

Diagnosis Of Headache Problems Using An Expert System

Husam R. Almadhoun

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

Abstract: Headache is pain in the head, neck, or scalp, and in general there is no major cause for headache despite its different types, the pain may come in the forehead, near the eyes, or in the back of the head, a person may have a headache continuously and regularly, i.e. monthly or weekly Or daily, and can last for several hours. The proposed expert system is designed to assist people with headache problems to help them overcome these problems by giving an accurate diagnosis, taking necessary preventive and curative measures, and consulting a doctor if necessary. The language used in programming the proposed system is CLIPS and Delphi. programming language.

Keywords: Expert Systems, CLIPS, headache problems.

1. INTRODUCTION

Headache hinders a person from practicing his daily life normally, but in general the headache is in the form of pain in the head or in the upper part of the neck of the body, as it arises from the tissues and structures surrounding the skull, because the brain does not contain nerves that cause pain.



Figure 1: Illustrative image of a pain in the head

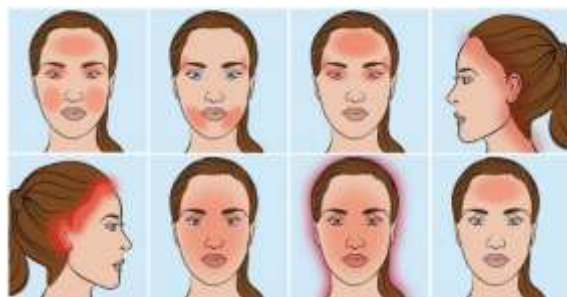


Figure 2: Different types of head pain

Causes of headaches:

There are many different types of headaches, so identifying a single cause can be difficult. all known types of headache can be assigned to one of two broad categories:

primary headaches usually appear after following unhealthy lifestyles, as follows:

- stress.
- Constant work leads to fatigue.
- Smoking.
- Malnutrition.
- Drinking alcohol.
- Lack of sleep.

secondary headaches, it is often a sign of a health disorder in the body. Sinusitis. Among the most prominent health disorders that may lead to a headache are the following :

- Jaw injury.
- toothache.
- Arterial lacerations.
- A blood clot inside the brain.
- Aneurysm inside the brain.
- Brain tumor.
- Carbon monoxide poisoning.
- Ear infection.

For all the reasons mentioned above, the proposed expert system is designed to help people overcome these problems by giving an accurate diagnosis, taking necessary preventive and curative measures, and consulting a doctor if needed.

The Expert System (ES) is a computer application that has the intelligence to make decisions in solving problems just as a skilled human expert does, it uses the specialized skills and information that some specialists provide to provide it as a computerized consulting service. The basic components of any expert system are shown in the figure below .

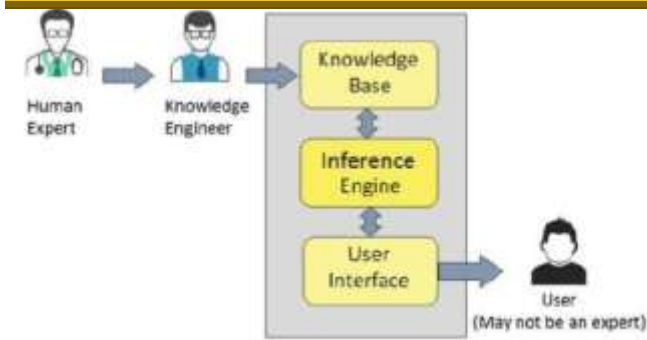


Figure3 : Main Components of Expert System

2. LITERATURE REVIEW

Numerous expert systems that have been developed to diagnose medical problems, plant diseases, law and regulations and other types of diseases [3-60]. But there is no expert system that specializes in diagnosing headache problems for free. Although many headache problems have common symptoms. The proposed expert system is specifically designed and developed to assist clinicians and individuals in understanding these problems, their causes, and treatments in diagnosing headache problems.

3. MATERIALS AND METHODS

The proposed expert system diagnoses eleven headache problems by offering a specified number of options. The suggested expert system will ask the user to choose the correct options in the screen. At the end of the dialogue session, the proposed expert system provides appropriate diagnosis and possible recommendations for resolving the headache problem. Figure 4,5 illustrates a sample dialogue between an expert system and a user. Figure 6 shows how users get a diagnosis and a recommendation, and Figure 7 shows the decision tree of the expert system for diagnosing the headache problems.

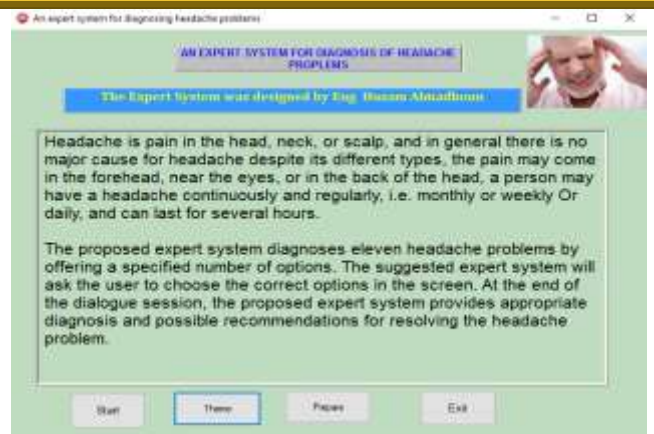


Figure 5 : illustrates a sample dialogue between an expert system and a user.



Figure 6 Shows how users get a diagnosis and a recommendation

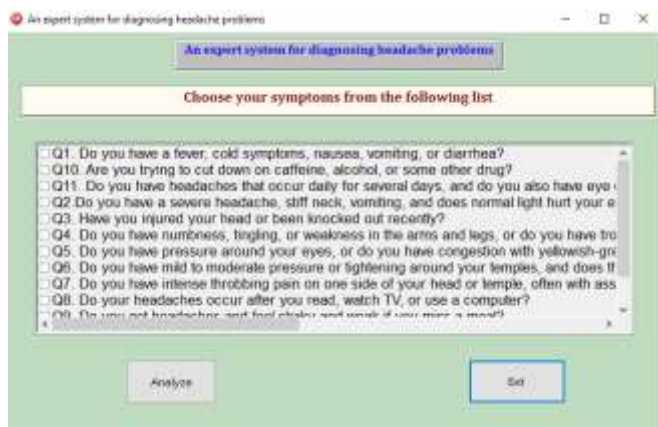


Figure 5 : illustrates a sample dialogue between an expert system and a user.



Figure 7: Headache problems decision tree.

4. KNOWLEDGE REPRESENTATION

The main sources of knowledge in this expert system are headache problems, and this knowledge was used to construct facts and rules using the Delphi. programming language and the clips used in building specialized systems.

The proposed expert system will diagnose the eleven headache problems by employing the knowledge obtained from a specialized site that will ask the user to answer questions and through it the proposed expert system will provide the diagnosis and recommendations to the user. Below we present the rules and expert system code.

```
(defrule disease1
(Q1. Do you have a fever, cold symptoms, nausea, vomiting,
or diarrhea?)
(not (disease identified))
=>
(assert (disease identified))
(printout fdatao "1" crlf )
)
(defrule disease2
(Q2.Do you have a severe headache, stiff neck, vomiting,
and does normal light hurt your eyes, or do normal sounds
hurt your ears?)
(not (disease identified))
=>
(assert (disease identified))
(printout fdatao "2" crlf )
)
(defrule disease3
(Q3. Have you injured your head or been knocked out
recently?)
(not (disease identified))
=>
(assert (disease identified))
(printout fdatao "3" crlf )
)
(defrule disease4
(Q4. Do you have numbness, tingling, or weakness in the
arms and legs, or do you have trouble speaking or
understanding speech?)
(not (disease identified))
=>
(assert (disease identified))
(printout fdatao "4" crlf )
)
(defrule disease5
(Q5. Do you have pressure around your eyes, or do you have
congestion with yellowish-green nasal discharge and a
fever?)
(not (disease identified))
=>
```

```
(assert (disease identified))
(printout fdatao "5" crlf )
)
(defrule disease6
(Q6. Do you have mild to moderate pressure or tightening
around your temples, and does the pain occur during times
of stress or after you have been sitting in one position for a
long time?)
(not (disease identified))
=>
(assert (disease identified))
(printout fdatao "6" crlf )
)
(defrule disease7
(Q7. Do you have intense throbbing pain on one side of your
head or temple, often with associated nausea or vomiting,
and do see flashing lights or spots before the headache?)
(not (disease identified))
=>
(assert (disease identified))
(printout fdatao "7" crlf )
)
(defrule disease8
(Q8. Do your headaches occur after you read, watch TV, or
use a computer?)
(not (disease identified))
=>
(assert (disease identified))
(printout fdatao "8" crlf )
)
(defrule disease9
(Q9. Do you get headaches and feel shaky and weak if you
miss a meal?)
(not (disease identified))
=>
(assert (disease identified))
(printout fdatao "9" crlf )
)
(defrule disease10
(Q10. Are you trying to cut down on caffeine, alcohol, or
some other drug?)
(not (disease identified))
=>
(assert (disease identified))
(printout fdatao "10" crlf )
)
```

```
(defrule disease11
```

```
(Q11. Do you have headaches that occur daily for several days, and do you also have eye discharge and runny nose from the same side as the headache?)
```

```
(not (disease identified))
```

```
=>
```

```
(assert (disease identified))
```

```
(printout fdatao "11" 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))
```

```
(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 "))")
```

```
(close fdata)
```

```
)
```

6. LIMITATIONS

The current expert system specializes in diagnosing only eleven symptoms of headache problems and the inability to diagnose symptoms other than those listed in the proposed system.

7. CONCLUSION

In this paper, a proposed expert system is presented to help physicians and people with headache problems diagnose the problem with eleven different possible symptoms of headache problems.

This system enables the user to obtain a diagnosis quickly and more accurately than a traditional diagnosis. It is also easy to use and does not require any training before use. It was developed using clips Expert System language and Delphi.

References

1. Harvard Health Publishing Website <https://www.health.harvard.edu/pain/headache-when-to-worry-what-to-do>, date visited March 24, 2021.
2. CHI Health Website <https://www.chihealth.com/en/about-us/press-room/news-center/2019/headaches-101.html>, date visited March 24, 2021.
3. Abu Ghali, M. J., et al. (2017). "Expert System for Problems of Teeth and Gums." *International Journal of Engineering and Information Systems (IJEAIS)* 1(4): 198-206.
4. AbuEl-Reesh, J. Y., et al. (2017). "A Knowledge based System for Diagnosing Shortness of Breath in Infants and Children." *International Journal of Engineering and Information Systems (IJEAIS)* 1(4): 102-115.
5. Abu-Nasser, B. S., et al. (2018). "Cognitive System for Helping Farmers in Diagnosing Watermelon Diseases." *International Journal of Academic Information Systems Research (IJAISR)* 2(7): 1-7.
6. Abu-Saqer, M. M., et al. (2019). "Developing an Expert System for Papaya Plant Disease Diagnosis." *International Journal of Academic Engineering Research (IJAER)* 3(4): 14-21.
7. Abu-Saqer, M. M., et al. (2019). "Knowledge based System for Uveitis Disease Diagnosis." *International Journal of Academic Information Systems Research (IJAISR)* 3(5): 18-25.
8. Akkila, A. N., et al. (2016). "Proposed Expert System for Calculating Inheritance in Islam." *World Wide Journal of Multidisciplinary Research and Development* 2(9): 38-48.
9. Al Rekhawi, H. A., et al. (2017). "Rickets Expert System Diagnoses and Treatment." *International Journal of Engineering and Information Systems (IJEAIS)* 1(4): 149-159.
10. Alajrami, M. A., et al. (2018). "Onion Rule based System for Disorders Diagnosis and Treatment." *International Journal of Academic Pedagogical Research (IJAPR)* 2(8): 1-9.
11. Alajrami, M. A., et al. (2019). "Grapes Expert System Diagnosis and Treatment." *International Journal of Academic Engineering Research (IJAER)* 3(5): 38-46.
12. Alajrami, M. A., et al. (2020). "Type of Tomato Classification Using Deep Learning." *International Journal of Academic Pedagogical Research (IJAPR)* 3(12): 21-25.
13. Alamawi, W. W., et al. (2016). "Rule based System for Diagnosing Wireless Connection Problems Using SL5 Object." *International Journal of Information Technology and Electrical Engineering* 5(6): 26-33.
14. Albatish, I. M., et al. (2019). Modeling and Controlling Smart Traffic Light System Using a Rule based System 2019 International Conference on Promising Electronic Technologies (ICPET), IEEE.
15. Al-Dahdooh, R., et al. (2010). "Knowledge management in ESMDA: Expert System for medical diagnostic assistance." *Artificial Intelligence and Machine Learning Journal* 10(1): 31-40.
16. Aldaour, A. F., et al. (2019). "An Expert System for Diagnosing Tobacco Diseases Using CLIPS." *International Journal of Academic Engineering Research (IJAER)* 3(3): 12-18.
17. Aldaour, A. F., et al. (2019). "Anemia Expert System Diagnosis Using SL5 Object." *International Journal of Academic Information Systems Research (IJAISR)* 3(5): 9-17.
18. Almadhoun, H. R., et al. (2018). "Banana Knowledge based System Diagnosis and Treatment." *International Journal of Academic Pedagogical Research (IJAPR)* 2(7): 1-11.
19. Almadhoun, H. R., et al. (2020). "An Expert System for Diagnosing Coronavirus (COVID-19) Using SL5."
20. Almurshidi, S. H., et al. (2018). Expert System For Diagnosing Breast Cancer, Al-Azhar University, Gaza, Palestine.
21. Al-Qumboz, M. N. A., et al. (2019). "Spinach Expert System: Diseases and Symptoms." *International Journal of Academic Information Systems Research (IJAISR)* 3(3): 16-22.
22. Al-Qumboz, M. N. A., et al. (2019). "Kidney Expert System Diseases and Symptoms." *International Journal of Academic Engineering Research (IJAER)* 3(5): 1-10.
23. Alshawwa, I. A., et al. (2019). "An Expert System for Coconut Diseases Diagnosis." *International Journal of Academic Engineering Research (IJAER)* 3(4): 8-13.
24. Alshawwa, I. A., et al. (2019). "An Expert System for Depression Diagnosis." *International Journal of Academic Health and Medical Research (IAHMR)* 3(4): 20-27.
25. Al-Shawwa, M., et al. (2019). "Knowledge based System for Apple Problems Using CLIPS." *International Journal of Academic Engineering Research (IJAER)* 3(3): 1-11.
26. Al-Shawwa, M. O., et al. (2019). "A Proposed Expert System for Diagnosing Skin Cancer Using SL5 Object." *International Journal of Academic Information Systems Research (IJAISR)* 3(4): 1-9.
27. Azaab, S., et al. (2000). "A proposed Expert System for selecting exploratory factor analysis procedures." *Journal of the College of Education* 4(2): 9-26.
28. Bakeer, H., et al. (2017). "Photo Copier Maintenance Expert System V.01 Using SL5 Object Language." *International Journal of Engineering and Information Systems (IJEAIS)* 1(4): 116-124.
29. Baker, J., et al. (1996). "Information Visualization." *Information Technology Journal* 7(2): pp: 403-404.
30. Baraka, M. H., et al. (2008). "A Proposed Expert System For Guiding Freshman Students In Selecting A Major In Al-Azhar University, Gaza." *Journal of Theoretical & Applied Information Technology* 4(9).
31. Barhoom, A. M., et al. (2018). "Black Pepper Expert System." *International Journal of Academic Information Systems Research (IJAISR)* 2(8): 9-16.
32. Dahouk, A. W., et al. (2018). "A Proposed Knowledge based System for Desktop PC Troubleshooting." *International Journal of Academic Pedagogical Research (IJAPR)* 2(6): 1-8.
33. Dheir, I., et al. (2019). "Knowledge based System for Diagnosing Guava Problems." *International Journal of Academic Information Systems Research (IJAISR)* 3(3): 9-15.
34. Dheir, I. M., et al. (2019). "Knowledge based System for Diabetes Diagnosis Using SL5 Object." *International Journal of Academic Pedagogical Research (IJAPR)* 3(4): 1-10.
35. El Agha, M., et al. (2017). "Polymyalgia Rheumatic Expert System." *International Journal of Engineering and Information Systems (IJEAIS)* 1(4): 125-137.
36. El Kahlout, M. I., et al. (2019). "An Expert System for Citrus Diseases Diagnosis." *International Journal of Academic Engineering Research (IJAER)* 3(4): 1-7.
37. El Kahlout, M. I., et al. (2019). "Silicosis Expert System Diagnosis and Treatment." *International Journal of Academic Information Systems Research (IJAISR)* 3(5): 1-8.
38. El-Hissi, H., et al. (2010). "An Expert System for endocrine diagnosis and treatments using JESS." *Journal of Artificial Intelligence; Scialert* 3(4): 239-251.
39. El-Mashharawi, H. Q., et al. (2019). "An Expert System for Sesame Diseases Diagnosis Using CLIPS." *International Journal of Academic Engineering Research (IJAER)* 3(4): 22-29.
40. El-Mashharawi, H. Q., et al. (2019). "An Expert System for Arthritis Diseases Diagnosis Using SL5 Object." *International Journal of Academic Health and Medical Research (IAHMR)* 3(4): 28-35.
41. Elqassas, R., et al. (2018). "Expert System for the Diagnosis of Mango Diseases." *International Journal of Academic Engineering Research (IJAER)* 2(8): 10-18.
42. Elsharif, A. A., et al. (2019). "An Expert System for Diagnosing Sugarcane Diseases." *International Journal of Academic Engineering Research (IJAER)* 3(3): 19-27.
43. Elsharif, A. A., et al. (2019). "Hepatitis Expert System Diagnosis Using SL5 Object." *International Journal of Academic Information Systems Research (IJAISR)* 3(4): 10-18.
44. Kashkash, K. A., et al. (2010). "Developing an Expert System for plant disease diagnosis." *Journal of Artificial Intelligence ; Scialert* 3(4): 269-276.
45. Kashkash, K., et al. (2005). "Expert System methodologies and applications-a decade review from 1995 to 2004." *Journal of Artificial Intelligence* 1(2): 9-26.
46. Khalil, A. J., et al. (2019). "Apple Trees Knowledge based System." *International Journal of Academic Engineering Research (IJAER)* 3(9): 1-7.
47. Khella, R., et al. (2017). "Rule based System for Chest Pain in Infants and Children." *International Journal of Engineering and Information Systems* 1(4): 138-148.
48. Mansour, A. I., et al. (2019). "Expert System for the Diagnosis of Wheat Diseases." *International Journal of Academic Information Systems Research (IJAISR)* 3(4): 19-26.
49. Mansour, A. I., et al. (2019). "Knowledge based System for the Diagnosis of Dengue Disease." *International Journal of Academic Health and Medical Research (IAHMR)* 3(4): 12-19.
50. Masri, N., et al. (2019). "Survey of Rule-Based Systems." *International Journal of Academic Information Systems Research (IJAISR)* 3(7): 1-23.
51. Mettleq, A. S. A., et al. (2019). "A Rule based System for the Diagnosis of Coffee Diseases." *International Journal of Academic Information Systems Research (IJAISR)* 3(3): 1-8.
52. Mettleq, A. S. A., et al. (2019). "Expert System for the Diagnosis of Seventh Nerve Inflammation (Bell's palsy) Disease." *International Journal of Academic Information Systems Research (IJAISR)* 3(4): 27-35.
53. Mrouf, A., et al. (2017). "Knowledge based System for Long-term Abdominal Pain (Stomach Pain) Diagnosis and Treatment." *International Journal of Engineering and Information Systems (IJEAIS)* 1(4): 71-88.
54. Musleh, M. M., et al. (2018). "Rule based System for Diagnosing and Treating Potatoes Problems." *International Journal of Academic Engineering Research (IJAER)* 2(8): 1-9.
55. Nabahin, A., et al. (2017). "Expert System for Hair Loss Diagnosis and Treatment." *International Journal of Engineering and Information Systems (IJEAIS)* 1(4): 160-169.
56. Nassr, M. S., et al. (2018). "Knowledge based System for Diagnosing Pineapple Diseases." *International Journal of Academic Pedagogical Research (IJAPR)* 2(7): 12-19.
57. Qwaider, S. R., et al. (2017). "Expert System for Diagnosing Ankle Diseases." *International Journal of Engineering and Information Systems (IJEAIS)* 1(4): 89-101.