

Ahsanullah University of Science and Technology

Department of Computer Science and Engineering



Term Assignment: 1

CSE 4108

Artificial Intelligence

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Q: Implementation of Forward Chaining Approach in python.

Answer:

Forward Chaining Approach:

- The Forward-chaining approach is a process of making a conclusion based on known facts or data, by starting from the initial state and reaches the goal state.
- It starts its journey from the given knowledge base. If all the premises of the implication are known, then its conclusion will be added to the set of known facts.
- It is also called a data-driven algorithm as we reach to the goal using available data.

Input:

Input 1:

Let the goal is to conclude if a lathe requires a power source or not.

Given that,

1. If x is power-driven then x requires a power source.
2. If x is a machine tool then x has a tool holder.
3. If x is a machine tool then x is power-driven.

So,

```
rules={  
    "power-source" : ["power-driven"],  
    "tool-holder" : ["machine-tool"],  
    "power-driven": ["machine-tool"],  
}
```

And the followings fact is given,

1. A lathe is a machine.

So,

```
facts=["lathe", "machine-tool"]
```

Input 2:

Let the following facts and rules are given. Then, is m in the knowledge base (KB) or not.

```
facts= ['a','b','c','d']
```

```
rules={
```

```
    'q' : ['p'],  
    'p' : ['c','l'], 'P' : ['d','m'],  
    'm' : ['b','l'],  
    'l' : ['a','p'], 'l' : ['a','b'],  
    'g' : ['a','d'],  
    'c' : ['g','b']  
}
```

Major Steps of Processing:

1. At first, we check all the facts. If the input presents in KB then we can say the goal is proven.

```
input= input(str("Enter the goal: "))

if input in facts:
    print("\n")
    print(input + " found in kb")
```

2. If the goal is not in the KB, we take every fact and check whether the fact is present in the premises of the rules.
3. Here, a dictionary is maintained for rules where keys are the conclusion, and the values are the premises.
4. If the facts satisfy the premises , the conclusion will be added as a fact in the KB.
5. The process will be continued until all the facts are checked. It is a complete process as all atomic facts/ sentences will be derived from it. The process will be terminated when the goal is found in KB otherwise.

```
else:
    for f in facts:
        if input in facts:
            print("\n")
            print(input + " found in kb")
            break;
        for (k,v) in rules.items():
            if(len(v)==1) :
                if v[0] in facts and k not in facts:
                    facts.append(k)
                    print(k + " is generated")
            if(len(v)==2):
                if v[0] in facts and v[1] in facts and k not in facts:
                    facts.append(k)
                    print(k + " is generated")

print("\n All the facts are following: " )
print(facts)
```

Output:

Output 1:

```
Run: forward-chaining-2 x
E:\Anaconda3\python.exe "F:/4.1/ai lab/term assignment 1/Term Assignment python/forward-chaining-2.py"
Enter the goal: power-source
tool-holder is generated
power-driven is generated
power-source is generated

power-source found in kb

All the facts are following:
['lathe', 'machine-tool', 'tool-holder', 'power-driven', 'power-source']

Process finished with exit code 0
```

Output 2:

```
Run: forward-chaining-2 x
E:\Anaconda3\python.exe "F:/4.1/ai lab/term assignment 1/Term Assignment python/forward-chaining-2.py"
Enter the goal: m
l is generated
g is generated
m is generated

m found in kb

All the facts are following:
['a', 'b', 'c', 'd', 'l', 'g', 'm']

Process finished with exit code 0
|
```