International Journal of Academic Engineering Research (IJAER)
ISSN: 2643-9085
Vol. 6 Issue 5, May - 2022, Pages: 41-45

Knowledge Based System for Diagnosing Custard Apple Diseases and Treatment

Mustafa M. K. Al-Ghoul, Mohammed H. S. Abueleiwa, Fadi E. S. Harara, Sami M. Okasha, Samy S. Abu-Naser

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

Abstract: *There is no doubt that custard apple diseases are among the important reasons that destroy the Custard Apple plant and its agricultural crops. This leads to obvious damage to these plants and they become inedible. Discovering these diseases is a good step to provide the appropriate and correct treatment. Determining the treatment with high accuracy depends on the method used to correctly diagnose the disease, expert systems can greatly help in avoiding damage to these plants. The expert system correctly diagnoses Custard Apple disease to make it easier for farmers to find the right treatment based on the appropriate diagnosis. Objectives: A specialized syllable language system was established for the diagnosis of Custard Apple plant disease.*

Keywords: Artificial intelligent, Custard Apple disease, expert system, CLIPS

INTRODUCTION

Custard Apple crop can be grown in moderate soil types that are well cultivated almost. Providing organic materials such as manure can lead to an increase in the yield and success of the crop at a high rate, and it may work to reduce the risks and problems that may be the cause of crop damage. Custard Apple and the following vegetables, such as cucumbers, peppers, cabbage and onions, cannot be grown on the same land more than two or three times a year. On the positive side, a crop or a crop that precedes the Custard Apple must be a type of herbs to restructure the land, such as the molokhia crop, and the diversity of cultivation is important for its soil, meaning that the Custard Apple crop cannot be planted periodically because the soil is not damaged and the multiplicity of diseases that result from this crop and to avoid diseases resulting from the soil Which may attack the Custard Apple crop. The cultivation of the Custard Apple crop is very important and the approved plants must be planted whenever possible**.**

Expert System

An expert system has been established that diagnoses Custard Apple diseases. The expert system helps farmers and facilitates the process of discovering diseases in a clear and good manner. The system also diagnoses Custard Apple diseases by showing a list of symptoms related to Custard Apple diseases. The expert system was programmed using the CLIPS language. The expert system diagnoses diseases related to Custard Apple diseases through a system that consists of some menus that facilitate its use by the user

At first, a user interface will appear that contains four tasks. If the user clicks on the "Start" icon, the user will see an interface that contains a list of all the symptoms. The user will choose all the symptoms related to the disease he wants.

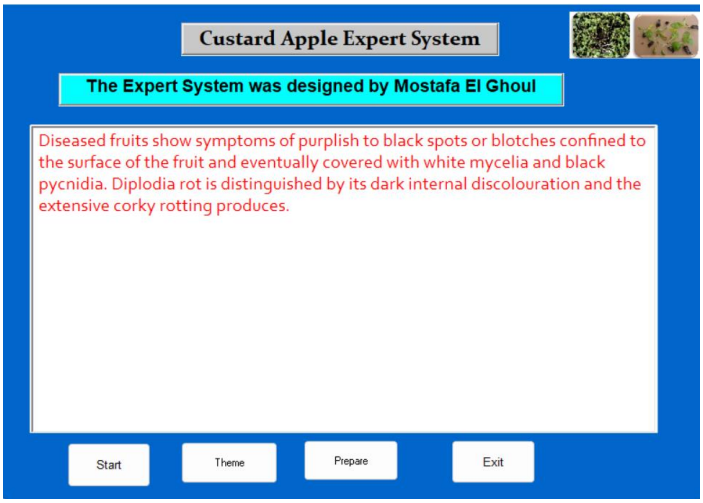

Figure 1 : user interface

Then appear list about destination diagnosis to show the symptoms for the user to choose the symptoms that will be treatment

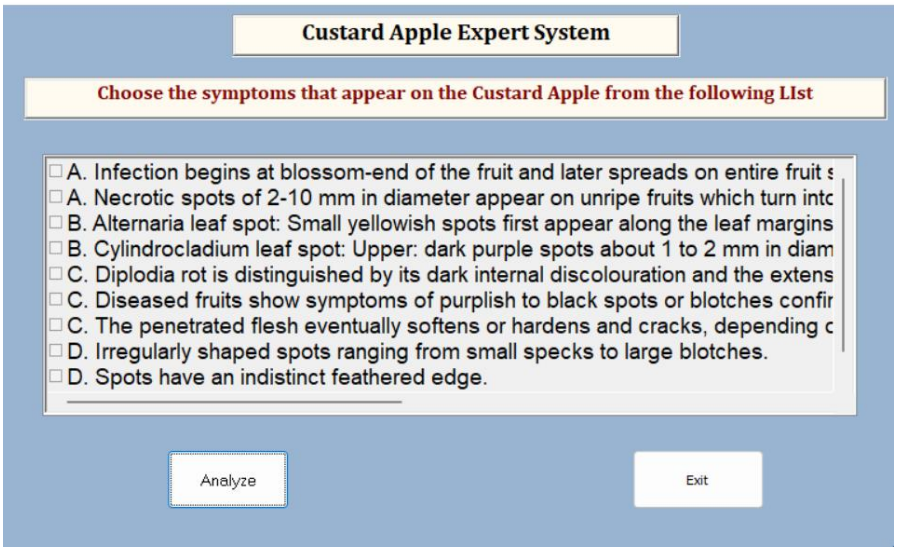

Figure2 : Symptom list

Then appear list about destination analyze to show the symptoms for the user to show the Favorable Conditions and Survival and spread.

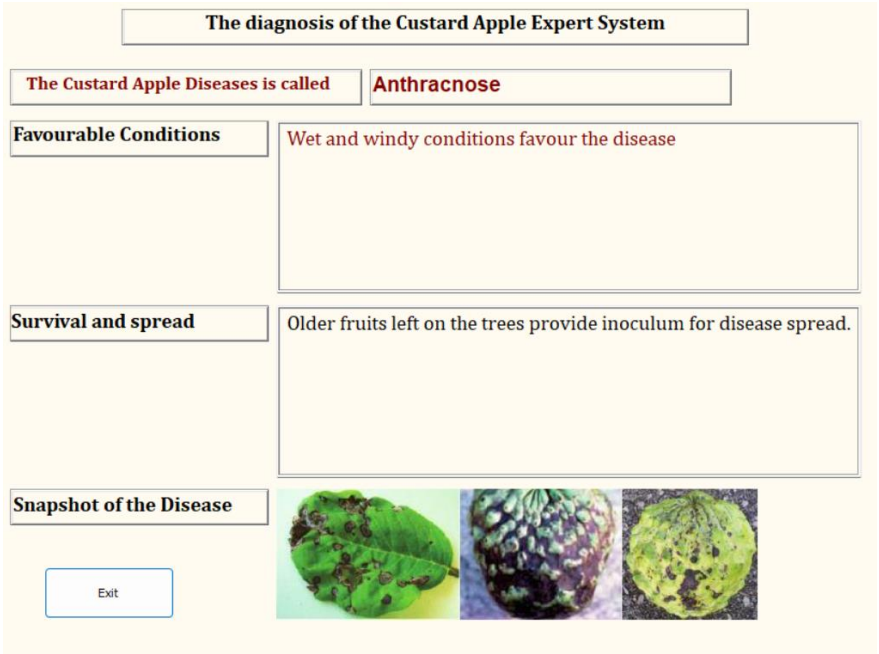

Figure3 : Diagnosis of the disease

LITERATURE REVIEW:

Previous Studies

There are many expert systems developed in agriculture [2-25] like: papaya plant disease diagnosis, grapes diagnosis and treatment, onion rule based system for disorders diagnosis and treatment, diagnosing tobacco diseases, banana knowledge based system diagnosis and treatment, spinach expert system: diseases and symptoms, knowledge based system for apple problems using clips, diagnosing banana disorders, black pepper expert system, knowledge based system for diagnosing guava problems, an expert system for citrus diseases diagnosis, expert system for sesame diseases diagnosis, expert system for the diagnosis of mango diseases, expert system for diagnosing sugarcane diseases, expert system for the diagnosis of wheat diseases, coffee

diseases, diagnosing and treating potatoes problems, safflower disease diagnosis and treatment, castor diseases and diagnosis, coconut diseases diagnosis, plant disease diagnosis, and apple trees.

There are many expert systems implemented for educations [26-28], like: guiding freshman students in selecting a major in Al-Azhar University, selecting exploratory factor analysis procedures, calculating inheritance in Islam. In general health [29-65] like: anemia expert system diagnosis, diagnosing coronavirus (covid-19), short-term abdominal pain (stomach pain) diagnosis and treatment, diagnosing breast cancer, diagnosing skin cancer , ankle problems, hip problems, hair loss diagnosis, chest pain in infants and children, diagnosis of dengue disease, high blood pressure, ankle diseases, thyroid problems, problems of teeth and gums, diagnosing cough problem, lower back pain, rickets diagnoses and treatment, neck pain diagnosis, diagnosing facial-swelling, throat problems, kidney, depression diagnosis, diabetes diagnosis, polymyalgia rheumatic, silicosis, endocrine diagnosis and treatments, arthritis diseases diagnosis, hepatitis, diagnosis of seventh nerve inflammation (bell's palsy) disease, knee problems diagnosis, and uveitis disease diagnosis. In control [69-70,] like: modeling and controlling smart traffic light system. In maintenance [66-68], like: photo copier maintenance, desktop pc troubleshooting, and diagnosing wireless connection problems.

Comments about previous studies

Although, there are many expert systems in agriculture field, there are no expert system for diagnosing Custard Apple diseases and treatment. That is why we are proposing expert system for diagnosing and treating Custard Apple problems.

KNOWLEDGE REPRESENTATION

There six diseases to be diagnosed that are represented using CLIPS expert system language [1]:

1. **Anthracnose**: Anthracnose is a term used to loosely describe a group of related fungal diseases that typically cause dark lesions on leaves. In severe cases it may also cause sunken lesions and cankers on twigs and stems.

Figure4 : Anthracnose: Anthracnose disease

2. **Leaf spot**: Small yellowish spots first appear along the leaf margins, which gradually enlarge and turn into brownish patches with concentric **rings. Severe infection leads to drying and defoliation.**

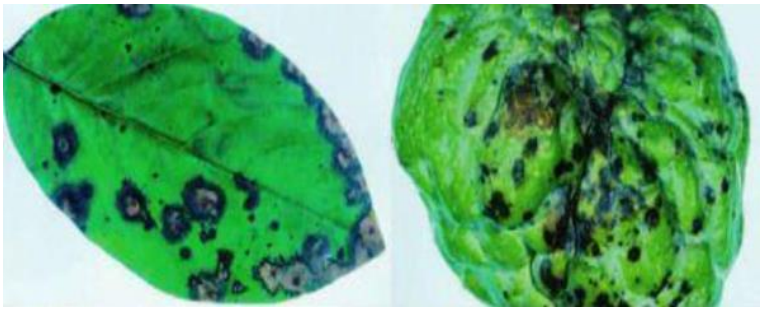

Figure5 : Leaf spot disease

3. **Diplodia rot**: Diseased fruits show symptoms of purplish to black spots or blotches confined to the surface of the fruit and eventually covered with white mycelia and black pycnidia. Diplodia rot is distinguished by its dark internal discolouration and the extensive corky rotting produces.

Figure6 : Diplodia rot disease

4. **Black canker**: Infection begins at blossom-end of the fruit and later spreads on entire fruit surface, affected fruits shrivel and they may cling to the tree or fall down. Necrotic spots of 2-10 mm in diameter appear on unripe fruits which turn into dark brown to black spots.

Figure7 : Black canker disease

5. **Spiral nematode and Stunt nematode**: Nematodes molt four times during each life cycle with a molt occurring at the end of each larval stage. Therefore, molts separate the first and second larval stages, the second and third larval stages, the third and fourth larval stages, and also the fourth larval stages and immature adults. The 5th stage larva grows to the limit of its new cuticle, at the same time developing into a sexually mature adult male or female.

Figure8 : Spiral nematode and Stunt nematode disease

6. **IPM for Custard Apple**: Mealy bugs harbor in the soil around the tree. They ascend on trees on having appropriate environment and infest developing fruits. Wrap the plastic bend around the tree trunk above 1 to 1.5 feet above the ground level and apply the grease. Cover the both ends of the bend with cow dung.

Figure9 : IPM for Custard Apple disease

Conclusion:

Finally, an expert system was established that diagnoses Custard Apple diseases, and these six diseases are Anthracnose, Leaf spot, Diplodia rot, Black canker, Spiral nematode and Stunt nematode, IPM for Custard Apple. This system works on the diagnoses of these diseases in the right and appropriate way that helps farmers to find the appropriate treatment for these diseases.

References

1. https://vikaspedia.in/agriculture/crop-production/integrated-pest-managment/ipm-for-fruit-crops/ipm-strategies-for-strawberry/custard-apple -diseases.
2. 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.
3. 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.
4. Alajrami, M. A., et al. (2019). "Grapes Expert System Diagnosis and Treatment." International Journal of Academic Engineering Research (IJAER) 3(5): 38-46.
5. 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.
6. Almadhoun, H. R., et al. (2018). "Banana Knowledge Based System Diagnosis and Treatment." International Journal of Academic Pedagogical Research (IJAPR) 2(7): 1-11.
7. 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.
8. 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.
9. AlZamily, J. Y., et al. (2018). "A Cognitive System for Diagnosing Musa Acuminata Disorders." International Journal of Academic Information Systems Research (IJAISR) 2(8): 1-8.
10. Barhoom, A. M., et al. (2018). "Black Pepper Expert System." International Journal of Academic Information Systems Research (IJAISR) 2(8): 9-16.
11. Dheir, I., et al. (2019). "Knowledge Based System for Diagnosing Guava Problems." International Journal of Academic Information Systems Research (IJAISR) 3(3): 9-15.
12. 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.
13. 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.
14. Elqassas, R., et al. (2018). "Expert System for the Diagnosis of Mango Diseases." International Journal of Academic Engineering Research (IJAER) 2(8): 10-18.
15. Elsharif, A. A., et al. (2019). "An Expert System for Diagnosing Sugarcane Diseases." International Journal of Academic Engineering Research (IJAER) 3(3): 19-27.
16. 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.
17. 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.
18. 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.
19. Salman, F., et al. (2019). "Rule based System for Safflower Disease Diagnosis and Treatment." International Journal of Academic Engineering Research (IJAER) 3(8): 1-10.
20. Salman, F. M., et al. (2019). "Expert System for Castor Diseases and Diagnosis." International Journal of Engineering and Information Systems (IJEAIS) 3(3): 1-10.
21. Alshawwa, I. A., et al. (2019). "An Expert System for Coconut Diseases Diagnosis." International Journal of Academic Engineering Research (IJAER) 3(4): 8-13.
22. Kashkash, K. A., et al. (2010). "Developing an expert system for plant disease diagnosis." Journal of Artificial Intelligence; Scialert 3(4): 269-276.
23. Khalil, A. J., et al. (2019). "Apple Trees Knowledge Based System." International Journal of Academic Engineering Research (IJAER) 3(9): 1-7.
24. 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.
25. 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.
26. 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).
27. 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.
28. Almadhoun, H. R., et al. (2020). "An Expert System for Diagnosing Coronavirus (COVID-19) Using SL5." International Journal of Academic Engineering Research (IJAER) 4(4): 1-9.
29. Al-Masawabe, M. M., et al. (2021). "Expert System for Short-term Abdominal Pain (Stomach Pain) Diagnosis and Treatment." International Journal of Academic Information Systems Research (IJAISR) 5(5): 37-56.
30. Almurshidi, S. H., et al. (2018). Expert System For Diagnosing Breast Cancer, Al-Azhar University, Gaza, Palestine.
31. 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.
32. Elhabil, B. Y., et al. (2021). "An Expert System for Ankle Problems." International Journal of Engineering and Information Systems (IJEAIS) 5(4).
33. Elhabil, B. Y., et al. (2021). "Expert System for Hib Problems." International Journal of Academic Information Systems Research (IJAISR) 5 (5):5-15.
34. Hamadaqa, M. H. M., et al. (2021). "Hair Loss Diagnosis Expert System and Treatment Using CLIPS." International Journal of Academic Engineering Research (IJAER) 5(5): 37-42.
35. 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.
36. Mansour, A. I., et al. (2019). "Knowledge Based System for the Diagnosis of Dengue Disease." International Journal of Academic Health and Medical Research (IJAHMR) 3(4): 12-19.
37. Mansour, A. I. and S. S., et al. (2021). "Expert system for the diagnosis of high blood pressure diseases."
38. Qwaider, S. R., et al. (2017). "Expert System for Diagnosing Ankle Diseases." International Journal of Engineering and Information Systems (IJEAIS) 1(4): 89-101.
39. Salman, F. M., et al. (2019). "Thyroid Knowledge Based System." International Journal of Academic Engineering Research (IJAER) 3(5): 11-20.
40. Salman, F. M., et al. (2020). "Expert System for COVID-19 Diagnosis." International Journal of Academic Information Systems Research (IJAISR) 4(3): 1-13.
41. 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.
42. Abu-Jamie, T. N., et al. (2021). "Diagnosing Cough Problem Expert System Using CLIPS." International Journal of Academic Information Systems Research (IJAISR) 5(5): 79-90.
43. Ahmed, A., et al. (2019). "Knowledge-Based Systems Survey." International Journal of Academic Engineering Research (IJAER) 3(7): 1-22.
44. Aish, M. A., et al. (2021). "Lower Back Pain Expert System Using CLIPS." International Journal of Academic Information Systems Research (IJAISR) 5(5): 57-67.
45. 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.
46. Alfarra, A. H., et al. (2021). "An Expert System for Neck Pain Diagnosis." International Journal of Academic Information Systems Research (IJAISR) 5(7): 1-8.
47. Alkahlout, M. A., et al. (2021). "Expert System Diagnosing Facial-Swelling Using CLIPS."
48. Alkahlout, M. A., et al. (2021). "Expert System for Throat Problems Using SL5 Object." International Journal of Academic Information Systems Research (IJAISR) 5(5): 68-78.
49. Alkahlout, M. A., et al. (2021). "Knowledge Based System for Diagnosing Throat Problem CLIPS and Delphi languages." International Journal of Academic Engineering Research (IJAER) 5(6): 7-12.
50. 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.
51. Alsaqqa, A. H., et al. (2021). "Knowledge Based for Tooth Problems." International Journal of Academic Information Systems Research (IJAISR) 5(5).
52. Alshawwa, I. A., et al. (2019). "An Expert System for Depression Diagnosis." International Journal of Academic Health and Medical Research (IJAHMR) 3(4): 20-27.
53. 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.
54. El Agha, M., et al. (2017). "Polymyalgia Rheumatic Expert System." International Journal of Engineering and Information Systems (IJEAIS) 1(4): 125-137.
55. 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.
56. 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.
57. 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 (IJAHMR) 3(4): 28-35.
58. 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.
59. Mansour, A. I., et al. (2021). "An Expert System for Diagnosing Cough Using SL5 Object." International Journal of Academic Engineering Research (IJAER) 5(6): 13-27.
60. 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.
61. 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.
62. 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.
63. Samhan, L. F., et al. (2021). "Expert System for Knee Problems Diagnosis." International Journal of Academic Information Systems Research (IJAISR) 5(4):59-66.
64. 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.
65. 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.
66. 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.
67. 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.
68. 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.
69. 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.
70. Masri, N., et al. (2019). "Survey of Rule-Based Systems." International Journal of Academic Information Systems Research (IJAISR) 3(7): 1-23.