Faculty of Computers, Informatics and Microelectronics

Technical University of Moldova

PLIA

Laboratory work # 3

Expert system in Prolog.

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Contents

1 Introduction

1.1 Topic

The aim is to study the design principles and organizing logic based expert systems rules.

1.2 Tasks

Based on material from the course and the examples of expert system discussed below study implementation of both types of expert systems using Prolog.
Developing an expert system for a specific area is selected in accordance with the number of the taks of Table, or any another area. The number of objects described should be at least 12, and a description of their attributes, it less than 8. Review the realization of an expert system based on logic and expert system which is based the rules, deductive and inductive making mechanism.

1.3 Report

Report will containt a short description of work done, and will present necessary information about tools, algorithms used or studied.

2 Theory

2.1 Definition

Expert System (ES) is a program (software package) that simulates to some extent the activity of a human expert in a particular field. Moreover, this area is strictly limited. The main goal of SE is to consult in the field for which it is designed.
An SE consists of three main components:

- **Knowledge Base** (BC). BC - the central part of the expert system. It contains a collection of facts and knowledge (rules) for extracting other knowledge. The information contained in the knowledge base used by SE to determine the response during the consultation. Usually, BC are separate from the main program or other fixed assets.
- **The mechanism (motor) inference.** MI contains descriptions of the application of knowledge contained in the knowledge base. During the consultation, MI SE starts working, meeting rules determine the acceptability of the solution found and forward the results to the system interface (System User Interface).
- **User System Interface** (HPI) is part of the SE, which interacts with the user. ISU functions include: receiving information from the user, the transfer results in the most convenient form of user explain the results received from SE (provides information on achieving results).

2.2 Determining the outcome (response) expert

The conclusion means proof that the set of assumptions should work. Logic of obtaining response (conclusion) specified by the rules of inference. The conclusion (result) is performed by searching and comparison of the model.

In SE, rule-based questions (goals) the user is converted into a form that is comparable with the rules of the form BC. Inference Engine initiates the process of linking the rule The "top" (top). Recourse to the rules is called "call". Calling the relevant rules in the correlation continues as long as there was no comparison or BC is not exhausted, and no value is found. If MI detects that you can call more than one rule, then start settlement process. In conflict resolution priority is given, usually rules which are more specific or more rules to consider current data.

3 Implementation

The given task was implemented with the help of *SYSEXP* softare fo generating *Expert Systems.* The following expert system is implemented to recommend the brand of the future mobile device based on customer needs and preferences.

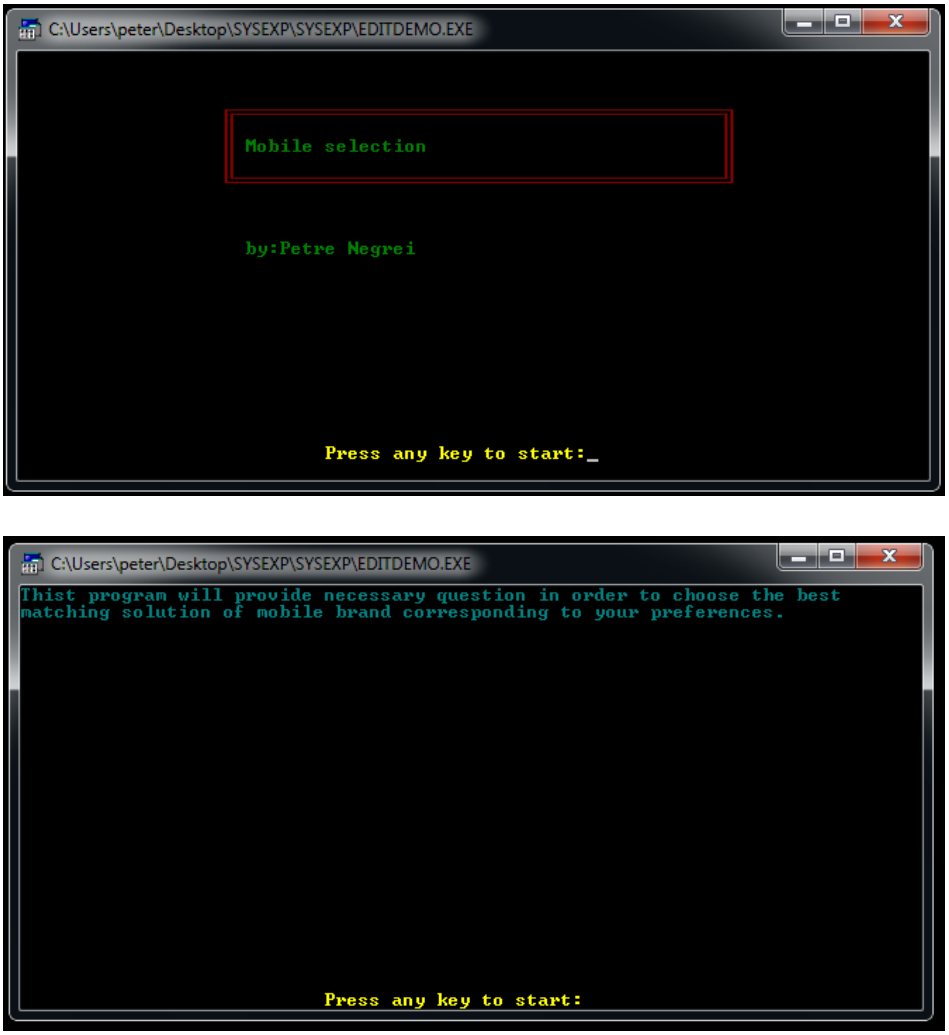
The following parameters were considered:

- A range of 0 -10 where 0 indicates absolutely not and 10 indicates absolutely certain. 1-9 indicate degrees of certainty.
  Whis means that for each of the proposed options will be assigned a value from 0 to 10, which will mean the compatibility with the question proposed. I mean, if you have the value 10, the solution will be sought and the system will cease to look for other possible solutions, and if you have the value 0 - the system will cease May to calculate the probability that element for this value, because it will not meet the criteria.
- Attempt to apply all possible rules The system will ask 12 most important questions that would help select the brand of mobile device. as needed ofr preferences. These questions are offered two possible answers. The first variant will be treated condition "THEN" and the second variant in condition "ELSE."

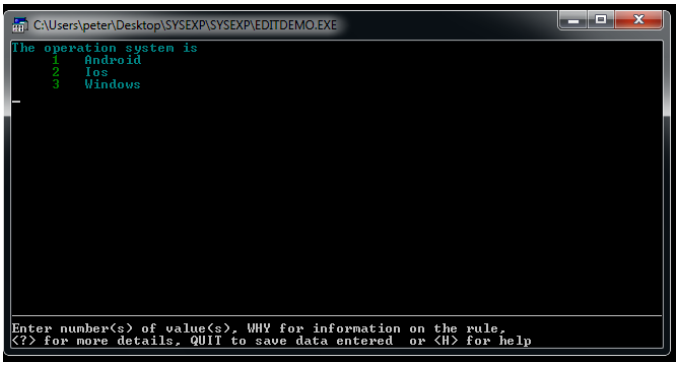
- Acer
- Samsung
- Apple
- ASUS
- Fly
- HTC
- Huawei
- Sony
- Lenovo
- LG
- Nokia
- Philips

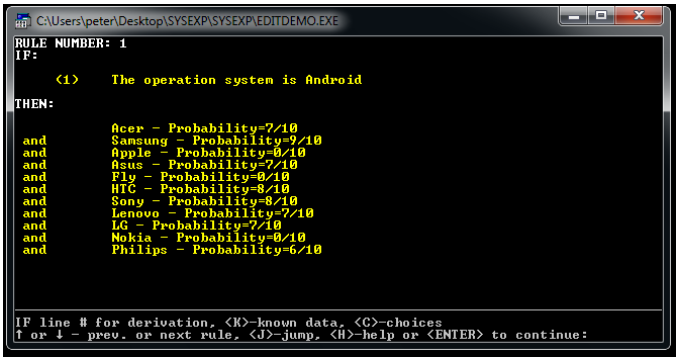
Due to the fact that a special tool is used to create an expert system there is no code to be shown. SYSEXP has a rich menu to create and edit different rules and macros to reuse qualifiers or edit delete rules. Below is shown an example of a defined rule and the options for that rule.

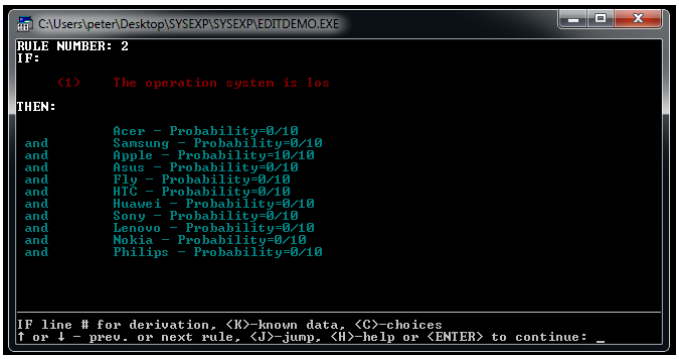
4 Results

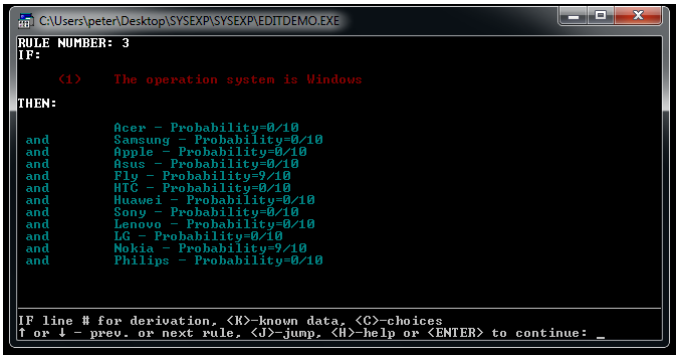


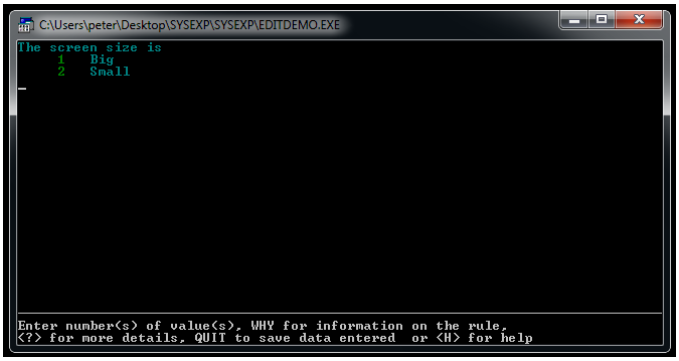
Program intro

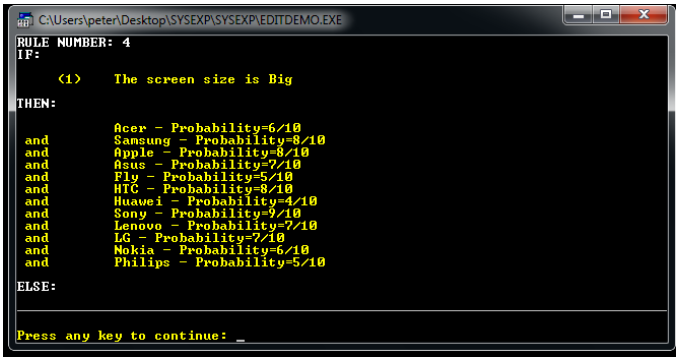

C:\Users\peter\Desktop\SYSEXP\SYSEXP\EDITDEMO.EXE
The operation system is
1 Android
2 Ios
3 Windows
Enter number(s) of value(s), WHY for information on the rule,
<?> for more details, QUIT to save data entered or <H> for help

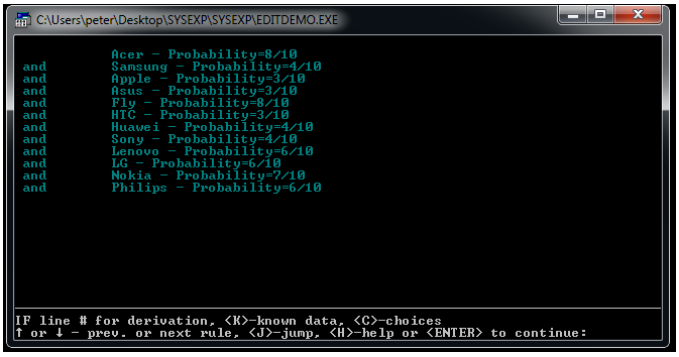

C:\Users\peter\Desktop\SYSEXP\SYSEXP\EDITDEMO.EXE
RULE NUMBER: 1
IF:
(1) The operation system is Android
THEN:
Acer - Probability=7/10
and Samsung - Probability=9/10
and Apple - Probability=0/10
and Asus - Probability=7/10
and Fly - Probability=0/10
and HTC - Probability=8/10
and Sony - Probability=8/10
and Lenovo - Probability=7/10
and LG - Probability=7/10
and Nokia - Probability=0/10
and Philips - Probability=6/10
IF line # for derivation, <K>-known data, <C>-choices
↑ or ↓ - prev. or next rule, <J>-jump, <H>-help or <ENTER> to continue:

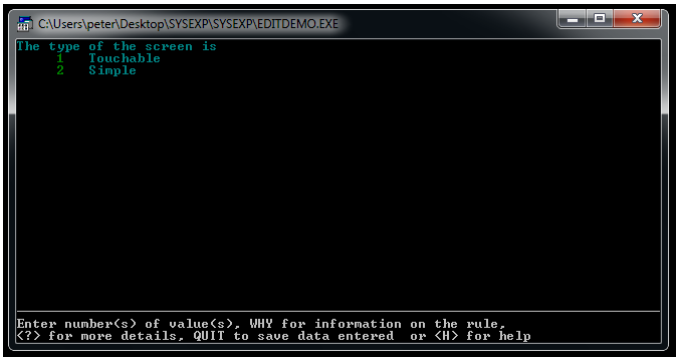

C:\Users\peter\Desktop\SYSEXP\SYSEXP\EDITDEMO.EXE
RULE NUMBER: 2
IF:
(1) The operation system is Ios
THEN:
Acer - Probability=0/10
and Samsung - Probability=0/10
and Apple - Probability=10/10
and Asus - Probability=0/10
and Fly - Probability=0/10
and HTC - Probability=0/10
and Huawei - Probability=0/10
and Sony - Probability=0/10
and Lenovo - Probability=0/10
and Nokia - Probability=0/10
and Philips - Probability=0/10
IF line # for derivation, <K>-known data, <C>-choices
↑ or ↓ - prev. or next rule, <J>-jump, <H>-help or <ENTER> to continue:

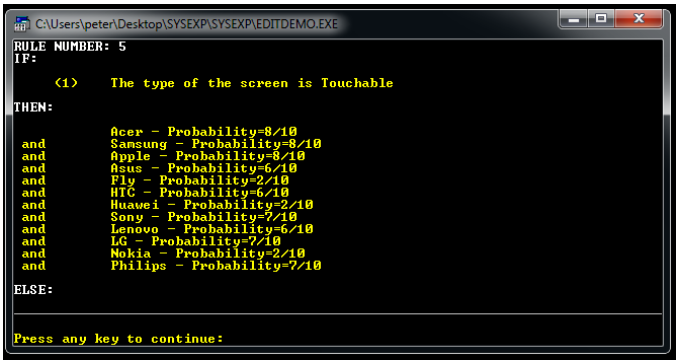

C:\Users\peter\Desktop\SYSEXP\SYSEXP\EDITDEMO.EXE
RULE NUMBER: 3
IF:
(1) The operation system is Windows
THEN:
Acer - Probability=0/10
and Samsung - Probability=0/10
and Apple - Probability=0/10
and Asus - Probability=0/10
and Fly - Probability=9/10
and HTC - Probability=0/10
and Huawei - Probability=0/10
and Sony - Probability=0/10
and Lenovo - Probability=0/10
and LG - Probability=0/10
and Nokia - Probability=9/10
and Philips - Probability=0/10
IF line # for derivation, <K>-known data, <C>-choices
↑ or ↓ - prev. or next rule, <J>-jump, <H>-help or <ENTER> to continue:

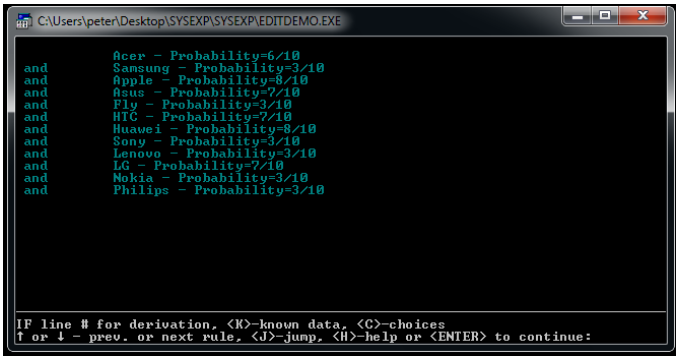

C:\Users\peter\Desktop\SYSEXP\SYSEXP\EDITDEMO.EXE
The screen size is
1 Big
2 Small
Enter number(s) of value(s), WHY for information on the rule,
<?> for more details, QUIT to save data entered or <H> for help

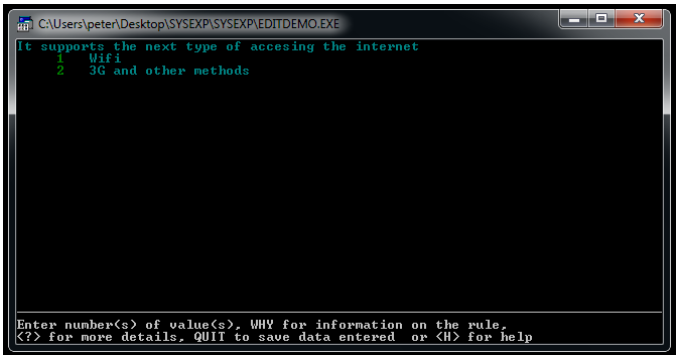

C:\Users\peter\Desktop\SYSEXP\SYSEXP\EDITDEMO.EXE
RULE NUMBER: 4
IF:
(1) The screen size is Big
THEN:
Acer - Probability=6/10
and Samsung - Probability=8/10
and Apple - Probability=8/10
and Asus - Probability=7/10
and Fly - Probability=5/10
and HTC - Probability=8/10
and Huawei - Probability=4/10
and Sony - Probability=9/10
and Lenovo - Probability=7/10
and LG - Probability=7/10
and Nokia - Probability=6/10
and Philips - Probability=5/10
ELSE:
Press any key to continue:

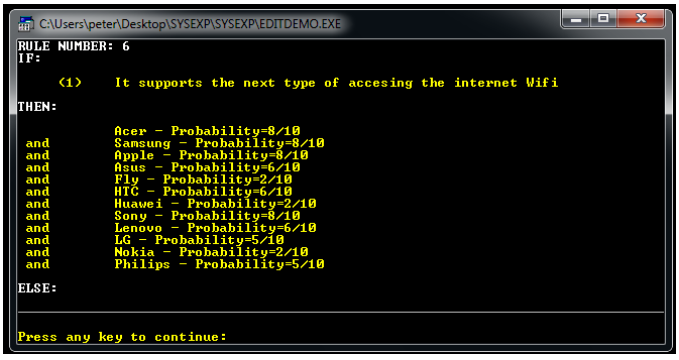

C:\Users\peter\Desktop\SYSEXP\SYSEXP\EDITDEMO.EXE
Acer - Probability=8/10
and Samsung - Probability=4/10
and Apple - Probability=3/10
and Asus - Probability=3/10
and Fly - Probability=8/10
and HTC - Probability=3/10
and Huawei - Probability=4/10
and Sony - Probability=4/10
and Lenovo - Probability=6/10
and LG - Probability=6/10
and Nokia - Probability=7/10
and Philips - Probability=6/10
IF line # for derivation, <K>-known data, <C>-choices
↑ or ↓ - prev. or next rule, <J>-jump, <H>-help or <ENTER> to continue:

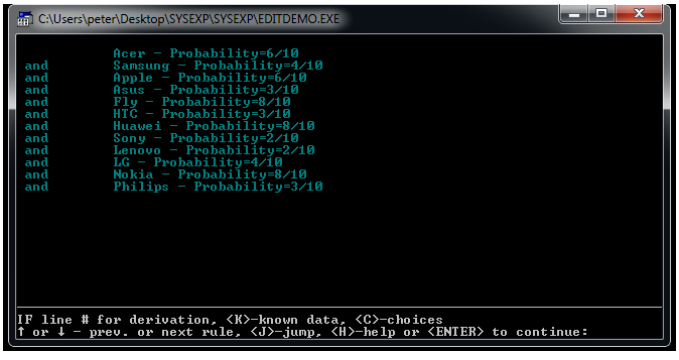

C:\Users\peter\Desktop\SYSEXP\SYSEXP\EDITDEMO.EXE
The type of the screen is
1 Touchable
2 Simple
Enter number(s) of value(s), WHY for information on the rule,
<?> for more details, QUIT to save data entered or <H> for help

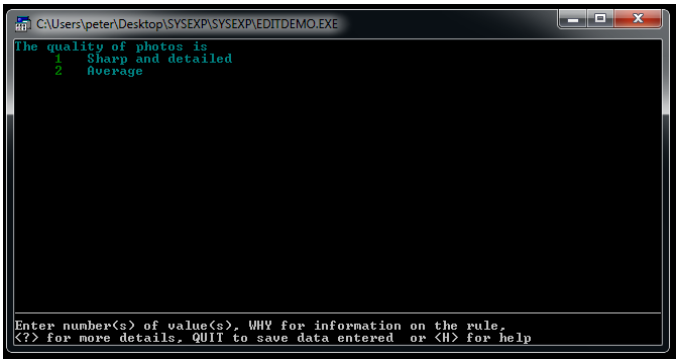

C:\Users\peter\Desktop\SYSEXP\SYSEXP\EDITDEMO.EXE
RULE NUMBER: 5
IF:
(1) The type of the screen is Touchable
THEN:
Acer - Probability=8/10
and Samsung - Probability=8/10
and Apple - Probability=8/10
and Asus - Probability=6/10
and Fly - Probability=2/10
and HTC - Probability=6/10
and Huawei - Probability=2/10
and Sony - Probability=7/10
and Lenovo - Probability=6/10
and LG - Probability=7/10
and Nokia - Probability=2/10
and Philips - Probability=7/10
ELSE:
Press any key to continue:

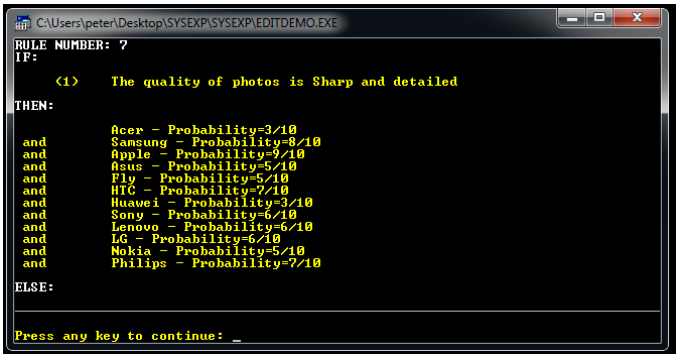

C:\Users\peter\Desktop\SYSEXP\SYSEXP\EDITDEMO.EXE
Acer - Probability=6/10
and Samsung - Probability=3/10
and Apple - Probability=8/10
and Asus - Probability=7/10
and Fly - Probability=3/10
and HTC - Probability=2/10
and Huawei - Probability=8/10
and Sony - Probability=3/10
and Lenovo - Probability=3/10
and LG - Probability=2/10
and Nokia - Probability=3/10
and Philips - Probability=3/10
IF line # for derivation, <K>-known data, <C>-choices
↑ or ↓ - prev. or next rule, <J>-jump, <H>-help or <ENTER> to continue:

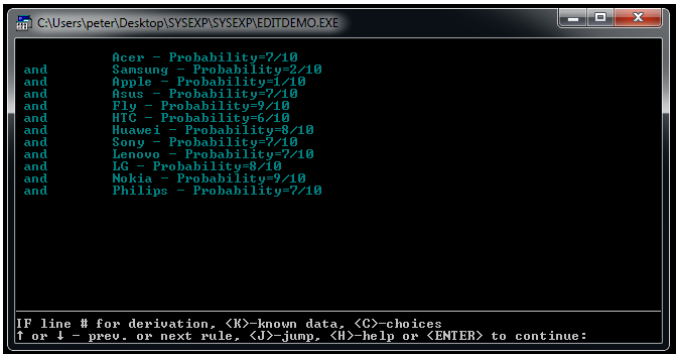

C:\Users\peter\Desktop\SYSEXP\SYSEXP\EDITDEMO.EXE
It supports the next type of accesing the internet
1 Wifi
2 3G and other methods
Enter number(s) of value(s), WHY for information on the rule,
<?> for more details, QUIT to save data entered or <H> for help

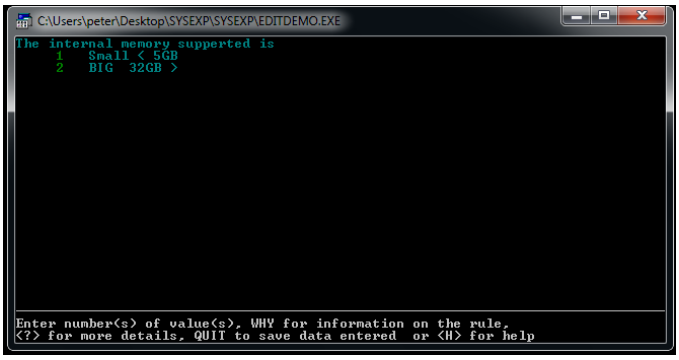

C:\Users\peter\Desktop\SYSEXP\SYSEXP\EDITDEMO.EXE
RULE NUMBER: 6
IF:
(1) It supports the next type of accesing the internet Wifi
THEN:
Acer - Probability=8/10
and Samsung - Probability=8/10
and Apple - Probability=8/10
and Asus - Probability=6/10
and Fly - Probability=2/10
and HTC - Probability=6/10
and Huawei - Probability=2/10
and Sony - Probability=8/10
and Lenovo - Probability=6/10
and LG - Probability=5/10
and Nokia - Probability=2/10
and Philips - Probability=5/10
ELSE:
Press any key to continue:

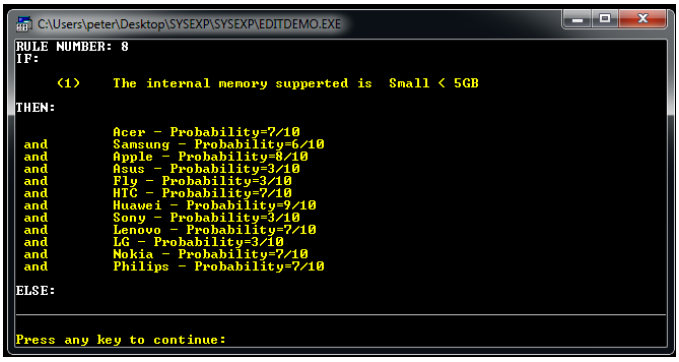

C:\Users\peter\Desktop\SYSEXP\SYSEXP\EDITDEMO.EXE
Acer - Probability=6/10
and Samsung - Probability=4/10
and Apple - Probability=6/10
and Asus - Probability=3/10
and Fly - Probability=8/10
and HTC - Probability=3/10
and Huawei - Probability=8/10
and Sony - Probability=2/10
and Lenovo - Probability=2/10
and LG - Probability=4/10
and Nokia - Probability=8/10
and Philips - Probability=3/10
IF line # for derivation, <K>-known data, <C>-choices
↑ or ↓ - prev. or next rule, <J>-jump, <H>-help or <ENTER> to continue:

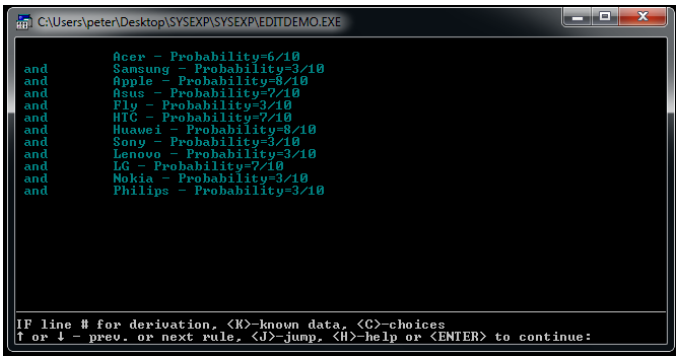

C:\Users\peter\Desktop\SYSEXP\SYSEXP\EDITDEMO.EXE
The quality of photos is
1 Sharp and detailed
2 Average
Enter number(s) of value(s), WHY for information on the rule,
<?> for more details, QUIT to save data entered or <H> for help

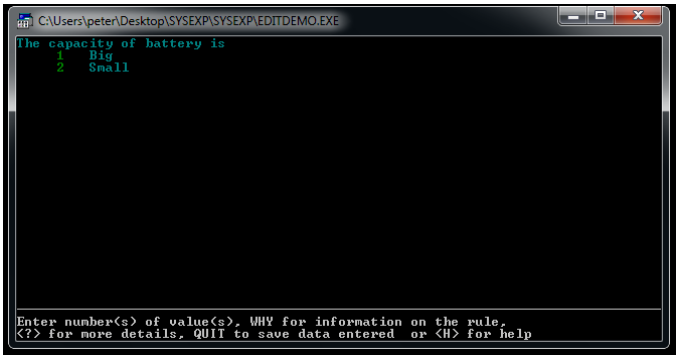

C:\Users\peter\Desktop\SYSEXP\SYSEXP\EDITDEMO.EXE
RULE NUMBER: 7
IF:
(1) The quality of photos is Sharp and detailed
THEN:
Acer - Probability=3/10
and Samsung - Probability=8/10
and Apple - Probability=9/10
and Asus - Probability=5/10
and Fly - Probability=5/10
and HTC - Probability=7/10
and Huawei - Probability=3/10
and Sony - Probability=6/10
and Lenovo - Probability=6/10
and LG - Probability=6/10
and Nokia - Probability=5/10
and Philips - Probability=7/10
ELSE:
Press any key to continue:

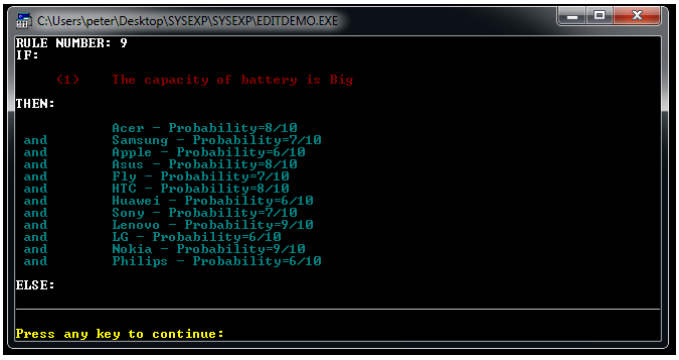

C:\Users\peter\Desktop\SYSEXP\SYSEXP\EDITDEMO.EXE
Acer - Probability=7/10
and Samsung - Probability=2/10
and Apple - Probability=1/10
and Asus - Probability=7/10
and Fly - Probability=9/10
and HTC - Probability=6/10
and Huawei - Probability=8/10
and Sony - Probability=7/10
and Lenovo - Probability=7/10
and LG - Probability=8/10
and Nokia - Probability=9/10
and Philips - Probability=7/10
IF line # for derivation, <K>-known data, <C>-choices
↑ or ↓ - prev. or next rule, <J>-jump, <H>-help or <ENTER> to continue:

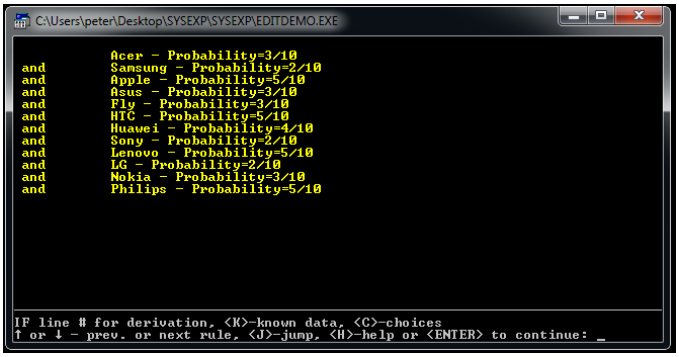

C:\Users\peter\Desktop\SYSEXP\SYSEXP\EDITDEMO.EXE
The internal memory supperted is
1 Small < 5GB
2 BIG 32GB >
Enter number(s) of value(s), WHY for information on the rule,
<?> for more details, QUIT to save data entered or <H> for help


C:\Users\peter\Desktop\SYSEXP\SYSEXP\EDITDEMO.EXE
RULE NUMBER: 8
IF:
(1) The internal memory supperted is Small < 5GB
THEN:
Acer - Probability=7/10
and Samsung - Probability=6/10
and Apple - Probability=8/10
and Asus - Probability=3/10
and Fly - Probability=3/10
and HTC - Probability=7/10
and Huawei - Probability=9/10
and Sony - Probability=3/10
and Lenovo - Probability=7/10
and LG - Probability=3/10
and Nokia - Probability=7/10
and Philips - Probability=7/10
ELSE:
Press any key to continue:


C:\Users\peter\Desktop\SYSEXP\SYSEXP\EDITDEMO.EXE
Acer - Probability=6/10
and Samsung - Probability=3/10
and Apple - Probability=8/10
and Asus - Probability=7/10
and Fly - Probability=3/10
and HTC - Probability=7/10
and Huawei - Probability=8/10
and Sony - Probability=3/10
and Lenovo - Probability=3/10
and LG - Probability=7/10
and Nokia - Probability=3/10
and Philips - Probability=3/10
IF line # for derivation, <K>-known data, <C>-choices
↑ or ↓ - prev. or next rule, <J>-jump, <H>-help or <ENTER> to continue:


C:\Users\peter\Desktop\SYSEXP\SYSEXP\EDITDEMO.EXE
The capacity of battery is
1 Big
2 Small
Enter number(s) of value(s), WHY for information on the rule,
<?> for more details, QUIT to save data entered or <H> for help


C:\Users\peter\Desktop\SYSEXP\SYSEXP\EDITDEMO.EXE
RULE NUMBER: 9
IF:
(1) The capacity of battery is Big
THEN:
Acer - Probability=8/10
and Samsung - Probability=7/10
and Apple - Probability=6/10
and Asus - Probability=8/10
and Fly - Probability=7/10
and HTC - Probability=8/10
and Huawei - Probability=6/10
and Sony - Probability=7/10
and Lenovo - Probability=9/10
and LG - Probability=6/10
and Nokia - Probability=9/10
and Philips - Probability=6/10
ELSE:
Press any key to continue:


C:\Users\peter\Desktop\SYSEXP\SYSEXP\EDITDEMO.EXE
Acer - Probability=3/10
and Samsung - Probability=2/10
and Apple - Probability=5/10
and Asus - Probability=3/10
and Fly - Probability=3/10
and HTC - Probability=5/10
and Huawei - Probability=4/10
and Sony - Probability=2/10
and Lenovo - Probability=5/10
and LG - Probability=2/10
and Nokia - Probability=3/10
and Philips - Probability=5/10
IF line # for derivation, <K>-known data, <C>-choices
↑ or ↓ - prev. or next rule, <J>-jump, <H>-help or <ENTER> to continue:


C:\Users\peter\Desktop\SYSEXP\SYSEXP\EDITDEMO.EXE
Values based on 0 - 10 system
VALUE
1 Samsung 7
2 Acer 6
3 HTC 6
4 Sony 6
5 Lenovo 6
6 Philips 6
7 Asus 5
8 LG 5
9 Huawei 4
All choices <A>, only if value>1 <G>, Print <P>, Change and rerun <C>,
rules used <line number>, Quit/save <Q>, Help <H>, Done <D>:

Results

5 Conclusion

Following this laboratory made the acquaintance of one of the most important features of IA allows us build your own system based on expert knowledge base and its own rules. In laboratory condition was specified the construction of this system using Turbo Prolog environment, but after I studied how SYSEXP done this, I wanted more to achieve it through this system. Initially we introduced variants of solutions to be certetate then each rule (10 in total) were introduced into the system and for each of them, the solutions were assigned a certain probability depending on user response.

SYSEXP exciting look to build an expert system because it has a more familiar graphical interface and initially when familiarizing yourself with something new, it offers several advantages for understanding.

Implementing an expert system with the help of specialized program offfers the speed and easiness, in the case of writing code is more complex using prolog. The program abstract the programming implementation and allow programmer to create, run and test an expert system faster, thus allowing the person to focus only on logic and how to create a good experst system leaving details behind.