

Artificial and Computational Intelligence

Assignment 2 - Problem Statement 5

Contributors

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2. Logic Design and Inferencing in Prolog

We have designed the rules in Prolog. For each leaf node we must have a rule.

Since we made it interactive where we take the sensor reading based on previous sensor reading. For example. If a5 is false, we don't need to have sensor reading from all 10 sensors. Same way sensor a3, a6 and a7 reading are not required to take decision.

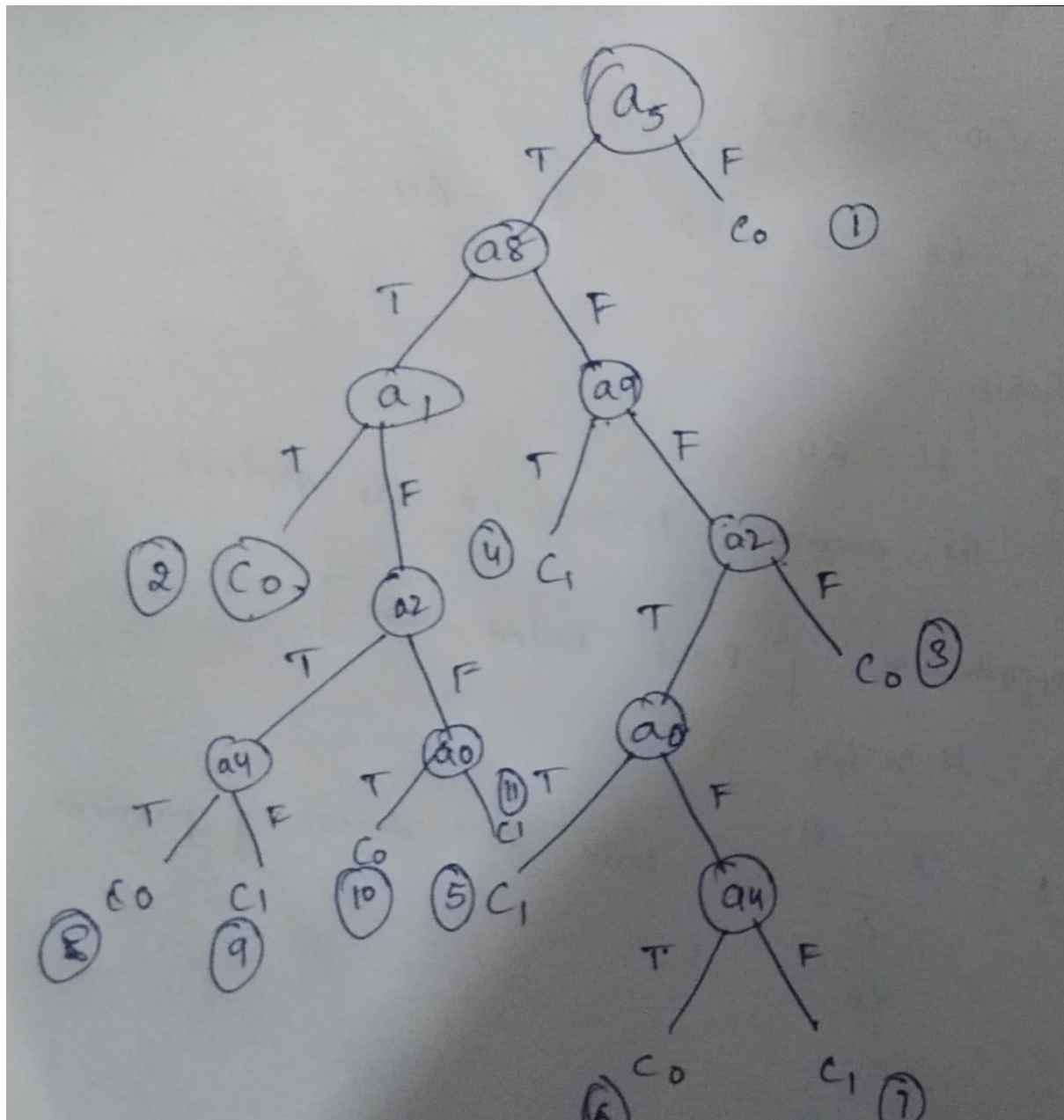
The Decision tree given below,

Decision tree as below

```
a5 = false: c0 (44.0/2.0)
a5 = true
| a8 = false
| | a9 = false
| | | a2 = false: c0 (4.0/1.0)
| | | a2 = true
| | | | a0 = false
| | | | | a4 = false: c1 (2.0)
| | | | | a4 = true: c0 (2.0)
| | | | a0 = true: c1 (5.0)
| | a9 = true: c1 (15.0/1.0)
| a8 = true
| | a1 = false
| | | a2 = false
| | | | a0 = false: c1 (4.0/1.0)
| | | | a0 = true: c0 (3.0)
| | | a2 = true
| | | | a4 = false: c1 (5.0)
| | | | a4 = true: c0 (2.0)
| | a1 = true: c0 (14.0/2.0)
```

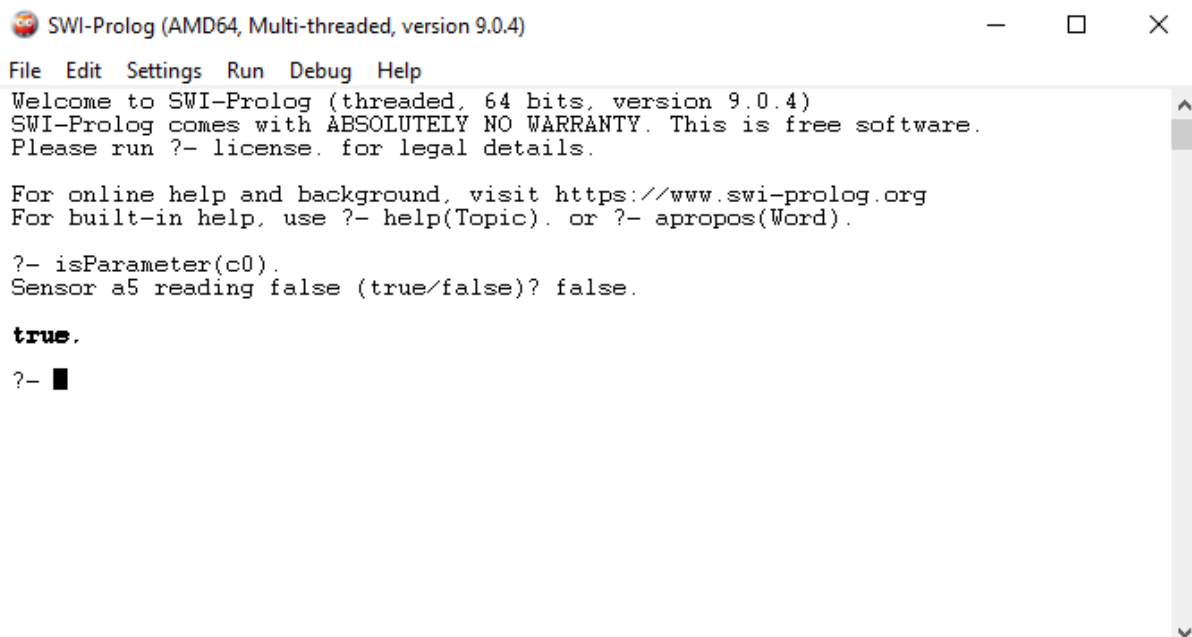
For testing we have used all the paths of decision tree which reaches to the leaf nodes

We have noted test cases below, and numbered the testcases we have 11 leaf nodes.



Test 1:

A5 = False



```
SWI-Prolog (AMD64, Multi-threaded, version 9.0.4)
File Edit Settings Run Debug Help
Welcome to SWI-Prolog (threaded, 64 bits, version 9.0.4)
SWI-Prolog comes with ABSOLUTELY NO WARRANTY. This is free software.
Please run ?- license. for legal details.

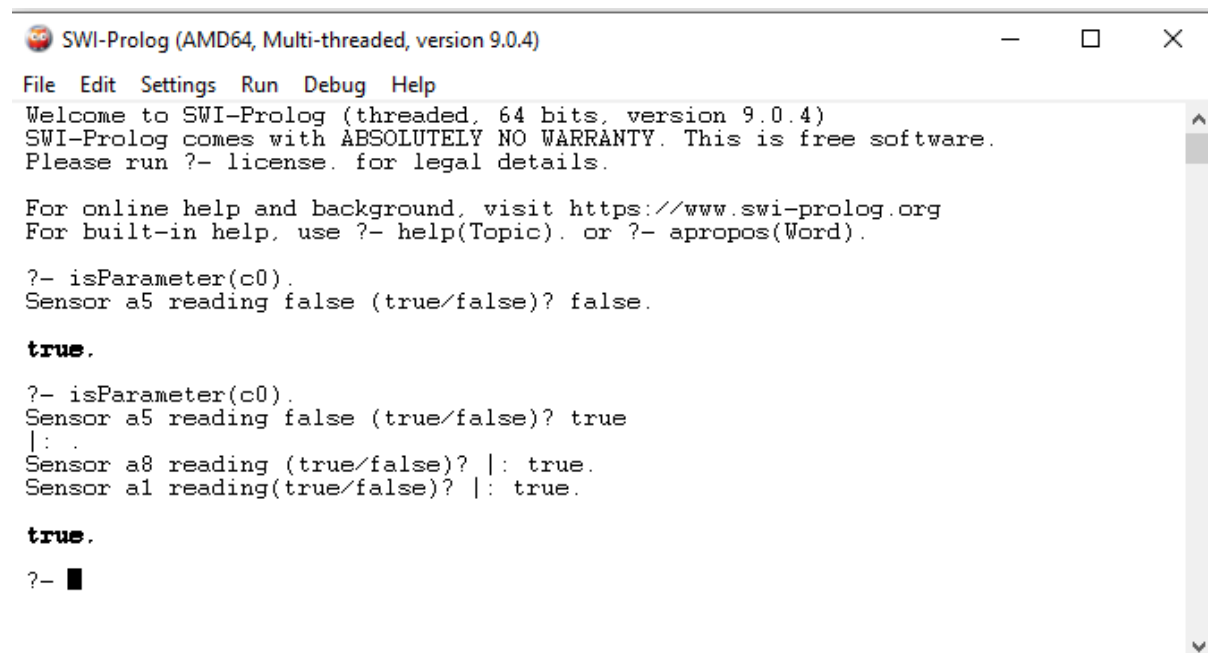
For online help and background, visit https://www.swi-prolog.org
For built-in help, use ?- help(Topic). or ?- apropos(Word).

?- isParameter(c0).
Sensor a5 reading false (true/false)? false.

true.
?- █
```

Test 2

A5 = True, a8 = true and a1= true



```
SWI-Prolog (AMD64, Multi-threaded, version 9.0.4)
File Edit Settings Run Debug Help
Welcome to SWI-Prolog (threaded, 64 bits, version 9.0.4)
SWI-Prolog comes with ABSOLUTELY NO WARRANTY. This is free software.
Please run ?- license. for legal details.

For online help and background, visit https://www.swi-prolog.org
For built-in help, use ?- help(Topic). or ?- apropos(Word).

?- isParameter(c0).
Sensor a5 reading false (true/false)? false.

true.
?- isParameter(c0).
Sensor a5 reading false (true/false)? true
|: .
Sensor a8 reading (true/false)? |: true.
Sensor a1 reading(true/false)? |: true.

true.
?- █
```

Test 3

A5= true, a8= false, a9= false, a2= false

For built-in help, use ?- help(Topic). or ?- apropos(Word).

```
?- isParameter(c0).
Sensor a5 reading false (true/false)? false.

true.

?- isParameter(c0).
Sensor a5 reading false (true/false)? true
|: .
Sensor a8 reading (true/false)? |: true.
Sensor a1 reading(true/false)? |: true.

true.

?- isParameter(c0).
Sensor a5 reading false (true/false)? true.
Sensor a8 reading (true/false)? |: false.
Sensor a9 reading (true/false)? |: false.
Sensor a2 reading(true/false)? |: false.

true.

?- █
```

Test 4

A5=true, a8= false, a9 = true

Sensor a9 reading (true/false)? |: true.

true.

```
?-
% d:/mtech/sem2/aci/assignment-2/part2 compiled 0.00 sec, -3 clauses
?-
| isParameter(c0).
Sensor a5 reading false (true/false)? true
|: .
Sensor a8 reading (true/false)? |: false.
Sensor a9 reading (true/false)? |: false.
Sensor a2 reading(true/false)? |: true,
|: .
```

ERROR: Stream user_input:43:9 Syntax error: Unexpected `,' before `.'

```
?- isParameter(c0).
Sensor a5 reading false (true/false)? true.
Sensor a8 reading (true/false)? |: false.
Sensor a9 reading (true/false)? |: true.
```

false.

```
?- █
```

Test 5

A5 = true, a8=false, a9=false, a2=true,a0=true

```
SWI-Prolog (AMD64, Multi-threaded, version 9.0.4)
File Edit Settings Run Debug Help
false.

?- isParameter(c0).
Sensor a5 reading false (true/false)? true
|: .
Sensor a8 reading (true/false)? |: false.
Sensor a9 reading (true/false)? |: false.
Sensor a2 reading(true/false)? |: true.
Sensor a0 reading(true/false)? |: true.

true.

?-
% d:/mtech/sem2/aci/assignment-2/part2 compiled 0.02 sec, 0 clauses
?- isParameter(c0).
Sensor a5 reading false (true/false)? true.
Sensor a8 reading (true/false)? |: false.
Sensor a9 reading (true/false)? |: false.
Sensor a2 reading(true/false)? |: true.
Sensor a0 reading(true/false)? |: true.

false.

?- █
```

Test 6

A5 = true, a8=false, a9=false, a2=true,a0=false, a4=true

```
SWI-Prolog (AMD64, Multi-threaded, version 9.0.4)
File Edit Settings Run Debug Help

?-
% d:/mtech/sem2/aci/assignment-2/part2 compiled 0.02 sec, 0 clauses
?- isParameter(c0).
Sensor a5 reading false (true/false)? true.
Sensor a8 reading (true/false)? |: false.
Sensor a9 reading (true/false)? |: false.
Sensor a2 reading(true/false)? |: true.
Sensor a0 reading(true/false)? |: true.

false.

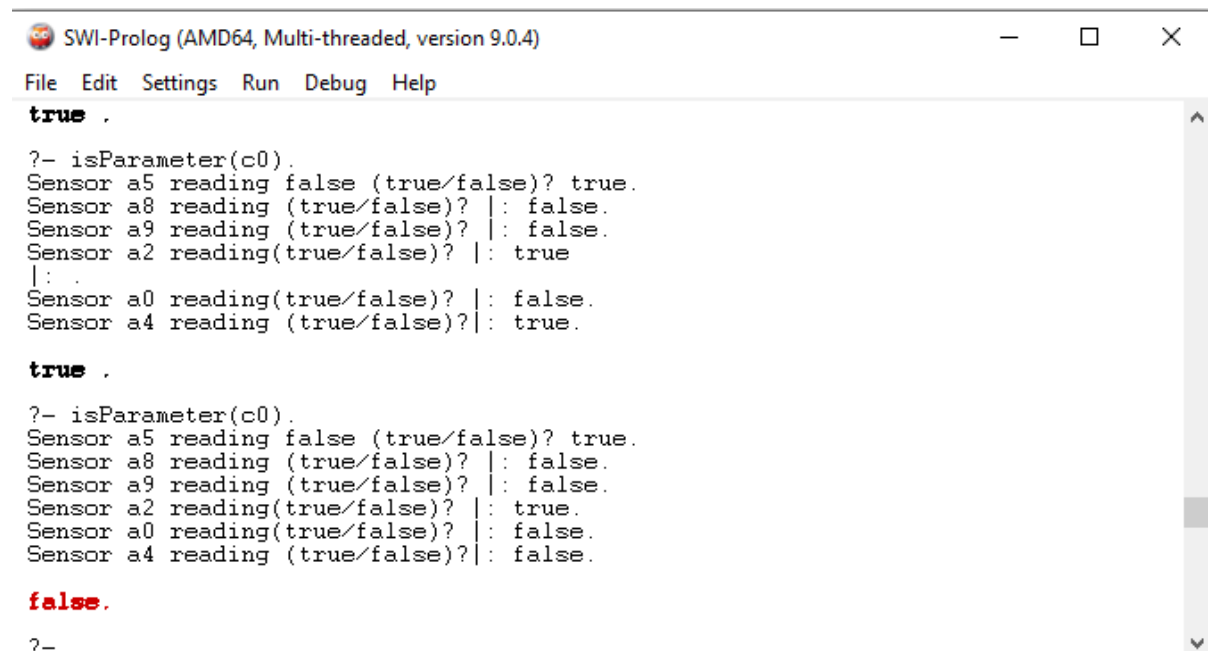
?- isParameter(c0).
Sensor a5 reading false (true/false)? true
|: .
Sensor a8 reading (true/false)? |: false.
Sensor a9 reading (true/false)? |: false.
Sensor a2 reading(true/false)? |: true.
Sensor a0 reading(true/false)? |: false.
Sensor a4 reading (true/false)? |: true.

true .

?- █
```

Test 7

A5 = true, a8=false, a9=false, a2=true,a0=false, a4=false



```
SWI-Prolog (AMD64, Multi-threaded, version 9.0.4)
File Edit Settings Run Debug Help

true .

?- isParameter(c0).
Sensor a5 reading false (true/false)? true.
Sensor a8 reading (true/false)? |: false.
Sensor a9 reading (true/false)? |: false.
Sensor a2 reading(true/false)? |: true
|: .
Sensor a0 reading(true/false)? |: false.
Sensor a4 reading (true/false)? |: true.

true .

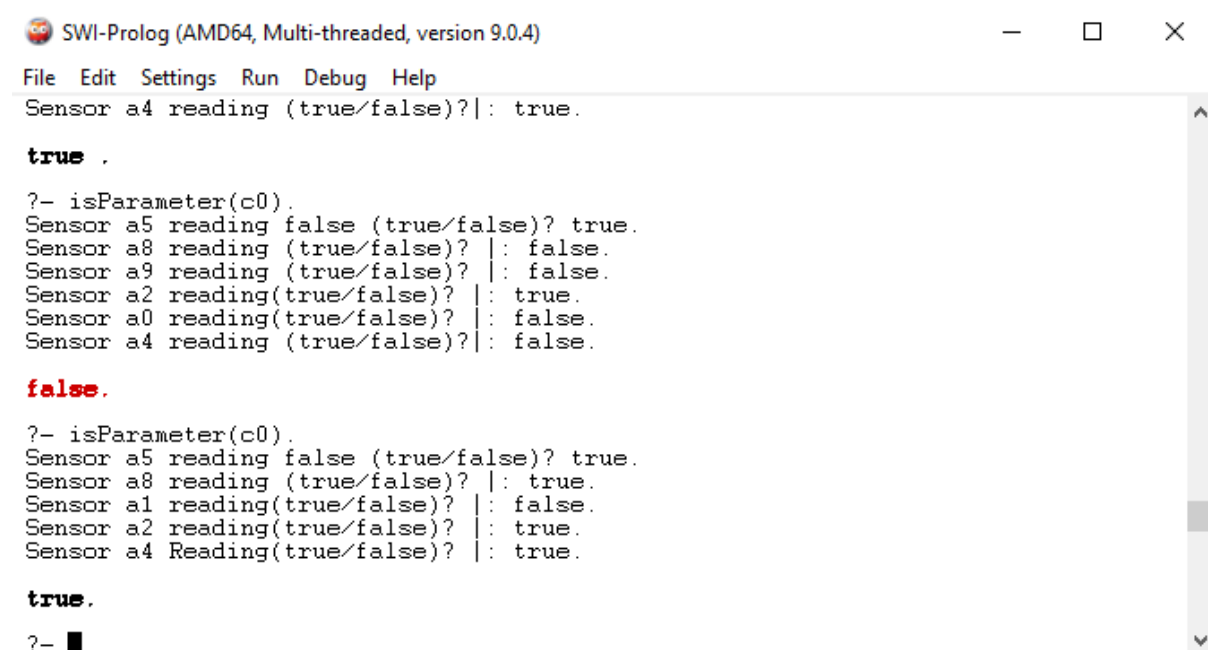
?- isParameter(c0).
Sensor a5 reading false (true/false)? true.
Sensor a8 reading (true/false)? |: false.
Sensor a9 reading (true/false)? |: false.
Sensor a2 reading(true/false)? |: true.
Sensor a0 reading(true/false)? |: false.
Sensor a4 reading (true/false)? |: false.

false.

?-
```

Test 8

A5 = true, a8= true, a1=false,a2=true,a4=true



```
SWI-Prolog (AMD64, Multi-threaded, version 9.0.4)
File Edit Settings Run Debug Help

Sensor a4 reading (true/false)? |: true.

true .

?- isParameter(c0).
Sensor a5 reading false (true/false)? true.
Sensor a8 reading (true/false)? |: false.
Sensor a9 reading (true/false)? |: false.
Sensor a2 reading(true/false)? |: true.
Sensor a0 reading(true/false)? |: false.
Sensor a4 reading (true/false)? |: false.

false.

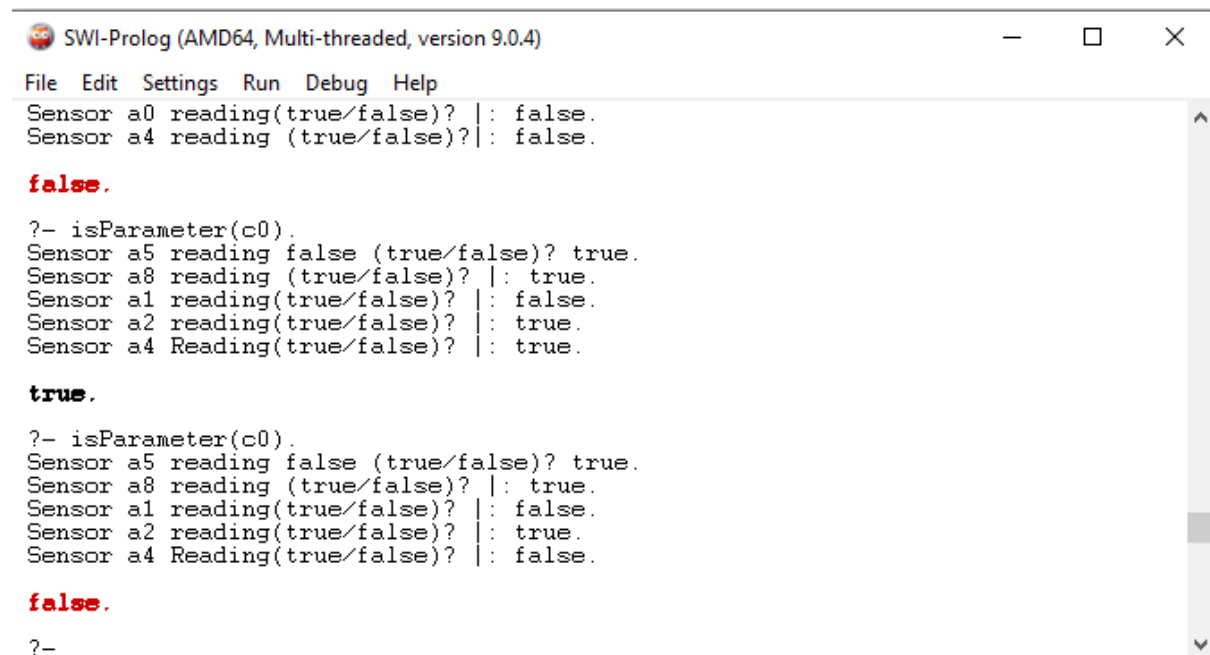
?- isParameter(c0).
Sensor a5 reading false (true/false)? true.
Sensor a8 reading (true/false)? |: true.
Sensor a1 reading(true/false)? |: false.
Sensor a2 reading(true/false)? |: true.
Sensor a4 Reading(true/false)? |: true.

true.

?- █
```

Test 9

A5 = true, a8= true, a1=false,a2=true,a4=false



```
SWI-Prolog (AMD64, Multi-threaded, version 9.0.4)
File Edit Settings Run Debug Help
Sensor a0 reading(true/false)? |: false.
Sensor a4 reading (true/false)? |: false.

false.

?- isParameter(c0).
Sensor a5 reading false (true/false)? true.
Sensor a8 reading (true/false)? |: true.
Sensor a1 reading(true/false)? |: false.
Sensor a2 reading(true/false)? |: true.
Sensor a4 Reading(true/false)? |: true.

true.

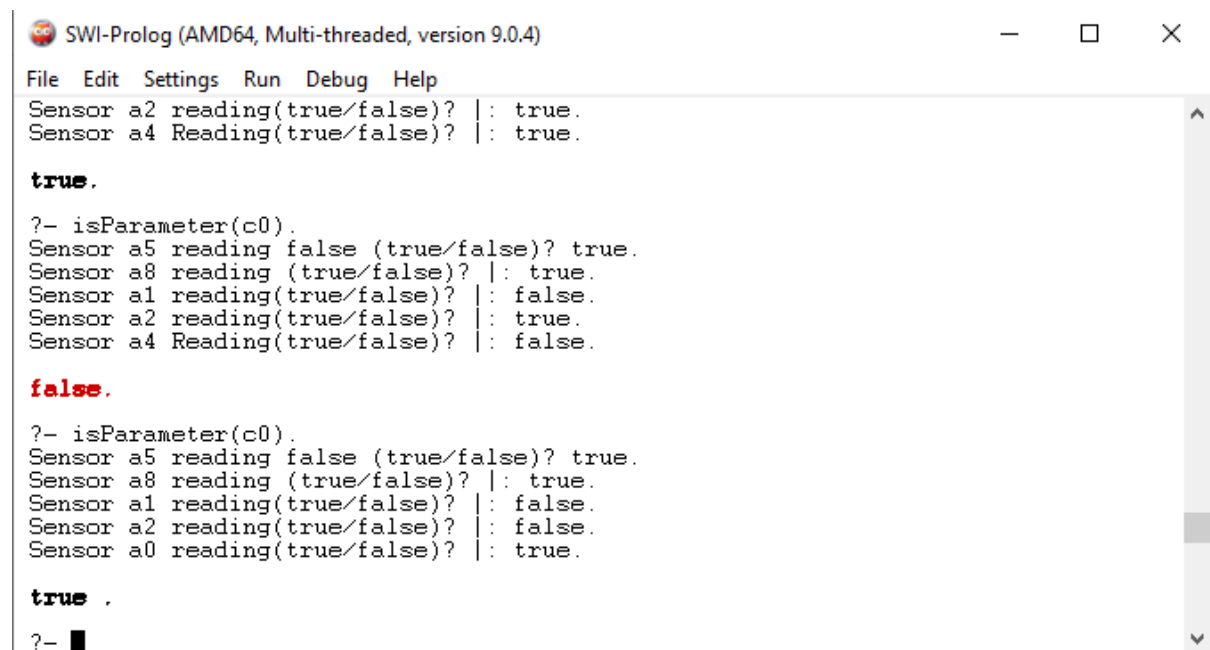
?- isParameter(c0).
Sensor a5 reading false (true/false)? true.
Sensor a8 reading (true/false)? |: true.
Sensor a1 reading(true/false)? |: false.
Sensor a2 reading(true/false)? |: true.
Sensor a4 Reading(true/false)? |: false.

false.

?-
```

Test 10

A5 = true, a8= true, a1=false, a2=false, a0=true



```
SWI-Prolog (AMD64, Multi-threaded, version 9.0.4)
File Edit Settings Run Debug Help
Sensor a2 reading(true/false)? |: true.
Sensor a4 Reading(true/false)? |: true.

true.

?- isParameter(c0).
Sensor a5 reading false (true/false)? true.
Sensor a8 reading (true/false)? |: true.
Sensor a1 reading(true/false)? |: false.
Sensor a2 reading(true/false)? |: true.
Sensor a4 Reading(true/false)? |: false.

false.

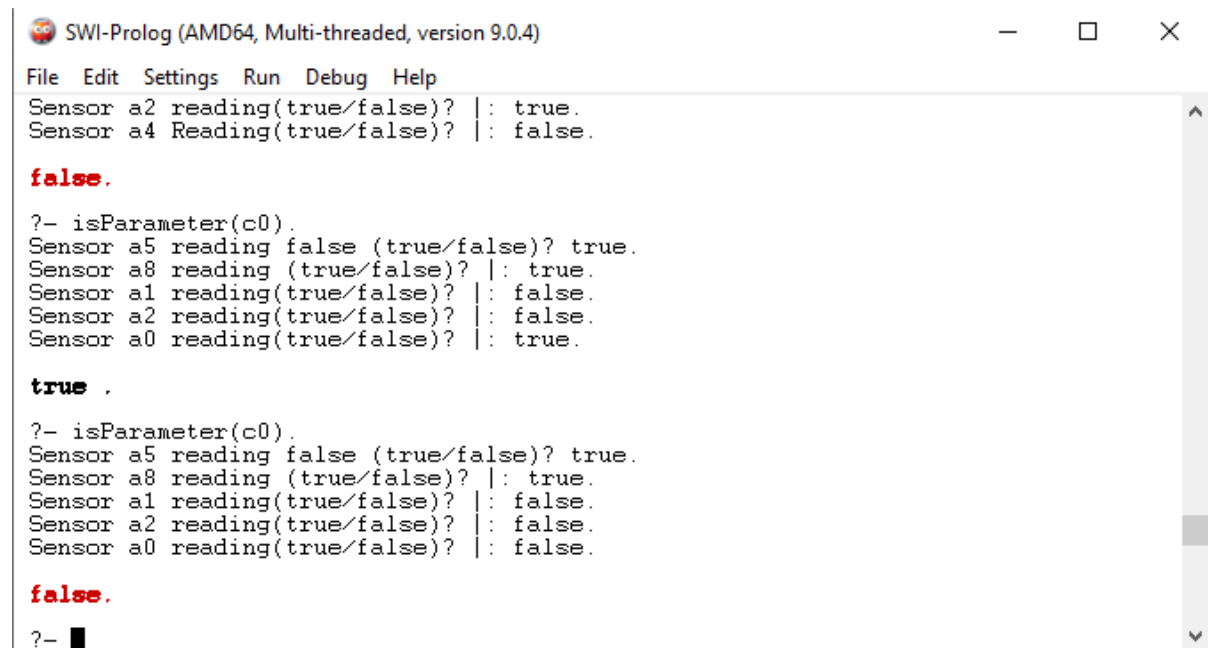
?- isParameter(c0).
Sensor a5 reading false (true/false)? true.
Sensor a8 reading (true/false)? |: true.
Sensor a1 reading(true/false)? |: false.
Sensor a2 reading(true/false)? |: false.
Sensor a0 reading(true/false)? |: true.

true .

?- █
```


Test 11

A5 = true, a8= true, a1=false, a2=false, a0=false



```
SWI-Prolog (AMD64, Multi-threaded, version 9.0.4)
File Edit Settings Run Debug Help
Sensor a2 reading(true/false)? |: true.
Sensor a4 Reading(true/false)? |: false.

false.

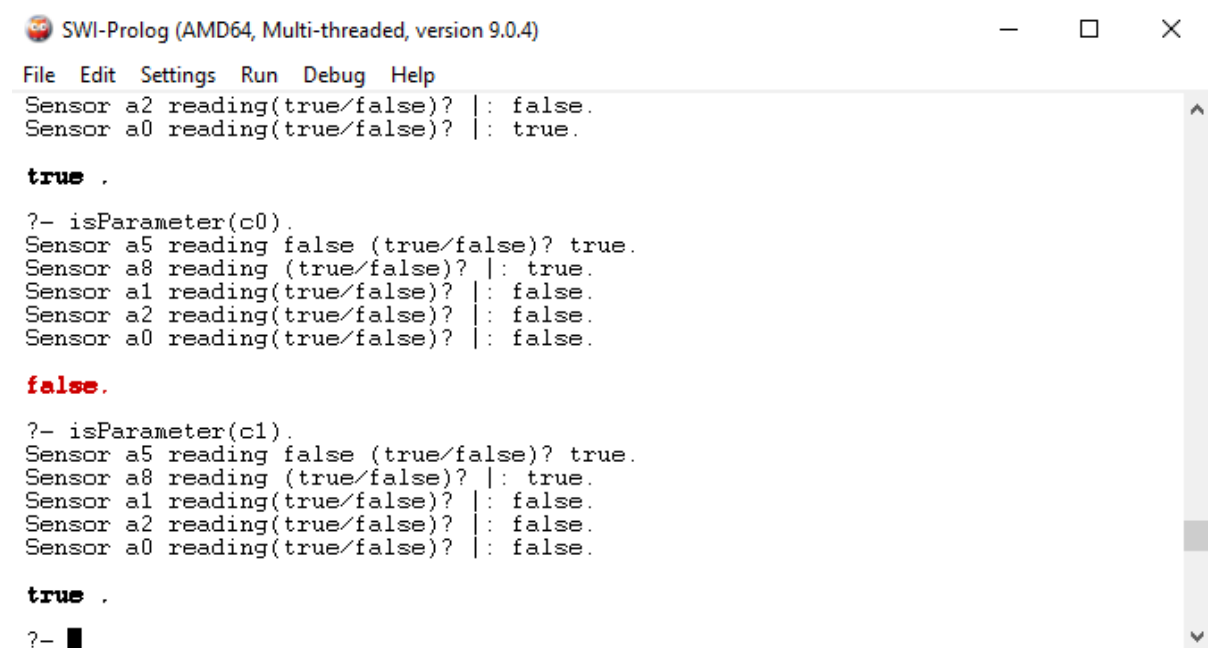
?- isParameter(c0).
Sensor a5 reading false (true/false)? true.
Sensor a8 reading (true/false)? |: true.
Sensor a1 reading(true/false)? |: false.
Sensor a2 reading(true/false)? |: false.
Sensor a0 reading(true/false)? |: true.

true .

?- isParameter(c0).
Sensor a5 reading false (true/false)? true.
Sensor a8 reading (true/false)? |: true.
Sensor a1 reading(true/false)? |: false.
Sensor a2 reading(true/false)? |: false.
Sensor a0 reading(true/false)? |: false.

false.

?-
```



```
SWI-Prolog (AMD64, Multi-threaded, version 9.0.4)
File Edit Settings Run Debug Help
Sensor a2 reading(true/false)? |: false.
Sensor a0 reading(true/false)? |: true.

true .

?- isParameter(c0).
Sensor a5 reading false (true/false)? true.
Sensor a8 reading (true/false)? |: true.
Sensor a1 reading(true/false)? |: false.
Sensor a2 reading(true/false)? |: false.
Sensor a0 reading(true/false)? |: false.

false.

?- isParameter(c1).
Sensor a5 reading false (true/false)? true.
Sensor a8 reading (true/false)? |: true.
Sensor a1 reading(true/false)? |: false.
Sensor a2 reading(true/false)? |: false.
Sensor a0 reading(true/false)? |: false.

true .

?-
```