Term Project

1. Introduction:

In this project you implement an expert system using the (C Language Integrated Production System) (CLIPS[1]), a rule-based programming language useful for creating expert systems and other programs where a heuristic solution is easier to implement and maintain than an algorithmic solution. Written in C for portability, CLIPS can be installed and used on a wide variety of platforms. Since 1996, CLIPS has been available as public domain software https://sourceforge.net/projects/clipsrules/files/latest/download

Clips is actually an expert system whose knowledge is removed (aka expert system shell) to which the user can just add his own knowledge in the form of rules and provide information to solve the problem. An expert system shell should have the following features:

1. It is able to create a rule based expert system
2. Has a builtin inference engine perform using either forward and/or backward chaining
3. Can answer user's why and how questions.

2. Intended Learning Outcome of the project:

By the end of the project you will gain:

- a deep understanding of the terms: expert system, expert system shell, rule based expert system, you will have gained a hands on experience of CLIPS and you will understand what is meant by the terms: expert system, expert system shell, rule based system, forward chaining and backword chaining, knowledge based systems, and working memory, rule firing and conflict resolution.
- A hands on experience of CLIPS programming.

3. Knowledge-base

Rule 1: IF size > 10

AND size <50

THEN height is small

Rule 2: IF size > 50

AND size <150

THEN height is medium

Rule 4: IF size > 150

THEN height is tall

Rule 5: IF life cycle is one year

THEN life type is annual

Rule 6: IF life cycle is more than one year

THEN life type is perennial

Rule 7: IF season is summer

AND color is blue

OR color is purple

OR color is yellow

AND life type is perennial

AND root type is bulb

THEN flower name is iris

Rule 8: IF season is autumn

AND color is white

OR color is pink

OR color is pinkish-red

THEN flower name is anemone

Rule 9: IF season is autumn

AND height is medium

AND color is yellow

OR color is while

OR color is purple

OR color is red

THEN flower name is Chrysanthemum

Rule 10: IF season is spring

AND root type is bulbs

AND color is white

OR color is yellow

OR color is orange

OR color is purple

OR color is red

OR color is blue

AND perfumed is true

THEN flower is Freesia

Rule 11: IF life type is perennial

AND height is tall

AND root type is bulbs

AND season is summer

THEN flower name is Dahlia

Rule 12: IF season is spring

AND root type is bulbs

AND color is yellow

OR color is white

THEN flower name is Narcissus

Rule 13: IF soil is acidic

AND color is white

OR color is pink

OR color is red

AND life type is perennial

AND root type is roots

THEN flower name is Camellia

Rule 14: IF season is spring

AND root type is bulbs

AND perfumed is true

AND height is small

AND life type is perennial

THEN flower name is Lily

Rule 15: IF height is small

AND life type is annual

AND soil is rich

OR soil is loose

OR soil is fertile

THEN flower name is Begonia

Rule 16: IF season is winter

AND color is white

OR color is pink

OR color is red

THEN flower name is Azalea

Rule 17: IF life type is perennial

AND root type is root

AND color is white

OR color is red

OR color is blue

OR color is yellow

THEN flower is Anemone

Rule 18: IF life type is perennial

AND root type is roots

AND color is white

OR color is pink

OR color is red

OR color is yellow

AND perfumed is true

AND soil is well-drained

THEN flower is rose

Rule 19: IF flower name is Lily

AND perfumed is true

THEN flower name is White lily

The linguistic variables (objects) and their possible values allowed by the experts systems and contained into the database are given in Table 1.

Object	**Value**	**Object**	**Value**
Flower name	Iris Anemone Chrysanthemums Freesia Dahlia Narcissus Camellias Lily Begonia Azaleas Anemone Roses White lily	color	blue purple yellow red white pink orange violet pinkish-red
Season	Autumn Summer Spring winter	Size	10-50 cm 50-150 cm >150 cm
Root type	Bulb root	Perfume	True False
Life type	Perennial Annual	Soil	Acidic Loose Fertile Rich Well-drained
Life cycle	One year More than one year	Height	Small Medium Tall

Table 1

4. **Deadlines**
   1. Groups list: Each group delivers the names of participant 7/12/2018
   2. Read Chapter 7 of **https://link.springer.com/chapter/10.1007%2F978-3-642-21004-4_7#aboutcontent** , and this tutorial : **https://www.cs.odu.edu/~mukka/cs480f09/Lecturenotes/Expertsystems/clips/tutorial/tutorial1.pdf**14/12/2018
   3. Deliver a printout of CLIPS program with the objects and value and rules 1-19,
   4. A working implementation of your system with suitable interface. 21/12/2018
   5. Presentaions with printout 28/12/2018
5. **References:**
   https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_expert_systems.htm
   https://link.springer.com/content/pdf/10.1007%2F978-3-642-21004-4.pdf ,
   Chapter 7