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EXPERIMENT NO: 8

IMPLEMENTATION OF KNOWLEDGE REPRESENTATION SCHEMES - USE CASES

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Aim: Implementation of knowledge representation schemes - use cases.

Initial State -

? (Make a guess)

Final State

Yes
or
Learn a new concept

Problem Formulation -

Given some classification rule and some predefined classes, guess an animal and let your machine predict it, If the machine is unable to predict the animal, it will ask the answer and store it in its knowledge base.

Problem Solving

Imagine an Animal (You are only allowed to answer Yes or No for the next set of questions)

→ Does it have a fur?
- Yes

→ Does it have dark spots?
- Yes

→ Is it the fastest animal?
- no

Were you thinking of a leopard? Yes

I knew it!

Algorithm:

Step 1: Start
Step 2: The user is expected to think of a animal and answer to the questions shown in the prompt.
Step 3: The user answers the set of questions and the inference rule is drawn from it.
Step 4: IF a conclusion to the premises result true it would display the name of the animal otherwise the machine learns from the given set of input.
Step 5: Repeat step 2 to 4 if the user want to make the guess again otherwise go to step 6.
Step 6: Stop

Identification of animal:

```
cheetah :- mammal,
carnivore,
verify(has_tawny_color),
verify(has_dark_spots).
tiger :- mammal,
carnivore,
verify(has_tawny_color),
verify(has_black_stripes).
giraffe :- ungulate,
verify(has_long_neck),
verify(has_long_legs).
zebra :- ungulate,
verify(has_black_stripes).
```

Classification rules:

```
mammal :- verify(has_hair), !.
mammal :- verify(gives_milk).
bird :- verify(has_feathers), !.
bird :- verify(flys),
verify(lays_eggs).
carnivore :- verify(eats_meat), !.
carnivore :- verify(has_pointed_teeth),
verify(has_claws),
verify(has_forward_eyes).
ungulate :- mammal,
verify(has_hooves), !.
ungulate :- mammal,
verify(chews_cud).
```

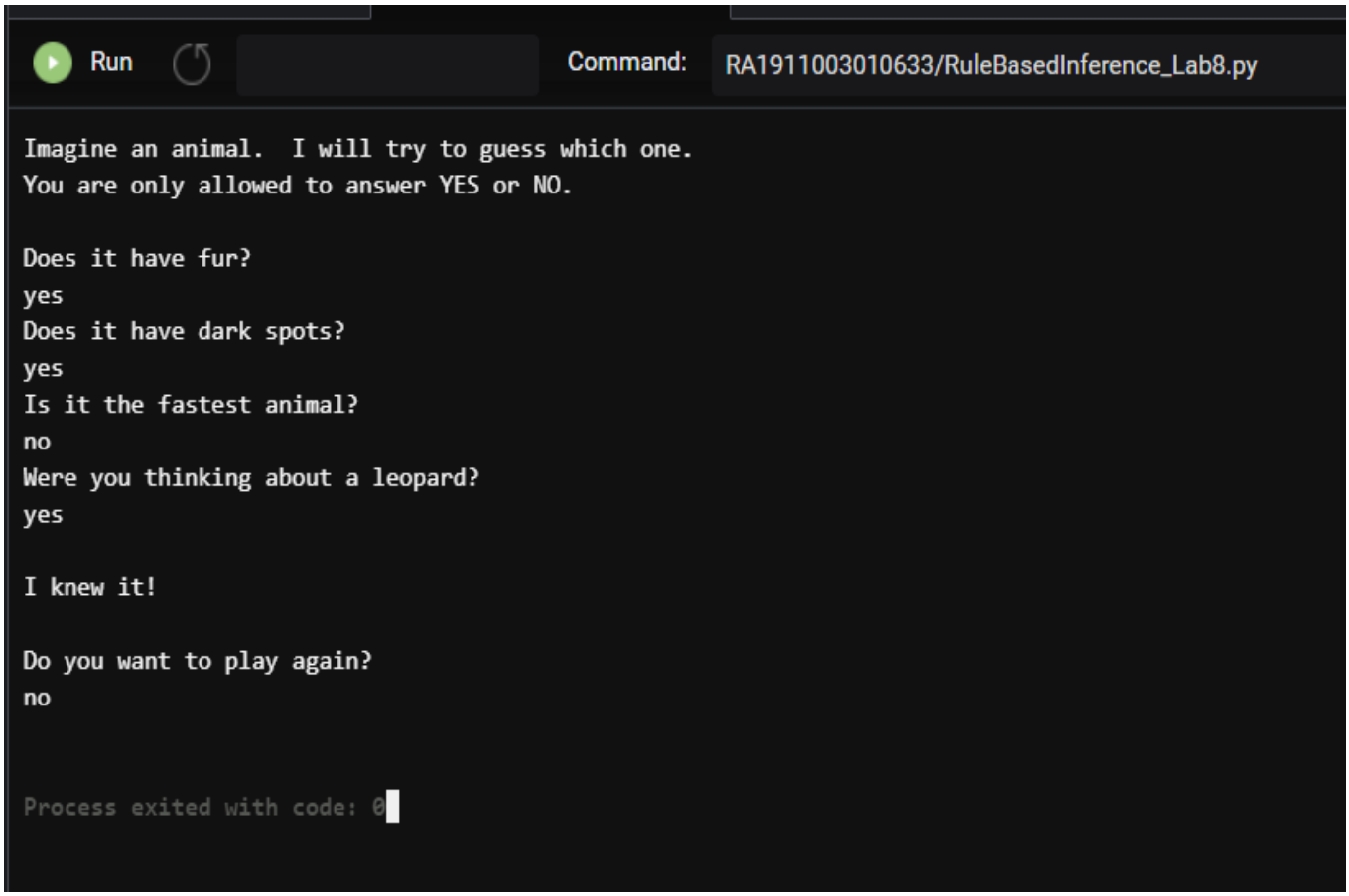
Source code:

```
import sys
def definiteNoun(s):
  s = s.lower().strip()
  if s in ['a', 'e', 'i', 'o', 'u', 'y']:
    return "an " + s
  else:
    return "a " + s

def removeArticle(s):
  "Remove the definite article 'a' or 'an' from a noun."
  s = s.lower().strip()
  if s[0:3] == "an ": return s[3:]
  if s[0:2] == "a ": return s[2:]
  return s

def makeQuestion(question, yes, no):
  return [question, yes, no]

def isQuestion(p):
  "Check if node is a question (with answers), or a plain answer."
  return type(p).__name__ == "list"

def askQuestion(question):
  print ("\r%s " % question,)
  return sys.stdin.readline().strip().lower()

def getAnswer(question):
  if isQuestion(question):
    return askQuestion(question[0])
  else:
    return askQuestion("Were you thinking about %s?" % definiteNoun(question))

def answeredYes(answer):
  if len(answer) > 0:
    return answer.lower()[0] == "y"
  return False

def gameOver(message):
  global tries
  print ("")
  print ("\r%s" % message)
  print ("")

def playAgain():
  return answeredYes(askQuestion("Do you want to play again?"))

def correctGuess(message):
```

```
  global tries
  gameOver(message)

  if playAgain():
    print ("")
    tries = 0
    return Q
  else:
    sys.exit(0)

def nextQuestion(question, answer):
  global tries
  tries += 1

  if isQuestion(question):
    if answer:
      return question[1]
    else:
      return question[2]
  else:
    if answer:
      return correctGuess("I knew it!")
    else:
      return makeNewQuestion(question)

def replaceAnswer(tree, find, replace):
  if not isQuestion(tree):
    if tree == find:
      return replace
    else:
      return tree
  else:
    return makeQuestion(tree[0],
      replaceAnswer(tree[1], find, replace),
      replaceAnswer(tree[2], find, replace))

def makeNewQuestion(wrongAnimal):
  global Q, tries

  correctAnimal = removeArticle(askQuestion("I give up.  What did you think about?"))

  newQuestion = askQuestion("Enter a question that would distinguish %s from %s:"
      % (definiteNoun(correctAnimal), definiteNoun(wrongAnimal))).capitalize()

  yesAnswer = answeredYes(askQuestion("If I asked you this question " +
    "and you thought about %s, what would the correct answer be?" %
definiteNoun(correctAnimal)))

  # Create new question node
  if yesAnswer:
```

```
    q = makeQuestion(newQuestion, correctAnimal, wrongAnimal)
  else:
    q = makeQuestion(newQuestion, wrongAnimal, correctAnimal)
  Q = replaceAnswer(Q, wrongAnimal, q)
  tries = 0
  return Q

def addNewQuestion(wrongAnimal, newques, correct):
    global Q
    q = makeQuestion(newques, correct, wrongAnimal)
    Q = replaceAnswer(Q, wrongAnimal, q)
    return Q

tries = 0
Q = (makeQuestion('Does it have fur?', 'Tiger', 'Penguin'))
q = addNewQuestion('Tiger', 'Does it have dark spots?', 'Leopard')
q = addNewQuestion('Leopard', 'Is it the fastest animal?', 'Cheetah')
q = addNewQuestion('Penguin', 'Can it fly?', 'Parrot')
q = Q

print ("Imagine an animal.  I will try to guess which one.")
print ("You are only allowed to answer YES or NO.")
print ("")

try:
  while True:
    ans = answeredYes(getAnswer(q))
    q = nextQuestion(q, ans)
except KeyboardInterrupt:
  sys.exit(0)
except Exception:
  sys.exit(1)
```

Output:



Result:

Hence, the Implementation of rule based inference system is done successfully.