**In-Lecture Group Exercise**

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• Create a Frame-Based Representation and Inference Scheme to diagnose why a car will not start.

• Form groups of at least 2.

• Create a MS Word or PDF document with your frames, slots, INSTANCE-OF slot (as appropriate), IS-A (as appropriate), IF-NEEDED (+ associated procedure pseudo code), IF-ADDED (+ associated procedure pseudo code)

• At top of document list the names of everyone in your group.

• Start the inference process by instantiating a frame. Provide brief (1 to 3 sentences) description of what happens at each step after initial instantiation.

• Submit your document to the “In-Lecture exercise (Frame-Based Rep)” assignment on Canvas.

Make note of the due date.

**Solution:**

⇒ Creating a Frame-Based Representation and Inference Scheme to diagnose why a car will not start is a structured approach to understanding and addressing common car starting issues. Here's a simplified outline for such a representation:

//vehicle is a parent class

Frame 1: Vehicle

Slots:

Type (Car, Truck, etc.)

Make

Model

Year

Number Of wheels

//car is inheriting from parent class vehicle

Frame 2: Car

**IS-A**: Vehicle

Slots:

Make

Model

Year

Number Of Wheels

Fuel Level

Battery Voltage

Engine Condition

Ignition Key Status

Starter Motor Status

Fuel Pump Status

Fuel Filter Status

Fuel Injector Status

Spark Plug Status

Ignition Coil Status

Crankshaft Position Sensor Status

Camshaft Position Sensor Status

//different types of facilities for car maintenance

Frame 3: Facility

Slots:

Type (FuelFacility, WashFacility)

//inherited from facilities that car needs

Frame 4: FuelFacility

**IS-A** - Facility

Slots:

AmountOfFuelAdded[**IF-ADDED{**

If “AmountOfFuelAdded” >0

then “Car.Fuel Level” += “AmountOfFuelAdded”**}]**

//ferrari is an object of car

Frame 5: Ferrari

**INSTANCE-OF -** Car

Slots:

Number Of Wheels: 4

Fuel Level: 1L

FuelStatusCheck:

**[IF-NEEDED**

**{**

If “Fuel Level” < 1L

Then “FuelStatusCheck” = Not OK

Else “FuelStatusCheck” = OK

}]

Battery Voltage: 200V

BatteryStatus:

[**IF-NEEDED**

**{**

If “Battery Voltage” < 240V

then “Car appliances might not work, recharge the battery”, BatteryStatus=Not OK

else “Battery condition” = OK**}]**

Engine Condition: Working

Ignition Key status: working

IgnitionStatusCheck

[**IF-NEEDED**

**{**

If “Ignition Key status” == working

then “IgnitionStatusCheck” = OK

else “IgnitionStatusCheck” = Not OK**}]**

Fuel Pump status: working

***Inference steps :***

1. Instantiation:

* Frame instantiated: Vehicle
* Frame instantiated: Car
* Frame instantiated: Ferrari

2. Inheritance and objects

* Car inherits properties from Vehicle, Car **IS-A**  vehicle
* Ferrari is an instance of Car, hence, Ferrari **INSTANCE-OF** Car

3. Step 1: Fuel Status Check **(IF-NEEDED)**:

* The system checks the "Fuel Level" slot in the Ferrari frame.
* IF "Fuel Level < 1L," the FuelStatusCheck is Not OK
* IF "Fuel Level is sufficient," the system confirms, FuelStatusCheck = OK

4. Step 2: Ignition Status Check **(IF-NEEDED**):

* The system checks the "IgnitionStatusCheck" slot in the Ferrari frame.
* IF "Ignition Key status" is “working” then system states, "Ignition Status Check is OK."
* IF "Ignition Key status" is not working the system recommends, "ignition Status Check is Not OK."

5. Step 3: Fuel Level Update (**IF-ADDED**):

* The system checks if an "AmountOfFuelAdded" is greater than 0.
* IF "AmountOfFuelAdded > 0," the system updates the "Fuel Level" by adding the specified amount.

6. Step 4: Battery Voltage Check (**IF-NEEDED**):

* The system checks if the “Battery Voltage” is less than 240V
* If the Battery Voltage < 240V, the system states that the battery might need a recharge, as the internal appliance won’t work as expected and car might malfunction. And applies to BatteryStatus.
* If the battery voltage >=240V, then the system states that the “Battery condition is OK”. and updates the property BatteryStatus.

At each step, the system evaluates specific conditions related to the Ferrari's attributes, providing recommendations, or confirming the status based on the IF-NEEDED and IF-ADDED procedures. These steps are part of the diagnostic and maintenance process for the Ferrari.