as chest diseases, diarrhea, eye problems and other diseases. MYCIN is a very famous expert system for diagnosing bacterial infections in the blood [8]. However, there is no specialized expert hair loss diagnostic system that covers all cases. Some of these expert systems specialize in specific hair loss diseases, but the current proposed expert system specializes in diagnosing five cases of hair loss[3].

KNOWLEDGE REPRESENTATION

The main sources of the knowledge for this expert system are hair loss physician and specializes websites for hair loss disease.

The captured knowledge has been converted into Clips Language base syntax (Facts, Rules and Function). Currently the expert system has 19 rules which cover six hair loss diseases[4]

Alopecia areata: is a disease that develops when the body's immune system attacks hair follicles (what holds the hair in place), causing hair loss. You can lose hair anywhere on your body, including your scalp, inside your nose, and in your ears. Some people lose their eyelashes or eyebrows. [5]



Figure 4: Alopecia areata

Thyroid disease: If you have a problem with your thyroid, you may see thinning hair. Some people notice that their hair comes out in clumps when they brush it.[6]



Figure 5: Thyroid disease

Hereditary hair loss: Both men and women develop this type of hair loss, which is the most common cause of hair loss worldwide. In men, it's called male pattern hair loss. Women get female pattern hair loss.



Figure 6: Hereditary hair loss

Ringworm of the scalp (tinea capitis): is a fungal infection of the scalp and hair shafts. The signs and symptoms of ringworm of the scalp may vary, but it usually appears as itchy, scaly, bald patches on the head[6].



Figure 6: Ringworm of the scalp

Lichen planopilaris: is a rare inflammatory condition that results in patchy progressive permanent hair loss mainly on the scalp[7]



Figure 7: Ringworm of the scalp

LIMITATIONS

The current system of experts specializes in diagnosing only 11 diseases and being unable to diagnose the disease if more than one symptom of different diseases is selected.

CONCLUSION

In this paper, a proposed expert system was introduced to assist physicians in diagnosing patients with 5 different hair loss diseases. This expert system does not require extensive training to use; it is easy to use. It was developed using Clips language.

FUTURE WORK

This system of experts is a basis for the future. It is planned to add more hair loss diseases and make them more accessible to users from anywhere and at any time.

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