

Rules Set and Working Of Automotive Expert System

Prepared by:

Swapnaneel Nandy(IIT2014111)

Amit Vijay(IIT2014110)

Utkarsh Srivastava(IIT2014507)

Mohd. Abdullah(ISM2014004)

Shivam Beri(IIT2014159)

Rules:

The various rules and decisions used to infer results for our project can be easily visualized using the following five decision trees based on the type of problem:

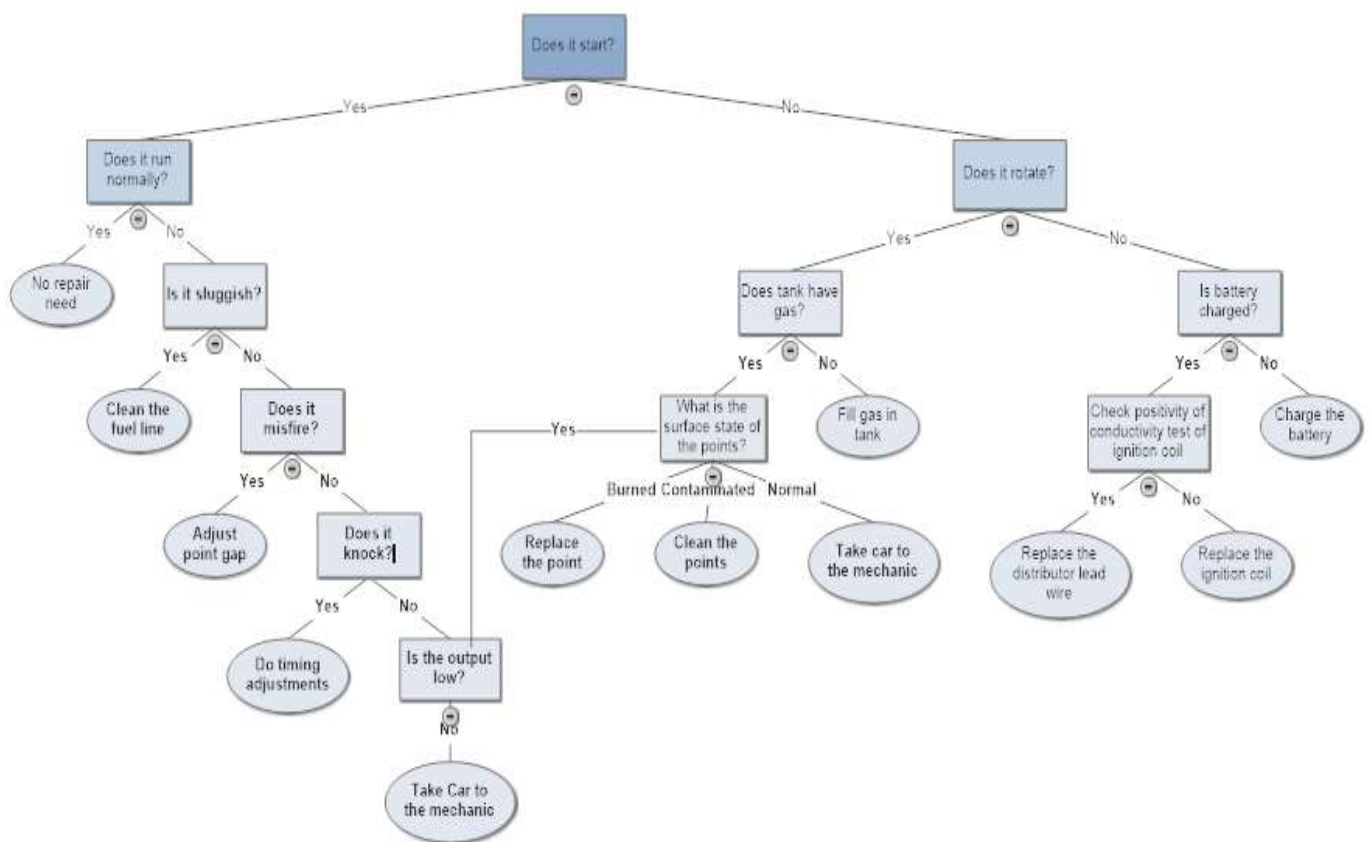


Figure 1: Engine Problems

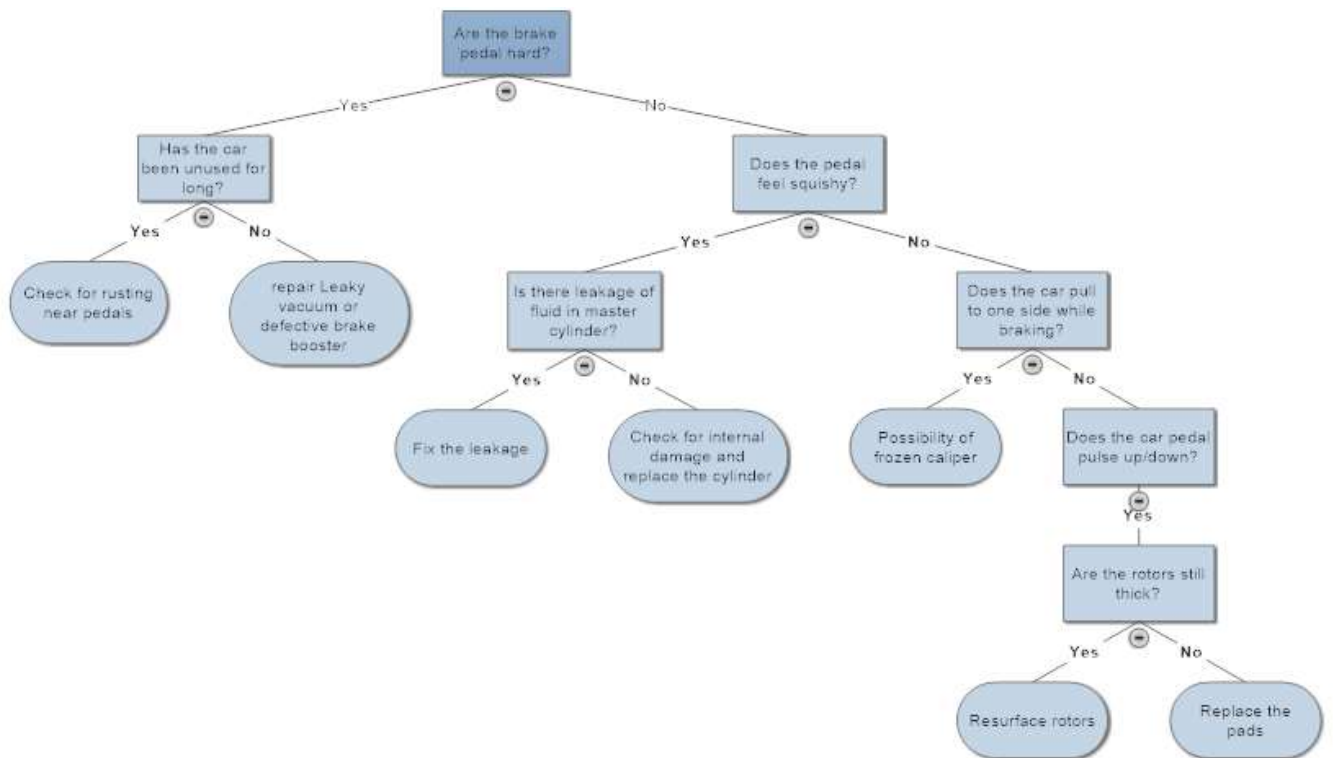


Figure 2: Brake Problems

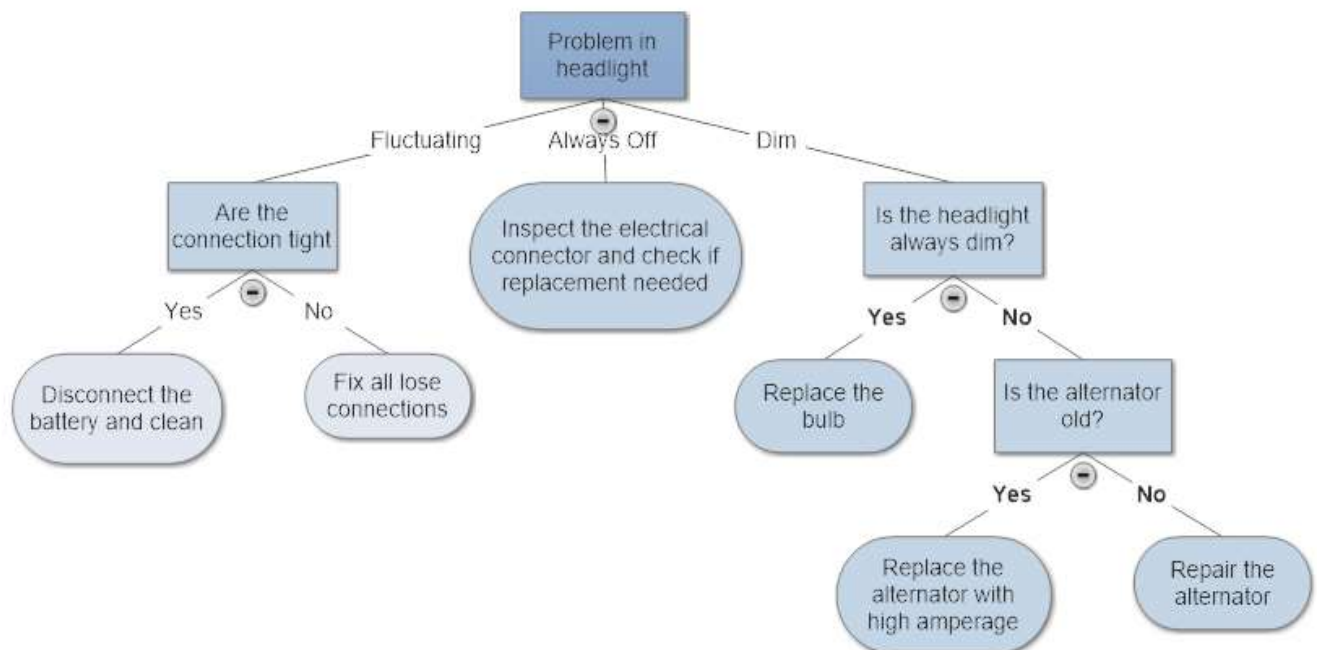


Figure 3: Headlight Problems

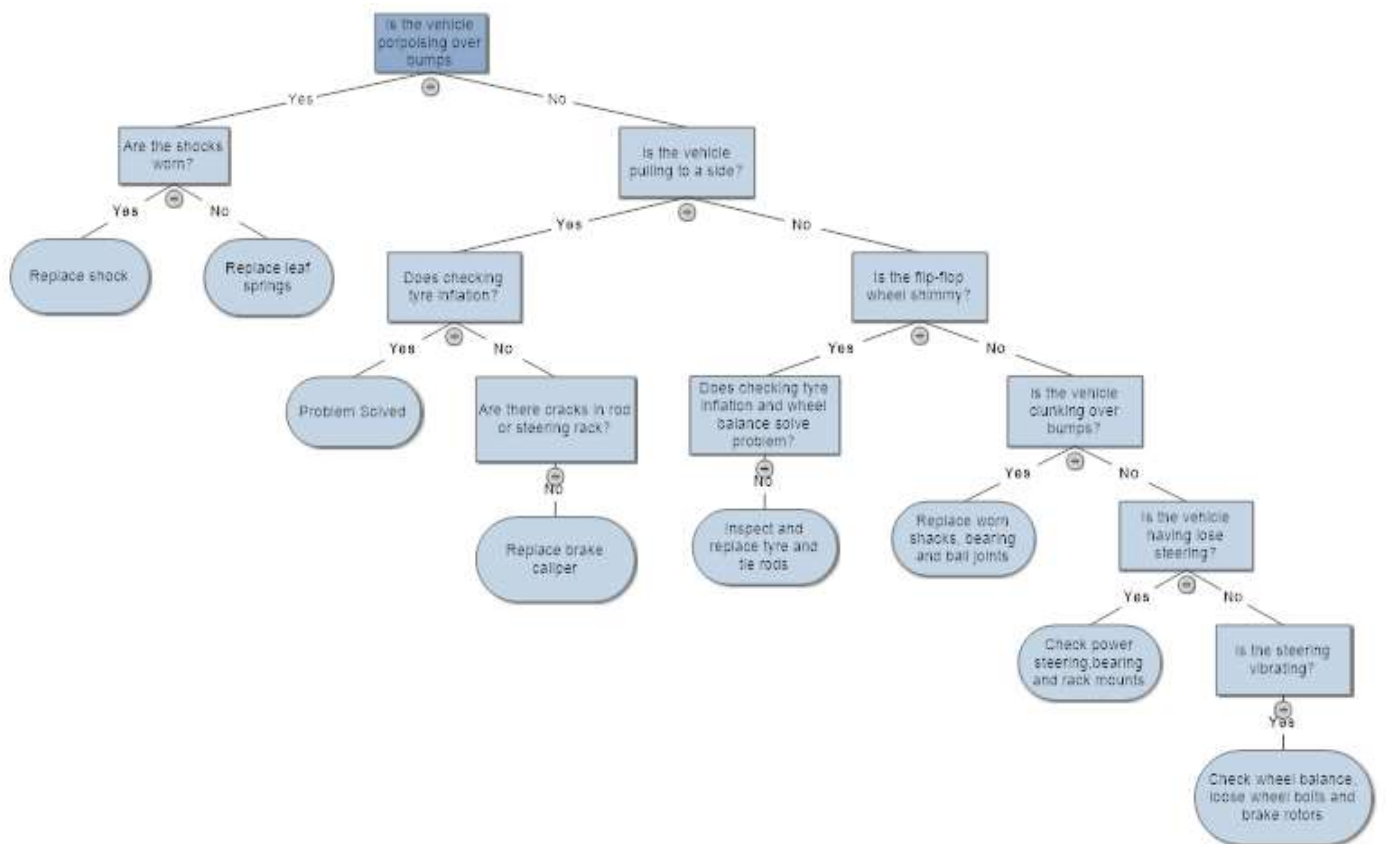


Figure 5: Suspension and Steering Problems

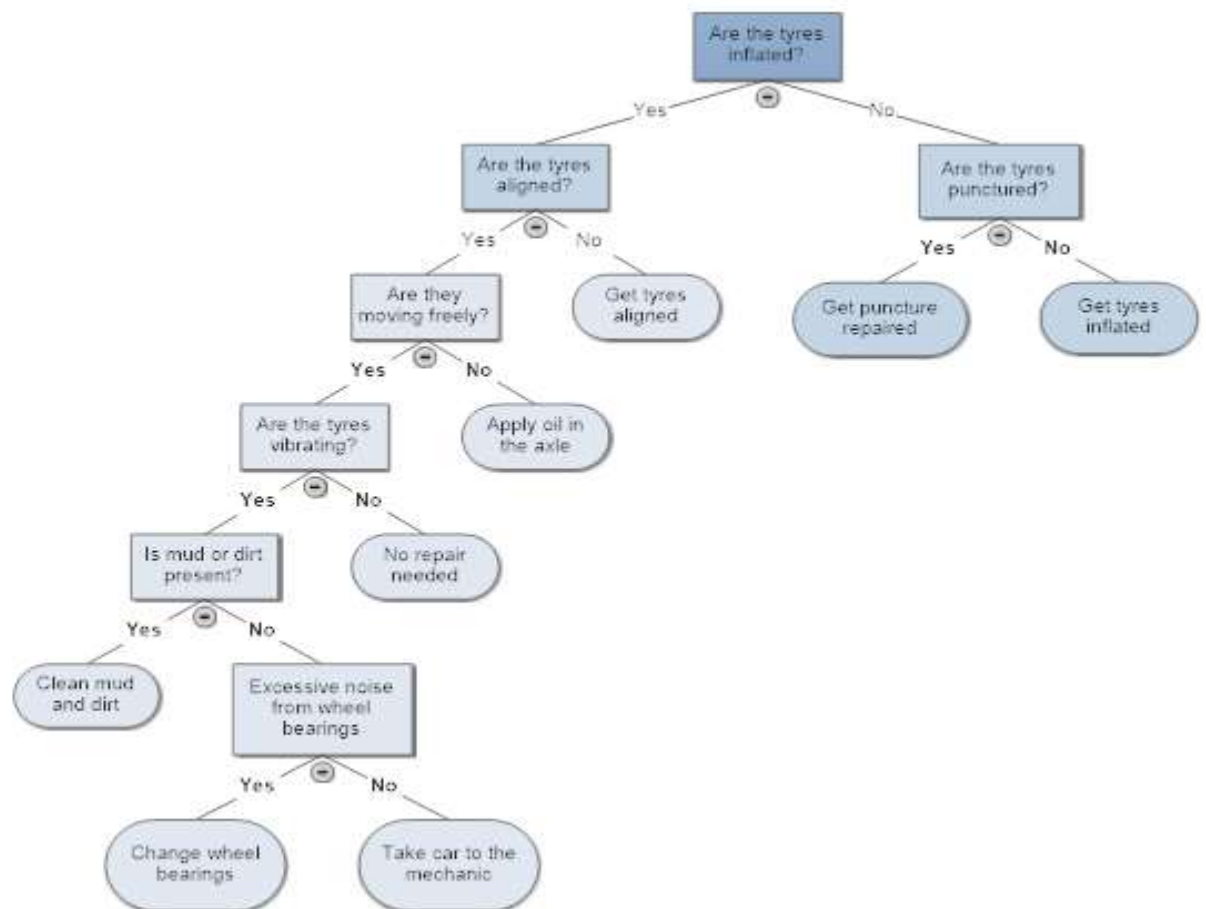


Figure 5:Tyres Problem

Decision Tables:

Based on the above decision trees the following decision tables have been constructed to further visualize each of the inference lines of our expert system:

Table 1:Engine

Starting	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	No
Running normally	Yes	No	No	No	No	X	X	X	X	X	X
Rotate	X	X	X	X	X	Yes	Yes	Yes	Yes	No	No
Sluggish	X	Yes	No	No	No	X	X	X	X	X	X
Misfire	X	X	Yes	No	No	X	X	X	X	X	X
Knock	X	X	X	Yes	No	X	X	X	X	X	X
Low output	X	X	X	X	Yes	X	X	X	X	X	X
Gas in tank	X	X	X	X	X	Yes	Yes	Yes	No	X	X
State of points	X	X	X	X	X	Burned	Normal	Contaminated	X	X	X
Battery Charged	X	X	X	X	X	X	X	X	X	Yes	No
Possible Solution	No repair needed		Clean the fuel line	Adjust the point gap	Do timing adjustments		Replace the point	Take car to mechanic	Clean the points	Fill the gas tank	Charge the battery

Table 2: Suspension and Steering

Porpoising over bumps	Yes	Yes	No	No	No	No	No	No
Shocks worn	Yes	No	X	X	X	X	X	X
Pulling to a side	X	X	Yes	Yes	No	No	No	No
Tyres inflated	X	X	No	Yes	X	X	X	X
Flip flop wheel	X	X	X	X	Yes	No	No	No
Cracks in rod	X	X	No	X	X	X	X	X
Clunking over bumps	X	X	X	X	X	Yes	No	No
Lose steering	X	X	X	X	X	X	Yes	X
Steering vibrating	X	X	X	X	X	X	X	Yes
Possible Solutions	Replace shock	Replace leaf springs	Replace brake caliper	Problem Solved	Inspect and replace tyre or rods	Replace worn shocks	Check power steering bearing	Check wheel balance

Table 3: Brakes

Symptoms							
Brakes hard	YES	YES	NO	NO	NO	NO	NO
Unused for long	YES	NO	X	X	X	X	X
Squishy pedal	X	X	YES	YES	NO	NO	NO
Fluid leakage	X	X	YES	NO	X	X	X
Pull to side while braking	X	X	X	X	YES	NO	NO
Pedal Pulse up/down	X	X	X	X	X	YES	YES
Rotors thick	X	X	X	X	X	YES	NO
Possible Solution	Check for Rusting near pedals	Repair leaky vacuum or defective brake boosters	Fix the leakage	Check for internal damage and repair the cylinder	Possibility of frozen caliper	Resurface rotors	Replace the pads

Table 4:Headlight

Symptoms						
Always Off	YES	NO	NO	NO	NO	NO
Fluctuating	NO	YES	YES	NO	NO	NO
Dim	NO	NO	NO	YES	YES	YES
Connection Tight	X	YES	NO	X	X	X
Headlight Always dim	X	X	X	YES	NO	NO
Old Alternator	X	X	X	X	YES	NO

Possible Solutions	Inspect the electrical connector and check if replacement is needed	Disconnect the battery and clean	Fix all the lose connections	Replace the bulb	Replace the alternator with high amperage	Repair the alternator
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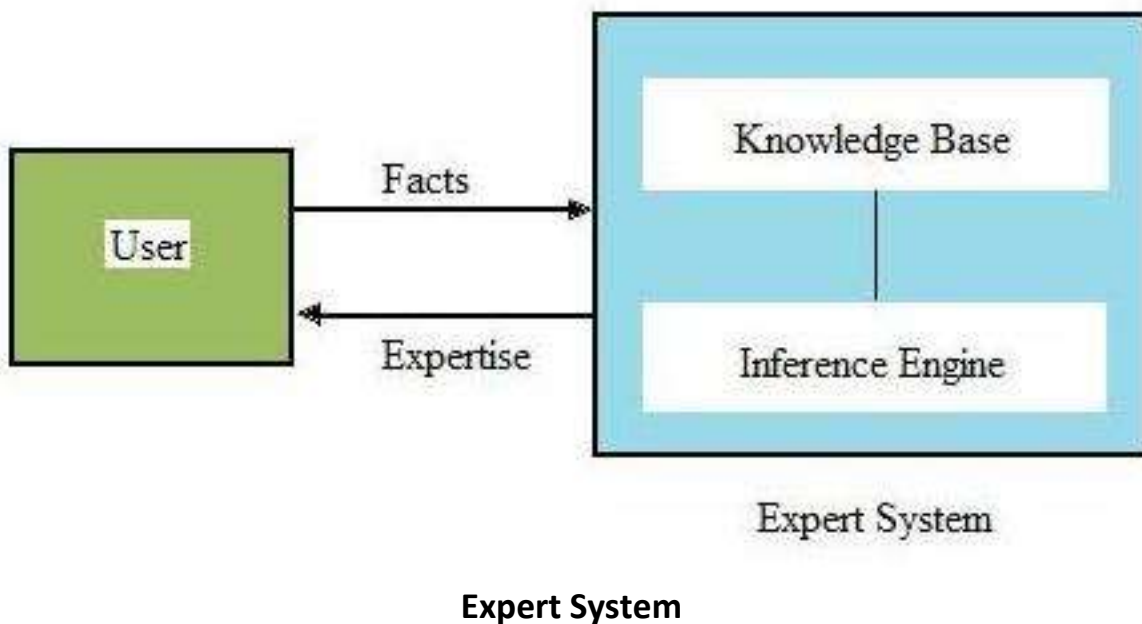
Table 5: Tyres

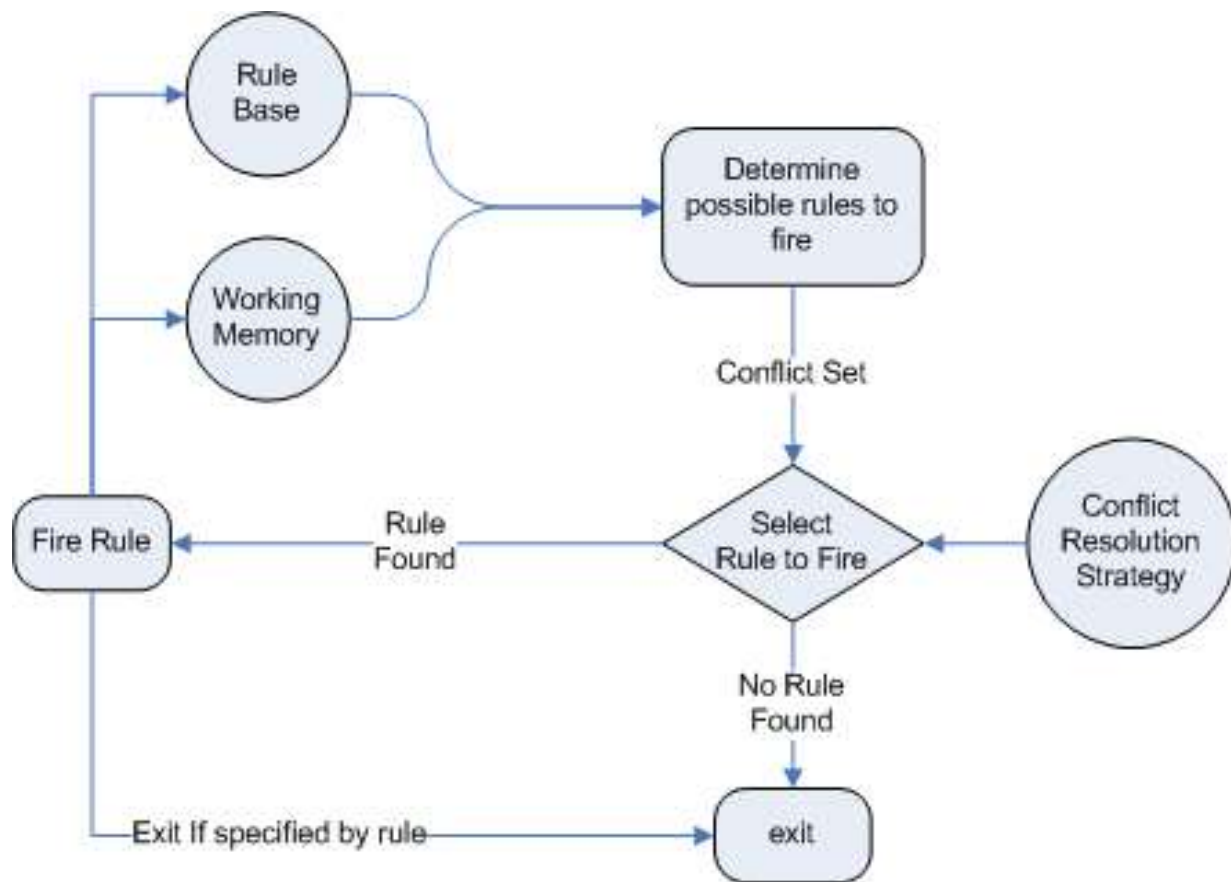
Tyres Infalted	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Tyres Aligned	X	X	No	Yes	Yes	Yes	Yes	Yes
Tyres Punctured	No	Yes	X	X	X	X	X	X
Moving freely	X	X	X	No	Yes	Yes	Yes	Yes
Tyres vibrating	X	X	X	X	No	Yes	Yes	Yes
Mud or dirt present	X	X	X	X	X	Yes	No	No
Noise from bearing	X	X	X	X	X	X	Yes	No
Possible Solution	Get tyres Inflated	Get Puncture Repaired	Get tyres Aligned	Apply oil in tyres	No repair needed	Clean mud	Change wheel bearings	Take car to mechanic

Based on the above drawn tables and decision trees the CLIPS framework infers a result using forward chaining. Forward Chaining is explained as follows.

Forward Chaining:

Forward Chaining is a problem solving technique used by Expert Systems when they are faced with a scenario and have to give a solution or conclusion to this scenario. The system will work its way through the rules, finding which ones fit and which leads to which using Deductive Reasoning.





Forward Chaining