Knowledge Based for Tooth Problems

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Abstract: **background:** *Dental and oral health is an essential part of your overall health and well-being. Poor oral hygiene can lead to dental cavities and gum disease, and has also been linked to heart disease, cancer, and diabetes. Maintaining healthy teeth and gums is a lifelong commitment. The earlier you learn proper oral hygiene habits — such as brushing, flossing, and limiting your sugar intake — the easier it'll be to avoid costly dental procedures and long-term health issues. (Healthline, n.d.)* **Objectives** *The main goal of this expert system is to get the appropriate diagnosis of disease and the correct treatment by presenting suggestions on Tooth Problems to the user by asking about symptoms.*

Keywords: Expert System, Tooth Problem

INTRODUCTIONS

An expert system incorporates a knowledge base containing accumulated experience and an inference or rules engine a set of rules for applying the knowledge base to each particular situation that is described to the program. The system's capabilities can be enhanced with additions to the knowledge base or to the set of rules. Current systems may include machine learning capabilities that allow them to improve their performance based on experience, just as humans do (TechTarget, n.d.)

According to the World Health Organization, "Oral health is a key indicator of overall health, well-being, and quality of life. It encompasses a range of diseases and conditions that include dental caries, periodontal disease, tooth loss, oral cancer, oral manifestations of HIV infection, oro-dental trauma, Noma, and birth defects such as cleft lip and palate" (1, 2). (Srivastava, Kumar, Sinha, & Mishra)

This process requires an expert to identify the disease, describe the methods of treatment and protection. Identifying the treatment accurately depends on the method that is used in diagnosing the diseases. Expert systems help a great deal in identifying those diseases and describing methods of treatment to be carried out considering the user capability in order to deal and interact with expert system easily and clearly
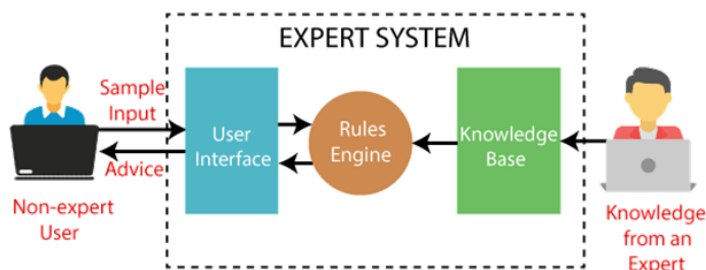

Figure 1 Diagram that represents the working of an expert system

MATERIALS AND METHODS

The proposed Expert System for Tooth Problems Diagnosis was implemented using, CLIPS and Delphi languages were used for designing and implementing the proposed expert system, This Expert System allows the user to display a list of questions and analyzed it based on the user's answers, as well as present the appropriate diagnosis and give treatment recommendations according to the user's answers.
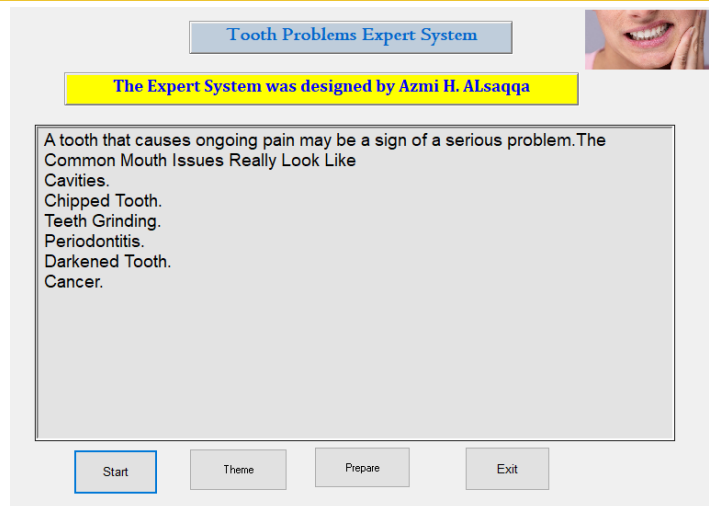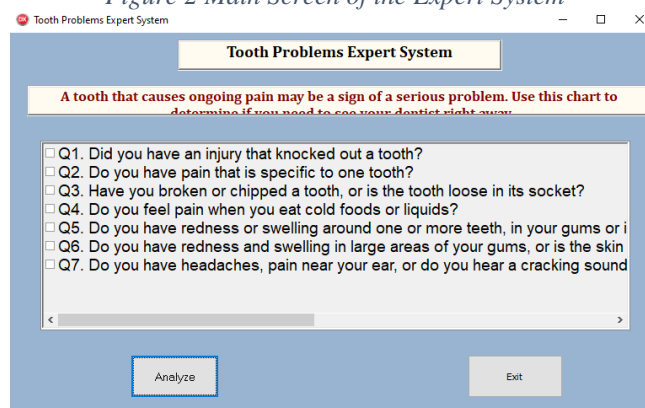
Figure 2 Main Screen of the Expert System

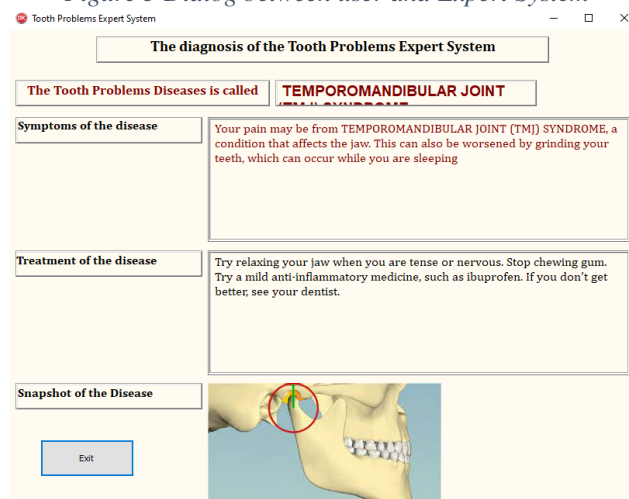*Figure 3 Dialog between user and Expert System*

Figure 4 Result & Diagnosed that recommended by Expert System

LITERATURE REVIEW

knowledge-based system (KBS) is a form of artificial intelligence (AI) that aims to capture the knowledge of human experts to support decision-making. Examples of knowledge-based systems include expert systems, which are so called because of their reliance on human expertise.

The typical architecture of a knowledge-based system, which informs its problem-solving method, includes a knowledge base and an inference engine. The knowledge base contains a collection of information in a given field -- medical diagnosis, for example. The inference engine deduces insights from the information housed in the knowledge base. Knowledge-based systems also include an interface through which users query the system and interact with it.

A knowledge-based system may vary with respect to its problem-solving method or approach. Some systems encode expert knowledge as rules and are therefore referred to as rule-based systems. Another approach, case-based reasoning, substitutes cases

for rules. Cases are essentially solutions to existing problems that a case-based system will attempt to apply to a new problem. (Tech Target, 2018)

There is a lot of Expert System that were designed to diagnose human and Plant Diseases.

KNOWLEDGE REPRESENTATION

The source knowledge for this expert system is taken from Family Doctor website. (Family doctor, n.d.) The diagnosis is based on the decision Tree
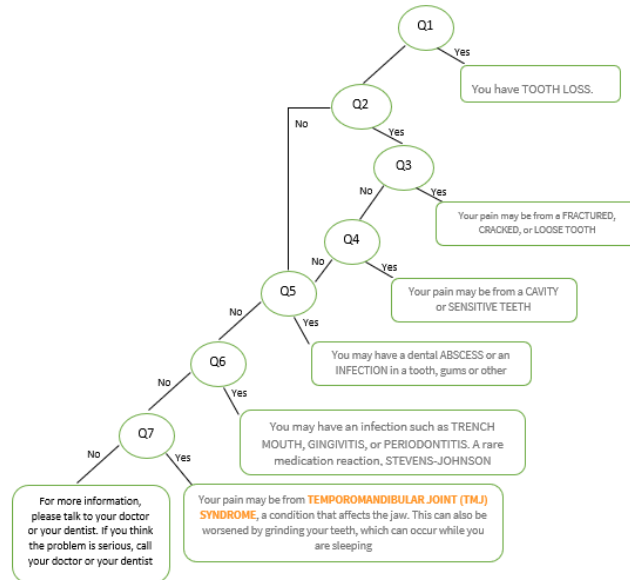

Figure 5 Decision Tree for Tooth Problem

Below are the List of questions for Decision Tree listed in Table 1

Table 1 List of questions for Decision Tree

Q1. Did you have an injury that knocked out a tooth?

Q2. Do you have pain that is specific to one tooth?

Q3. Have you broken or chipped a tooth, or is the tooth loose in its socket?

Q4. Do you feel pain when you eat cold foods or liquids?

Q5. Do you have redness or swelling around one or more teeth, in your gums or in your face?

Q6. Do you have redness and swelling in large areas of your gums, or is the skin inside your mouth peeling?

Q7. Do you have headaches, pain near your ear, or do you hear a cracking sound when you bite or chew?

5. TRENCH MOUTH, GINGIVITIS, or PERIODONTITIS
6. TEMPOROMANDIBULAR JOINT (TMJ) SYNDROME

SYSTEM EVALUATION

Our proposed Expert system has been internal evaluation by Prof. Dr. Samy AbuNasser, in terms of the technical efficiency, performance and functionality of the system.

CONCLUSION

This paper was presented a proposed an expert system to help and to diagnose dental problems, it obtains a more accurate and fast diagnosis than traditional diagnosis, the system was designed with easy, uncomplicated interfaces that do not require technical expertise to use.

FUTURE WORK

This expert system is characterized by flexibility in treating more dental diseases, and it is decided that we will add more diseases and make them accessible to users from anywhere to increase the efficiency of the system and to be more experienced in this field.

EXPERT SYSTEM SOURCE CODE

(defrule disease1
(Q1. Did you have an injury that knocked out a tooth?)

```
(not (disease identified))
=>
(assert (disease identified))
(printout fdatao "1"  crlf )
)


(defrule disease2
(Q2. Do you have pain that is specific to one tooth?)
(Q3. Have you broken or chipped a tooth, or is the tooth loose in its socket?)
(not (disease identified))
=>
(assert (disease identified))
(printout fdatao "2"  crlf )
)


(defrule disease3
(Q4. Do you feel pain when you eat cold foods or liquids?)
(not (disease identified))
=>
(assert (disease identified))
(printout fdatao "3"  crlf )
)


(defrule disease4
(Q5. Do you have redness or swelling around one or more teeth, in your gums or in your face?)
(not (disease identified))
=>
(assert (disease identified))
(printout fdatao "4"  crlf )
)
 (defrule disease5
(Q6. Do you have redness and swelling in large areas of your gums, or is the skin inside your mouth peeling?)
(not (disease identified))
=>
(assert (disease identified))
(printout fdatao "5"  crlf )
)
 (defrule disease6
(Q7. Do you have headaches, pain near your ear, or do you hear a cracking sound when you bite or chew?)
(not (disease identified))
=>
(assert (disease identified))
(printout fdatao "6"  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))


(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 ")"))
(close fdata))
```

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