

CM 3320

Logic Programming & Artificial Cognitive Systems Assignment

Internet Connectivity Troubleshooting Expert System

By

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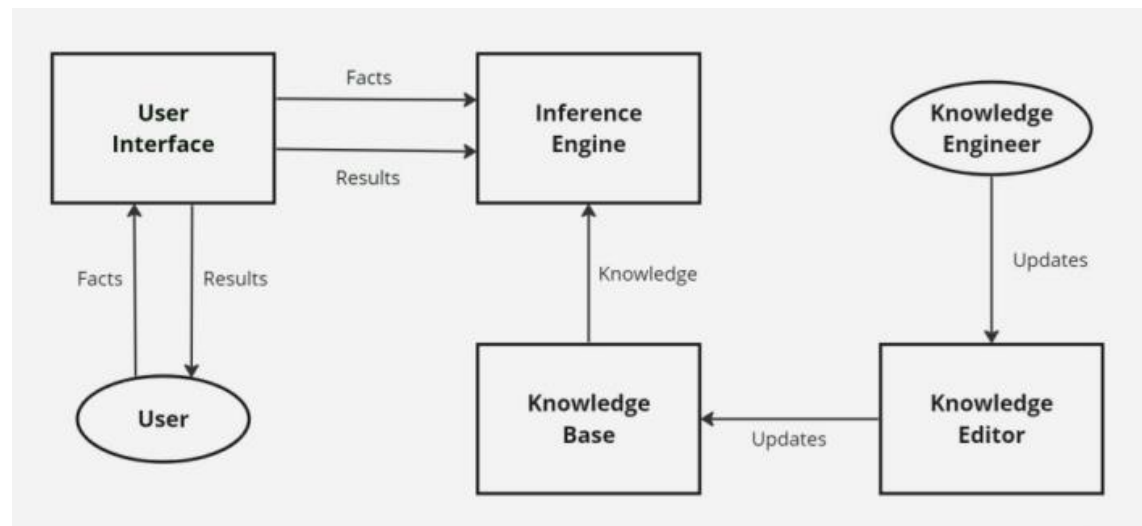
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Internet Connectivity Troubleshooting Expert System

The "Internet Connectivity Troubleshooting Expert System" is designed to assist users in resolving issues related to connecting their computer to the internet via Wi-Fi. This problem is characterized by the computer's inability to establish a connection despite the presence of a Wi-Fi network.

The expert system employs a set of rules, each articulated as a yes/no question, to systematically diagnose and address the underlying connectivity issue. These rules encompass checks for hardware (Wi-Fi adapter), network status, signal strength, password correctness, and operating system updates. The system guides users through a step-by-step process, aiming to identify and resolve the problem through targeted and user-friendly interactions.

This expert system guides users through a systematic troubleshooting process, addressing common issues step by step. By asking relevant yes/no questions and providing actionable suggestions based on the user's responses, it helps users identify and resolve internet connectivity problems effectively.



Click the link and check out the: [Internet Connectivity Troubleshooting Expert System](#)

Expert System Shells

An "Expert System Shell" refers to a software framework or platform that provides the infrastructure and tools for building and deploying expert systems. Think of it as a ready-made environment that facilitates the development of intelligent systems capable of reasoning and decision-making based on a set of rules and knowledge.

The heart of an expert system is its inference engine, which processes the rules and knowledge to make logical conclusions. An expert system shell includes a rule-based inference engine that enables the system to infer new information based on user inputs or existing data. Expert systems store and manage knowledge in a structured manner. The shell provides a mechanism for representing and organizing this knowledge, often using a knowledge base. This may include facts, rules, and relationships crucial for decision-making.

An expert system shell provides a foundation for the development of intelligent systems by offering a set of tools and functionalities that simplify the creation, management, and deployment of expert systems across various domains.

There are several different expert system shells available on the market, they are:

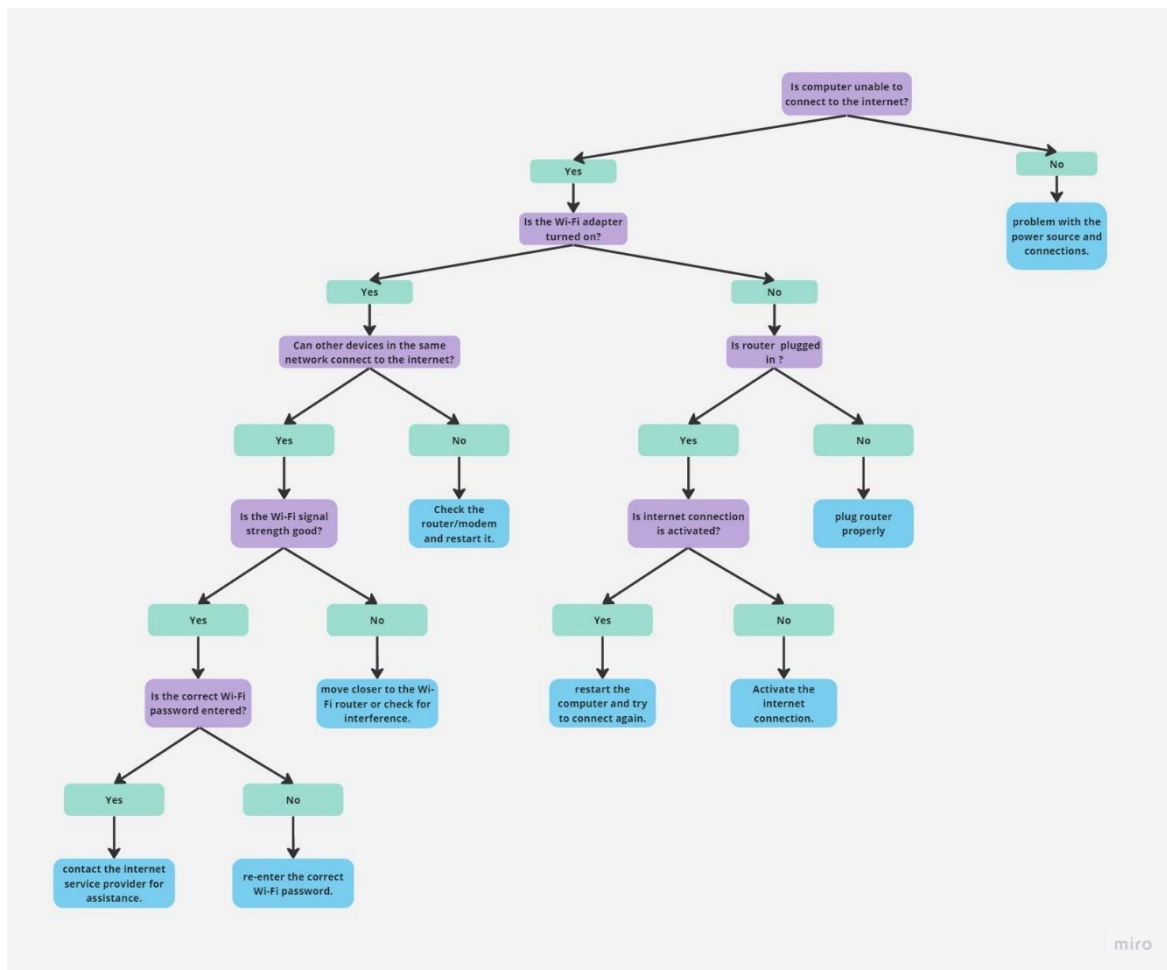
- C Language Integrated Production System (CLIPS)
- Java Expert System Shell (JESS)
- Python Knowledge Engine (Pyke)

I selected CLIPS for developing Internet Connectivity Troubleshooting Expert System.

C Language Integrated Production System (CLIPS)

The C Language Integrated Production System (CLIPS) is a rule-based programming language and expert system tool developed by NASA's Johnson Space Center. Designed to be highly portable and efficient, CLIPS allows developers to create rule-based expert systems for tasks ranging from diagnostics to decision support. It provides a powerful inference engine for reasoning through a set of rules and a language for defining and manipulating knowledge. CLIPS supports forward chaining, backward chaining, and hybrid reasoning strategies, making it versatile for various problem-solving approaches. Widely used in academic and industrial settings, CLIPS continues to be a valuable tool for developing knowledge-based systems and artificial intelligence applications, particularly in fields where rule-based reasoning is prevalent.

Decision Tree of Internet Connectivity Troubleshooting Expert System



Knowledge Base

Facts

Fact-1: Computer does not connect

Fact-2: Wi-Fi turns

Fact-3: Other devices in the same network connect to internet

Fact-4: Wi-Fi signal strength good

Fact-5: Wi-Fi password corrects

Fact-6: Router plugged in

Fact-7: Internet connection activated

Rules

Rule 1:

IF the computer is unable to connect to the internet

AND the Wi-Fi adapter is turned on

AND other devices in the same network can connect to the internet

AND Wi-Fi signal strength is good

AND the correct Wi-Fi password is entered

THEN contact the internet service provider for assistance.

Rule 2:

IF the computer is unable to connect to the internet

AND the Wi-Fi adapter is turned on

AND other devices in the same network can connect to the internet

AND Wi-Fi signal strength is good

AND the correct Wi-Fi password is not entered

THEN re-enter the correct Wi-Fi password.

Rule 3:

IF the computer is unable to connect to the internet
AND the Wi-Fi adapter is turned on
AND other devices in the same network can connect to the internet
AND Wi-Fi signal strength is not good
THEN move closer to the Wi-Fi router or check for interference.

Rule 4

IF the computer is unable to connect to the internet
AND the Wi-Fi adapter is turned on
AND other devices in the same network cannot connect to the internet
THEN Check the router/modem and restart it.

Rule 5

IF the computer is unable to connect to the internet
AND the Wi-Fi adapter is not turned on
AND router/modem is plugged in
AND internet connection is activated
THEN restart the computer and try to connect again.

Rule 6

IF the computer is unable to connect to the internet
AND the Wi-Fi adapter is not turned on
AND router/modem is plugged in
AND internet connection is not activated
THEN activate the internet connection.

Rule 7

IF the computer is unable to connect to the internet

AND the Wi-Fi adapter is not turned on

AND router/modem is not plugged in

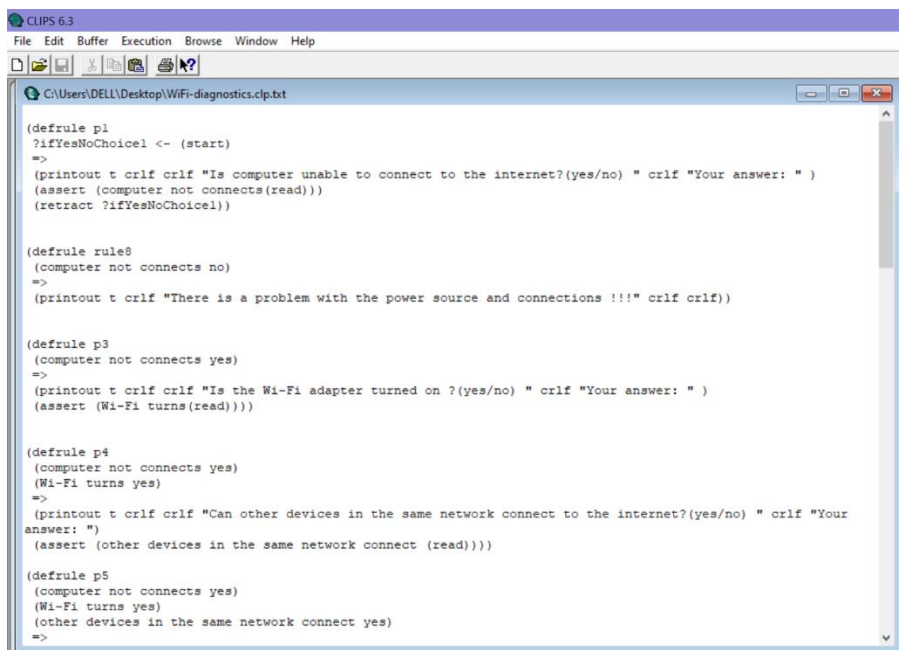
THEN plug router properly.

Rule 8

IF the computer can connect to the internet

THEN a problem with the power source and connections.

Define Rules & Facts in CLIPs



```
(defrule p1
  ?ifYesNoChoice1 <- (start)
  =>
  (printout t crlf crlf "Is computer unable to connect to the internet?(yes/no) " crlf "Your answer: " )
  (assert (computer not connects (read)))
  (retract ?ifYesNoChoice1))

(defrule rule8
  (computer not connects no)
  =>
  (printout t crlf "There is a problem with the power source and connections !!!" crlf crlf))

(defrule p3
  (computer not connects yes)
  =>
  (printout t crlf crlf "Is the Wi-Fi adapter turned on ?(yes/no) " crlf "Your answer: " )
  (assert (Wi-Fi turns (read))))

(defrule p4
  (computer not connects yes)
  (Wi-Fi turns yes)
  =>
  (printout t crlf crlf "Can other devices in the same network connect to the internet?(yes/no) " crlf "Your
  answer: " )
  (assert (other devices in the same network connect (read))))

(defrule p5
  (computer not connects yes)
  (Wi-Fi turns yes)
  (other devices in the same network connect yes)
  =>
```



```
CLIPS 6.3
File Edit Buffer Execution Browse Window Help

C:\Users\DELL\Desktop\WiFi-diagnostics.clp.txt

(defrule p5
  (computer not connects yes)
  (Wi-Fi turns yes)
  (other devices in the same network connect yes)
=>
  (printout t crlf crlf "Is Wi-Fi signal strength good?(yes/no) " crlf "Your answer: ")
  (assert (Wi-Fi signal strength good (read))))

(defrule p6
  (computer not connects yes)
  (Wi-Fi turns yes)
  (other devices in the same network connect yes)
  (Wi-Fi signal strength good yes)
=>
  (printout t crlf crlf "Is the correct Wi-Fi password entered?(yes/no) " crlf "Your answer: ")
  (assert (Wi-Fi password correct (read))))

(defrule rule1
  (computer not connects yes)
  (Wi-Fi turns yes)
  (other devices in the same network connect yes)
  (Wi-Fi signal strength good yes)
  (Wi-Fi password correct yes)
=>
  (printout t crlf crlf "Contact the internet service provider for assistance !!!" crlf crlf crlf))

(defrule rule2
  (computer not connects yes)
  (Wi-Fi turns yes)
  (other devices in the same network connect yes)
  (Wi-Fi signal strength good yes)
  (Wi-Fi password correct no)
=>
```

```
CLIPS 6.3
File Edit Buffer Execution Browse Window Help

C:\Users\DELL\Desktop\WiFi-diagnostics.clp.txt

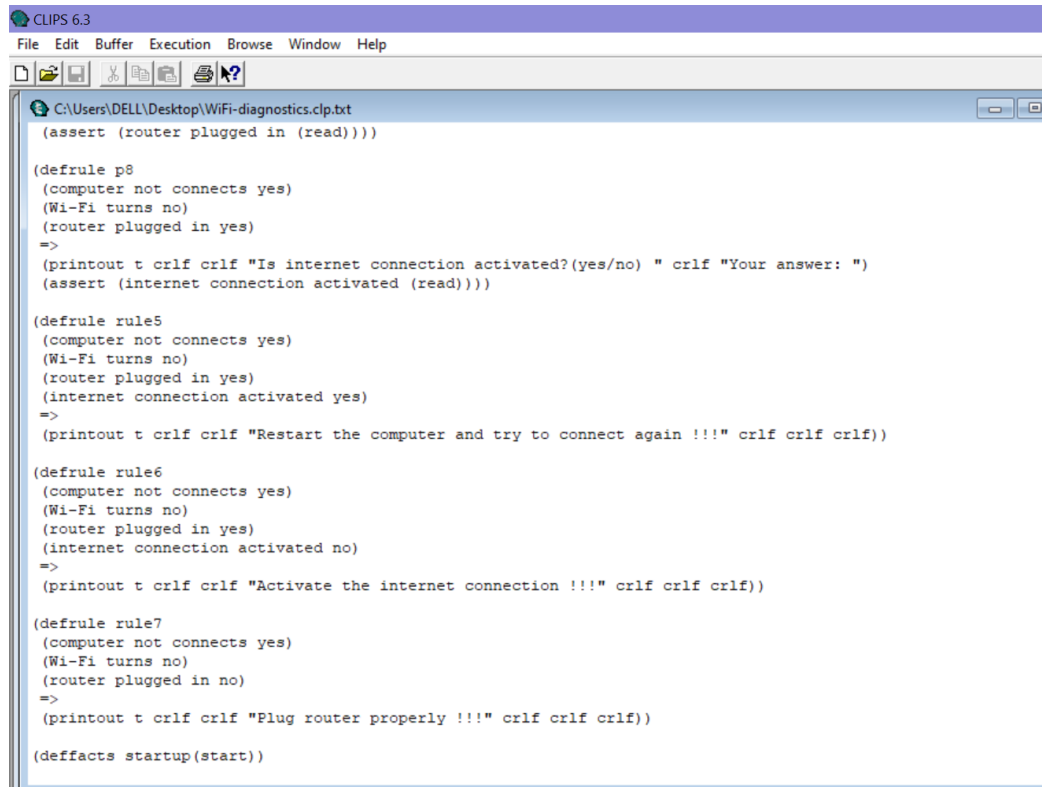
(defrule rule2
  (computer not connects yes)
  (Wi-Fi turns yes)
  (other devices in the same network connect yes)
  (Wi-Fi signal strength good yes)
  (Wi-Fi password correct no)
=>
  (printout t crlf crlf "Re-enter the correct Wi-Fi password. !!!" crlf crlf crlf))

(defrule rule3
  (computer not connects yes)
  (Wi-Fi turns yes)
  (other devices in the same network connect yes)
  (Wi-Fi signal strength good no)
=>
  (printout t crlf crlf "Move closer to the Wi-Fi router or check for interference !!!" crlf crlf crlf))

(defrule rule4
  (computer not connects yes)
  (Wi-Fi turns yes)
  (other devices in the same network connect no)
=>
  (printout t crlf crlf "Check the router/modem and restart it !!!" crlf crlf crlf))

(defrule p7
  (computer not connects yes)
  (Wi-Fi turns no)
=>
  (printout t crlf crlf "Is router/modem plugged in?(yes/no) " crlf "Your answer: ")
  (assert (router plugged in (read))))

(defrule p8
  (computer not connects yes)
  (Wi-Fi turns no)
```



The screenshot shows the CLIPS 6.3 application window. The title bar reads "CLIPS 6.3". The menu bar includes "File", "Edit", "Buffer", "Execution", "Browse", "Window", and "Help". The toolbar contains icons for file operations and execution. The main text area displays a Prolog script for WiFi diagnostics, saved as "C:\Users\DELL\Desktop\WiFi-diagnostics.clp.txt". The script includes several rules (p8, rule5, rule6, rule7) that handle different states of computer connectivity, Wi-Fi status, and router connection. It uses `(assert)` to add facts, `(printout t crlf crlf)` for formatted output, and `(read)` for user input. The script concludes with `(deffacts startup(start))`.

```
(assert (router plugged in (read)))

(defrule p8
  (computer not connects yes)
  (Wi-Fi turns no)
  (router plugged in yes)
=>
  (printout t crlf crlf "Is internet connection activated?(yes/no) " crlf "Your answer: ")
  (assert (internet connection activated (read))))

(defrule rule5
  (computer not connects yes)
  (Wi-Fi turns no)
  (router plugged in yes)
  (internet connection activated yes)
=>
  (printout t crlf crlf "Restart the computer and try to connect again !!!" crlf crlf crlf))

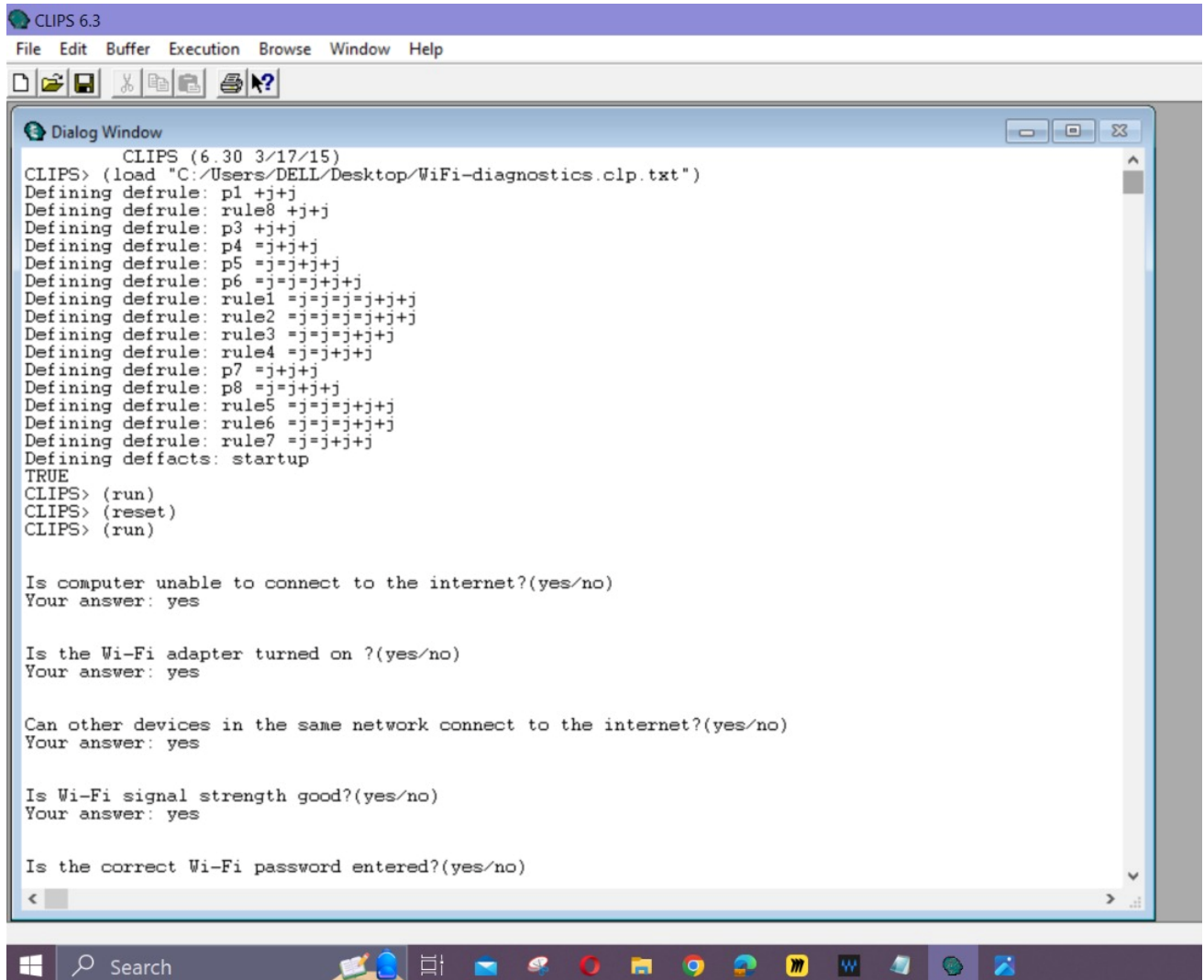
(defrule rule6
  (computer not connects yes)
  (Wi-Fi turns no)
  (router plugged in yes)
  (internet connection activated no)
=>
  (printout t crlf crlf "Activate the internet connection !!!" crlf crlf crlf))

(defrule rule7
  (computer not connects yes)
  (Wi-Fi turns no)
  (router plugged in no)
=>
  (printout t crlf crlf "Plug router properly !!!" crlf crlf crlf))

(deffacts startup(start))
```

Check the code: [Internet Connectivity Troubleshooting Expert](#)

Demonstration in CLIPs



The screenshot shows the CLIPS 6.30 application window. The title bar reads "CLIPS 6.3". The menu bar includes "File", "Edit", "Buffer", "Execution", "Browse", "Window", and "Help". Below the menu bar is a toolbar with icons for file operations and help. A "Dialog Window" is open, displaying the following text:

```
CLIPS (6.30 3/17/15)
CLIPS> (load "C:/Users/DELL/Desktop/WiFi-diagnostics.clp.txt")
Defining defrule: p1 +j+j
Defining defrule: rule8 +j+j
Defining defrule: p3 +j+j
Defining defrule: p4 =j+j+j
Defining defrule: p5 =j=j+j+j
Defining defrule: p6 =j=j=j+j+j
Defining defrule: rule1 =j=j=j=j+j+j
Defining defrule: rule2 =j=j=j=j+j+j
Defining defrule: rule3 =j=j=j=j+j+j
Defining defrule: rule4 =j=j=j=j+j+j
Defining defrule: p7 =j+j+j
Defining defrule: p8 =j=j+j+j
Defining defrule: rule5 =j=j=j+j+j+j
Defining defrule: rule6 =j=j=j+j+j+j
Defining defrule: rule7 =j=j=j+j+j+j
Defining deffacts: startup
TRUE
CLIPS> (run)
CLIPS> (reset)
CLIPS> (run)

Is computer unable to connect to the internet?(yes/no)
Your answer: yes

Is the Wi-Fi adapter turned on?(yes/no)
Your answer: yes

Can other devices in the same network connect to the internet?(yes/no)
Your answer: yes

Is Wi-Fi signal strength good?(yes/no)
Your answer: yes

Is the correct Wi-Fi password entered?(yes/no)
```

The Windows taskbar is visible at the bottom of the screen, showing the Start button, a search bar, and several application icons including File Explorer, Google Chrome, and Microsoft Word.

```
CLIPS 6.3
File Edit Buffer Execution Browse Window Help

Dialog Window
Defining defrule: p6 =j=j+j+j
Defining defrule: rule1 =j=j=j+j+j
Defining defrule: rule2 =j=j=j+j+j
Defining defrule: rule3 =j=j=j+j+j
Defining defrule: rule4 =j=j+j+j
Defining defrule: p7 =j+j+j
Defining defrule: p8 =j=j+j+j
Defining defrule: rule5 =j=j=j+j+j
Defining defrule: rule6 =j=j=j+j+j
Defining defrule: rule7 =j=j+j+j
Defining deffacts: startup
TRUE
CLIPS> (run)
CLIPS> (reset)
CLIPS> (run)

Is computer unable to connect to the internet?(yes/no)
Your answer: yes

Is the Wi-Fi adapter turned on?(yes/no)
Your answer: yes

Can other devices in the same network connect to the internet?(yes/no)
Your answer: yes

Is Wi-Fi signal strength good?(yes/no)
Your answer: yes

Is the correct Wi-Fi password entered?(yes/no)
Your answer: yes

Contact the internet service provider for assistance !!!

CLIPS> █
< █
```

```
CLIPS 6.3
File Edit Buffer Execution Browse Window Help

Dialog Window

Is Wi-Fi signal strength good?(yes/no)
Your answer: yes

Is the correct Wi-Fi password entered?(yes/no)
Your answer: yes

Contact the internet service provider for assistance !!!

CLIPS> (reset)
CLIPS> (run)

Is computer unable to connect to the internet?(yes/no)
Your answer: yes

Is the Wi-Fi adapter turned on?(yes/no)
Your answer: yes

Can other devices in the same network connect to the internet?(yes/no)
Your answer: yes

Is Wi-Fi signal strength good?(yes/no)
Your answer: yes

Is the correct Wi-Fi password entered?(yes/no)
Your answer: no

Re-enter the correct Wi-Fi password. !!!

CLIPS> █
< █
```

```
CLIPS 6.3
File Edit Buffer Execution Browse Window Help

Can other devices in the same network connect to the internet?(yes/no)
Your answer: yes

Is Wi-Fi signal strength good?(yes/no)
Your answer: yes

Is the correct Wi-Fi password entered?(yes/no)
Your answer: no

Re-enter the correct Wi-Fi password. !!!

CLIPS> (reset)
CLIPS> (run)

Is computer unable to connect to the internet?(yes/no)
Your answer: yes

Is the Wi-Fi adapter turned on?(yes/no)
Your answer: yes

Can other devices in the same network connect to the internet?(yes/no)
Your answer: yes

Is Wi-Fi signal strength good?(yes/no)
Your answer: no

Move closer to the Wi-Fi router or check for interference !!!

CLIPS>
```

```
CLIPS 6.3
File Edit Buffer Execution Browse Window Help

Is computer unable to connect to the internet?(yes/no)
Your answer: yes

Is the Wi-Fi adapter turned on?(yes/no)
Your answer: yes

Can other devices in the same network connect to the internet?(yes/no)
Your answer: yes

Is Wi-Fi signal strength good?(yes/no)
Your answer: no

Move closer to the Wi-Fi router or check for interference !!!

CLIPS> (reset)
CLIPS> (run)

Is computer unable to connect to the internet?(yes/no)
Your answer: yes

Is the Wi-Fi adapter turned on?(yes/no)
Your answer: yes

Can other devices in the same network connect to the internet?(yes/no)
Your answer: no

Check the router/modem and restart it !!!

CLIPS> █
```

```
CLIPS 6.3
File Edit Buffer Execution Browse Window Help

Dialog Window

Is computer unable to connect to the internet?(yes/no)
Your answer: yes

Is the Wi-Fi adapter turned on ?(yes/no)
Your answer: yes

Can other devices in the same network connect to the internet?(yes/no)
Your answer: no

Check the router/modem and restart it !!!

CLIPS> (reset)
CLIPS> (run)

Is computer unable to connect to the internet?(yes/no)
Your answer: yes

Is the Wi-Fi adapter turned on ?(yes/no)
Your answer: no

Is router/modem plugged in?(yes/no)
Your answer: yes

Is internet connection activated?(yes/no)
Your answer: yes

Restart the computer and try to connect again !!!

CLIPS> █
```

```
CLIPS 6.3
File Edit Buffer Execution Browse Window Help

Dialog Window

Is the Wi-Fi adapter turned on ?(yes/no)
Your answer: no

Is router/modem plugged in?(yes/no)
Your answer: yes

Is internet connection activated?(yes/no)
Your answer: yes

Restart the computer and try to connect again !!!

CLIPS> (reset)
CLIPS> (run)

Is computer unable to connect to the internet?(yes/no)
Your answer: yes

Is the Wi-Fi adapter turned on ?(yes/no)
Your answer: no

Is router/modem plugged in?(yes/no)
Your answer: yes

Is internet connection activated?(yes/no)
Your answer: no

Activate the internet connection !!!

CLIPS> █
```

```
CLIPS 6.3
File Edit Buffer Execution Browse Window Help

Dialog Window

Is computer unable to connect to the internet?(yes/no)
Your answer: yes

Is the Wi-Fi adapter turned on?(yes/no)
Your answer: no

Is router/modem plugged in?(yes/no)
Your answer: yes

Is internet connection activated?(yes/no)
Your answer: no

Activate the internet connection !!!

CLIPS> (reset)
CLIPS> (run)

Is computer unable to connect to the internet?(yes/no)
Your answer: yes

Is the Wi-Fi adapter turned on?(yes/no)
Your answer: no

Is router/modem plugged in?(yes/no)
Your answer: no

Plug router properly !!!

CLIPS>
```

```
CLIPS 6.3
File Edit Buffer Execution Browse Window Help

Dialog Window

Is router/modem plugged in?(yes/no)
Your answer: yes

Is internet connection activated?(yes/no)
Your answer: no

Activate the internet connection !!!

CLIPS> (reset)
CLIPS> (run)

Is computer unable to connect to the internet?(yes/no)
Your answer: yes

Is the Wi-Fi adapter turned on?(yes/no)
Your answer: no

Is router/modem plugged in?(yes/no)
Your answer: no

Plug router properly !!!

CLIPS> (reset)
CLIPS> (run)

Is computer unable to connect to the internet?(yes/no)
Your answer: no

There is a problem with the power source and connections !!!

CLIPS> █
```

ES Builder

(Used for Internet Connectivity Troubleshooting Expert System)

I used ES-Builder online tool to demonstrate the Internet Connectivity Troubleshooting Expert System.

Decision Tree of Internet Connectivity Troubleshooting Expert System



[ES-builder decision tree link](#)

User Interfaces of Internet Connectivity Troubleshooting Expert System

ES-Builder
Expert
System
Shell

ES-Builder Web
Expert System - Internet Connectivity Troubleshooting Expert by nithya Adhikari



computer not connect?

- yes
- no

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Wi-Fi turns?

- yes
- no

Decision History:

computer not connect?	yes
-----------------------	-----

Tip: Click on an attribute link above to return to that decision...

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Shell

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other devices connect?

- yes
- no

Decision History:

computer not connect?	yes
Wi-Fi turns?	yes

Tip: Click on an attribute link above to return to that decision...

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signal strength good?

yes

no

Decision History:

computer not connect?	yes
Wi-Fi turns?	yes
other devices connect?	yes

Tip: Click on an attribute link above to return to that decision...

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Wi-Fi password correct?

yes

no

Decision History:

computer not connect?	yes
Wi-Fi turns?	yes
other devices connect?	yes
signal strength good?	yes

Tip: Click on an attribute link above to return to that decision...

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Based on the responses you have made:
The conclusion is contact internet provider

Conclusion Notes:

Expert System Rule:

IF computer not connect? yes

AND wi-Fi turns? yes

AND other devices connect? yes

AND signal strength good? yes

AND wi-Fi password correct? yes

THEN the conclusion is contact internet provider.

contact internet provider

Google Search

Return to the Internet Connectivity Troubleshooting Expert Expert System Title Page

Check the demo: [Internet Connectivity Troubleshooting Expert](#)