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AN OVERVIEW TO PROGRAMMING PARADIGM IN ARTIFICIAL INTELLIGENCE: PRACTICAL APPROACH AND TERMINOLOGIES PARADIGM

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ABSTRACT

AI programming is an associate elevation of technology that has brought potency and optimum edges to totally different company's operations and people's lives. AI has brought another level of sensor technology to totally different industries and also the prospects of its potential still grows with the expectation that it'd reach the human intelligence. This can be as a result of developer's area unit willing to explore, experiment and implement its capabilities to satisfy additional of the human and organization wants. After all, necessity is that the mother of invention.

The programming languages that square measure accustomed to build AI and machine learning applications vary. Every application has its own constraints and necessities, and a few languages square measure higher than others specially drawback domains. Languages have conjointly been created and have evolved supported the distinctive necessities of AI applications. LISP, python, Prolog, Java, AIML etc. are the artificial intelligent language used for AI capable of satisfying totally different wants within the development and coming up with of various software package. It's up to a developer to decide on that of the AI languages can gratify the specified practicality and options of the application needs.

INTRODUCTION OF ARTIFICIAL INTELLIGENT

It is the skill of laptop or further types of machines to implement activities which is require intelligence. Hence, these types of activates are solved problems with insufficient or conflicting info, inference and logical deduction, artificial vision and make decisions centred on past experience [2]. It is recurrently used to develop attack problems and solutions which is not solvable through standard procedures. [1]

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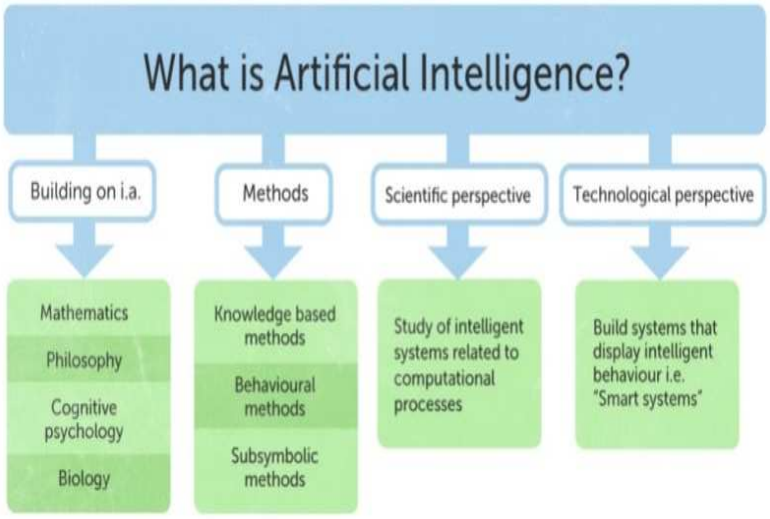

AI PROGRAMMING LANGUAGE

Programming is a set of instructions which is used to create and design the apps. It is faster than the human beings can do. [12]

Computers with electronic brains or artificial intelligence still need to transmit this sequence of instructions to the computer before the task can be carried out by the computer.[6]

There are many artificial intelligence programming languages like LISP, Java, Prolog, Paython, C#, Haskell and AIML etc.[5]

Figure 1.Some Programming Languages of Artificial Intelligence

An ideal language for artificial intelligence programming should afford mechanisms to express and manipulate actual domain knowledge. Usually, this is done using a logical formalism that allows for inferences [1]. To be effective, such an AI language must contain a standardized control mechanism and at the same time enable improved control and inference methods to be developed.[8]

LISP

In the late 1950s, LISP was first proposed by John McCarthy. Originally, language was intended as an alternative calculation model based on the theory of recursive functions.[9]

McCarthy (1960) set out his objectives: to create a language for symbolic rather than numerical computation.[6]

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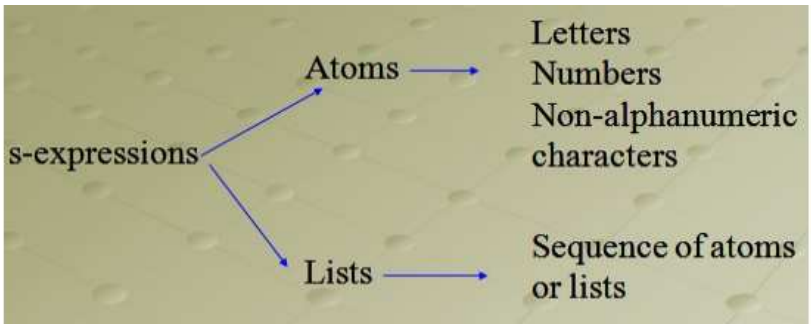
Implement a calculation model based on the theory of recursive functions (Church 1941) to provide a clear definition of the syntax and semantics of the language and to formally demonstrate the completeness of this calculation model.[3]

LISP is another language used for AI development. It a family of computer programing language and is that the second oldest artificial language when FORTRAN. LISP has developed over time to become a robust and dynamic language in writing.[12]

Some think about LISP because the best AI programing language thanks to the favor of liberty it offers developers. LISP is employed in AI thanks to its flexibility for quick in prototyping and experimentation that successively facilitate LISP to grow to a regular AI language. as an example, LISP contains a distinctive macro system that facilitates exploration and implementation of various levels of Intellectual Intelligence. LISP, unlike most AI programming languages, is a lot of economical in resolution specific because it adapts to the wants of the solutions a developer is writing. it's extremely appropriate in inductive logic comes and machine learning.[11]

ELEMENTS OF LISP



1. ATOMS

- It includes both lower and upper cases letters.[5]
  Example: Higher
- In LISP include some types of special symbols like-/,$,*,%,@,^,<,>,~,_,+,- etc.[4]
  Example: name-name
- It also includes numbers it means non-alphanumeric.[3]
  Example: 123.567

2. LIST

It is a clause such as objects. An inventory consists of associate open left spherical bracket (followed by the associate arbitrary variety of list parts separated by blanks and a closing right spherical bracket). Each list part is either associate atom or an inventory.[10]

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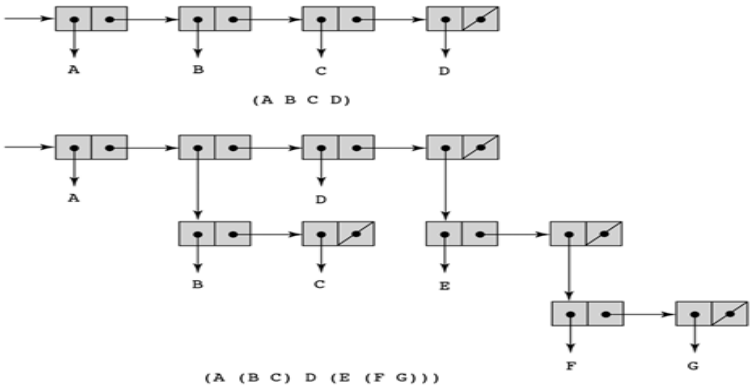


Figure 2.Examples of List

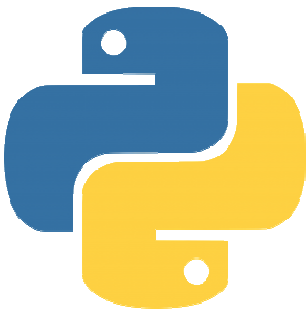
KEYWORD AND DATA TYPES OF LISP[4]

array	fixnum	package	simple-string
atom	float	pathname	simple-vector
bignum	function	random-state	single-float
bit	hash-table	ratio	standard-char
bit-vector	integer	rational	stream
character	keyword	readtable	string
[common]	list	sequence	[string-char]
compiled-function	long-float	short-float	symbol
complex	nill	signed-byte	t
cons	null	simple-array	unsigned-byte
double-float	number	simple-bit-vector	vector

ADVANTAGES

- quick and economical in committal to writing because it is supported by compilers rather than interpreters.[1]
- Automatic memory manager was fictional for LISP, therefore, it's a trash pickup.
- LISP offers specific management over systems ensuing to their most useful Drawbacks.
- Few developers are well conversant in Lisp programming.
- Being a vintage programing language computing, LISP needs configuration of recent software system and hardware to accommodate its use.[9]

PYTHON



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It is an object-oriented, powerful high level and greatest open source programming language. It is developed by the Guido van Rossum.[6]

It is a favorite programming language for AI developers because of its syntax versatility and simplicity. It is a less complex as compared to Java and C++.[7]

It is a portable language. it is used mostly used on platforms like Windows, UNIX, Mac OS, and Linux. Python has some types of features like Interpreted, portable, dynamic high level which make more unique and modular. It is a multiprogramming language which supports the procedural, functional and object-oriented. Python supports the development of NLP solutions and neural networks.[3]

It was developed at the end of the 1980s. Python implementation started in 1989. Its idea is extremely interesting which is includes different types of aphorisms. Simple rather than complex and Explicit rather than implicit.[4]

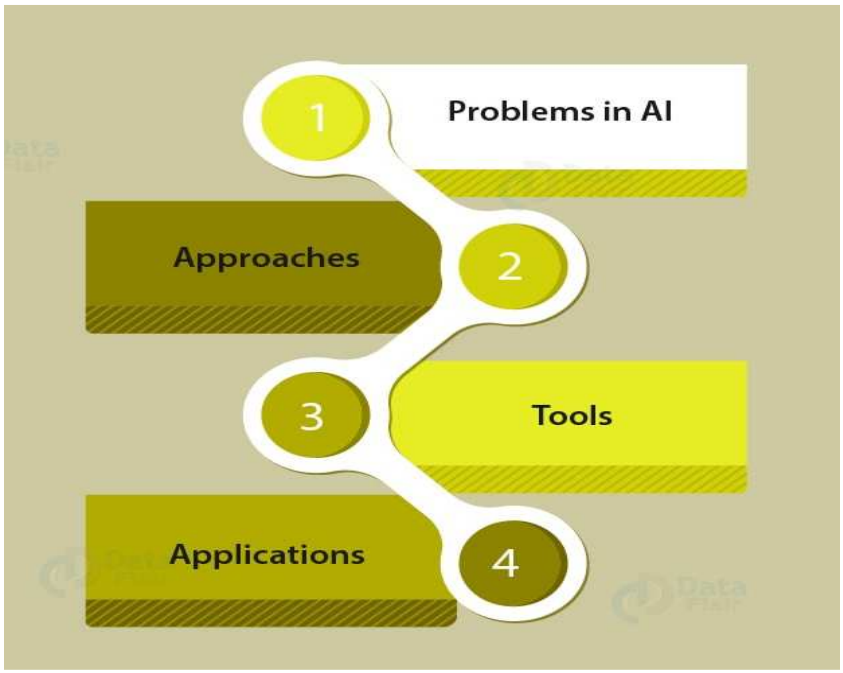

Figure 3.Artificial Intelligence With Python

LET'S STARTED WITH PYTHON

```
Python 3.4.2 (default, Oct 15 2014, 22:01:37)
[GCC 4.2.1 Compatible Apple LLVM 5.1 (clang-503.0.40)] on darwin
Type "help", "copyright", "credits" or "license" for more information.
>>>
```

>>> Prompt: It indicates that the Python interpreter is currently waiting for input.

Logic Programming is that the combination of two words, Programming, and Logic. It is a programming paradigm which the problems expended as rules and facts by statement of the program however within a system of formal logic. Another programming models such as Procedural, declarative functional and object-oriented etc. It is also an approach programming way. [8]

We need to get starting logic programming in python, we are installing two types of packages which is the following:[9]

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1. KANREN

It is used to make corporate logic code. It is express the logic in terms of facts and rules. we can install Kanren using the pip command. The syntax Of Kanren which is given below:[10]

```
pip install kanren
```

2. SYMPY

It is used for symbolic mathematics. It is mostly used for a become completely featured CAS(Computer algebra system) which is consist the simple as code as possible in order to easily extensible and comprehensible[11]. We can install Sympy using the pip command. The syntax of Sympy which given below:

```
pip install sympy
```

PROLOG

- Prolog stances for **Programming in logic.** It is used in artificial intelligence programming.
- It is a declarative programming language.

For example: While executing the solution for a set of problems, instead of specifying the ways to achieve a certain goal in a user needs to specify about the situation (facts and rules), specific situation and the goal (query). After these stages, It is interpreter derives the solution.

- It is valuable in Artificial Intelligent, Natural Language Processing, databases but unusable in other parts like numerical algorithms or graphics.[2]

ADVANTAGES OF PYTHON

- Java has an extensive and rich variety of tools and library.
- It supports algorithm to testing without having to implement the code.
- It supports the Object Oriented design which increases the productivity of programmer's.
- It is faster in development compared to C++ and Java.[4]

DRAWBACKS OF PYTHON

- It is not easy for developers because it is completely different syntax rather than using other programming languages for Artificial Intelligent.
- Nothing like Java and C++, python works with the help of an interpreter which makes execution and compilation slow in Artificial Intelligent development.
- It is not easy for mobile computing.[3]

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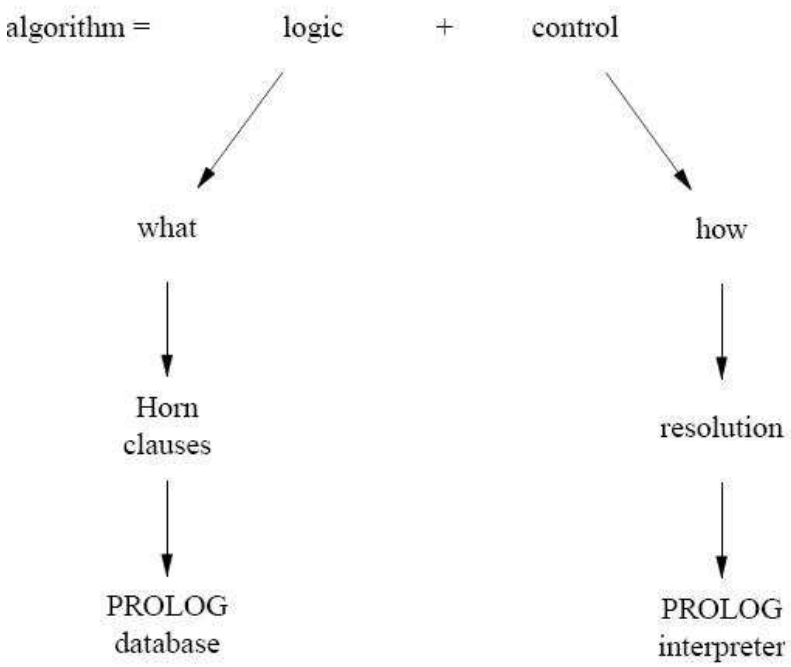

Figure 4.The relationship between logic programming and Prolog

Some applications of Prolog are:[1]

- Natural language understanding
- The intelligent database retrieval
- Expert systems
- Machine learning
- A specification language
- Robot planning
- Automated reasoning
- Theorem proving
- Problem-solving

It is identified relationships among Properties Of objects and also identify the objects.

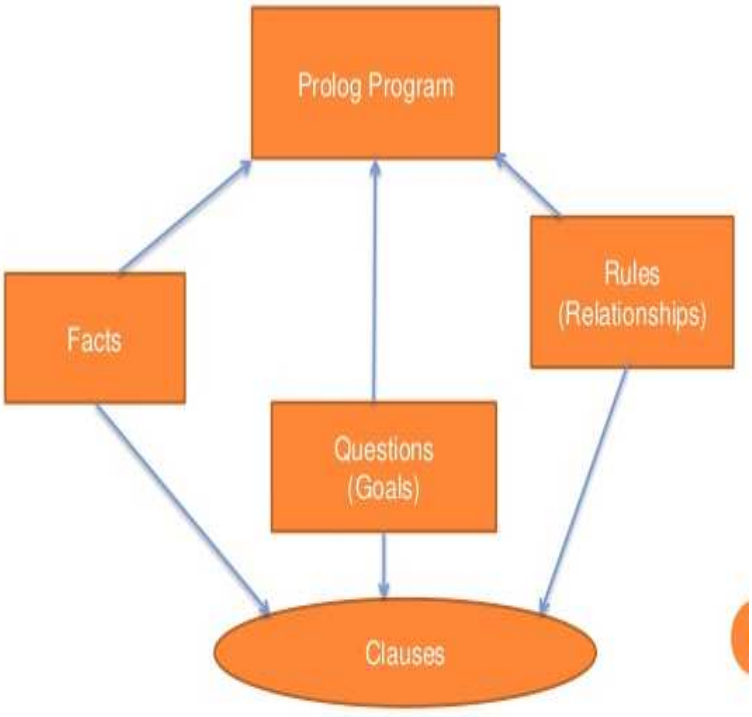

Figure 5.Structure of Prolog

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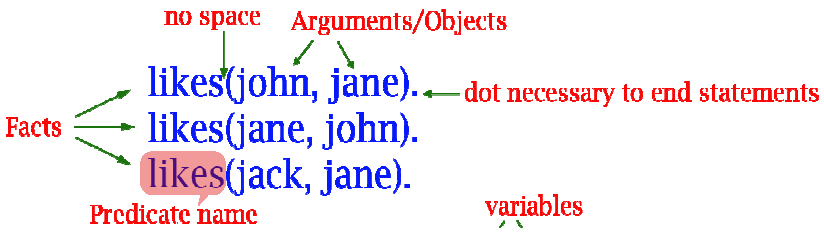
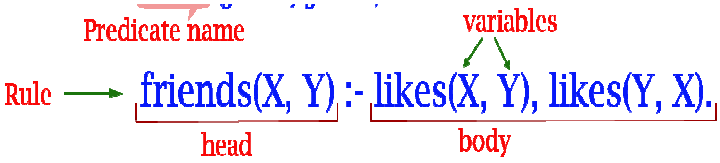
FACTS

- Facts are properties of objects or relationships between objects.[6]



RULES

- It is used to create n new knowledge.
- It consists the relationship between objects.
- It consists the two parts in Prolog:
  1. Head
  2. Body



CLAUSES

It is combinations of facts and rules.

Example:

Friends (Manju, suman):-likes(Manju, suman), likes(suman, Manju).

GOAL OR QUERY

Queries will be based on facts and rules. We can ask questions based on the stored information.[5]

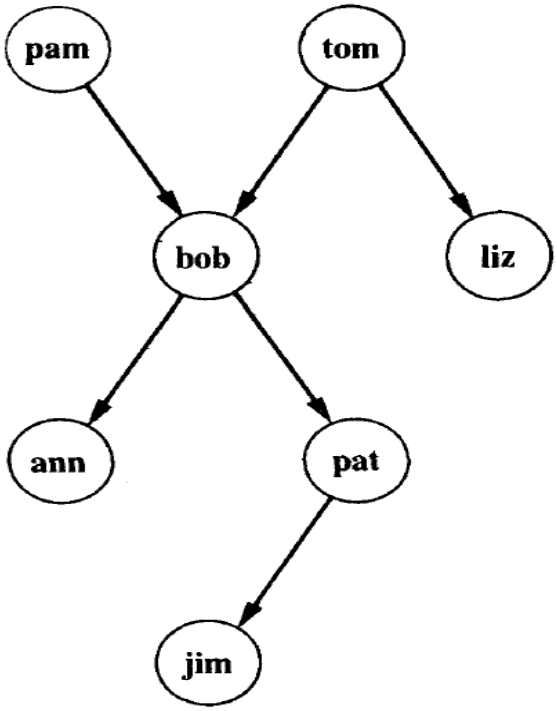


Figure 6.Tree of Family

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```
parent( pam, bob).
parent( tom, bob).
parent( tom, liz).
parent( bob, ann).
parent( bob, pat).
parent( pat, jim).
```

TERMS: Terms is a collection of data. it is constants that are numbers and atoms.[3]

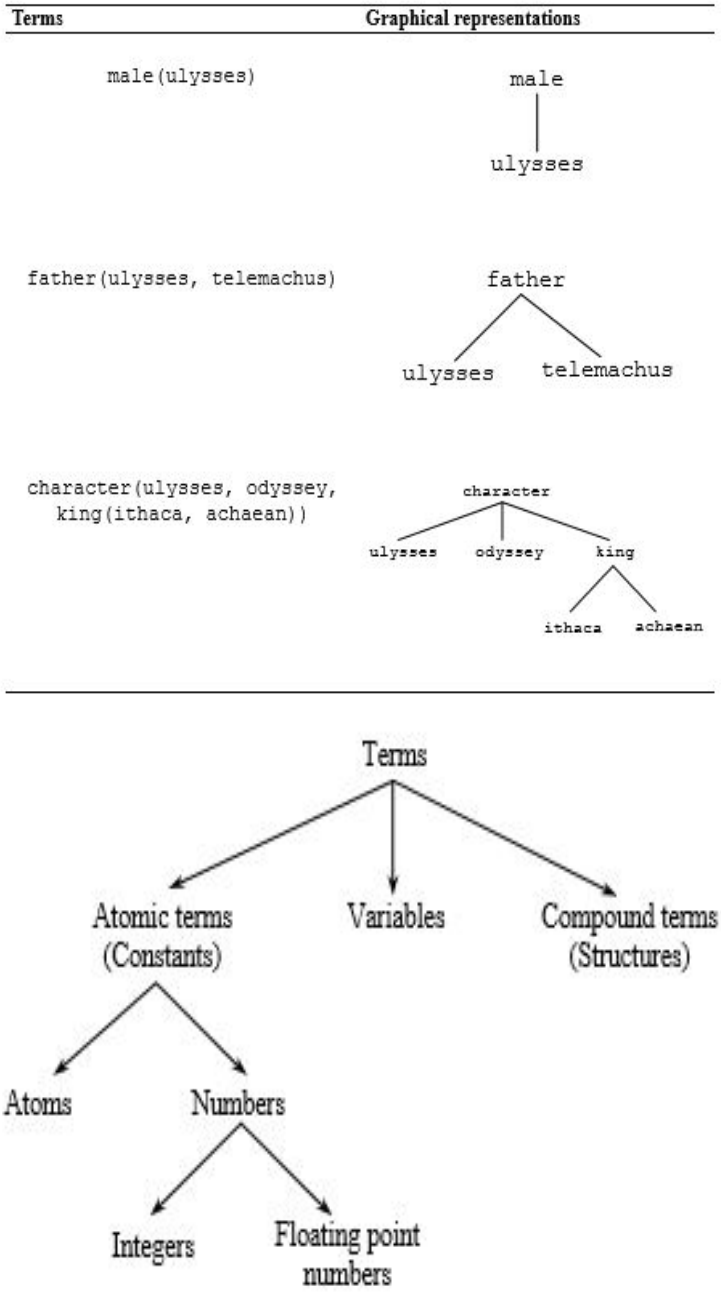

Figure 7.Different Kinds of Terms

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STRUCTURE OF PROLOG PROGRAMMING

```
DOMAINS
/* …
domain declarations
… */
PREDICATES
/* …
predicate declarations
… */
CLAUSES
/* …
clauses (rules and facts)
… */
GOAL
/* …
subgoal_1,
subgoal_2,
etc. */
```

JAVA

It is based on JVM (Java Virtual Machine) technology. JVM allows developers to develop a single application version that will run on all types of java enabled computing platform.[10]

There are some strong features of Java which are given below:

- Portability
- Maintainability
- transparency

Artificial Intelligent mostly used for genetic programming, search algorithms and the use of artificial neural networks. There are some benefits using programming AI in Java which is better user interaction, simplified work with large scale projects, easy use, facilitated visualization and debugging case etc. It is the incorporation of SWT (Standard Widget Toolkit) and Swing. These features make interfaces and graphics look sophisticated and appealing.[11]

BEST FEATURES OF JAVA

- Fast.
- Scalability.
- Easy usability.
- User interaction.
- In-built Garbage Collection.
- Strong Libraries.

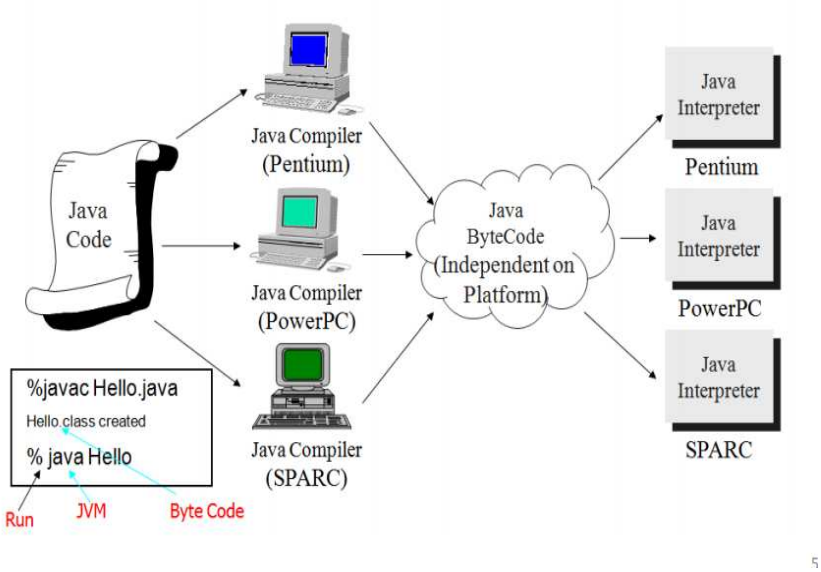

Figure 8.Environment of java virtual Machine

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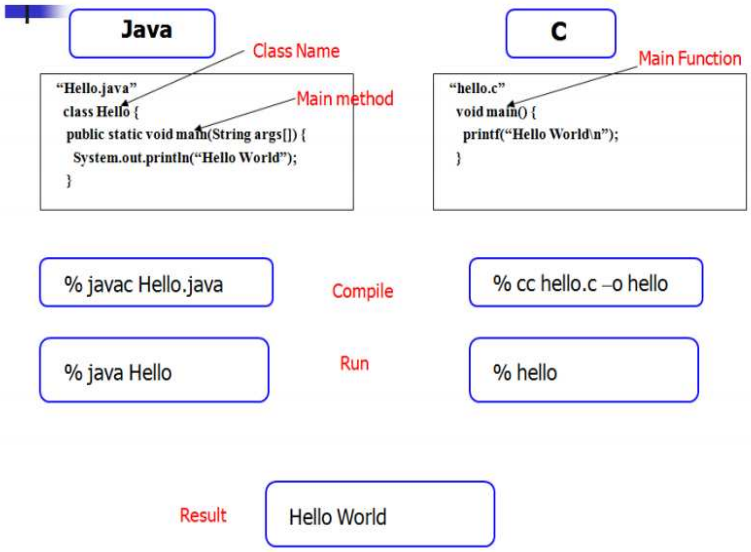
DATA TYPES OF JAVA:[10]

Types

- char 16bits Unicode character data
- boolean Boolean Variable
- byte 8 bits signed integer
- short 16 bits signed integer
- int 32 bits signed integer
- long 64 bits signed integer
- float 32 bits signed floating point number
- double 64 bits signed floating point number

EXAMPLE OF JAVA PROGRAMMING



HASKELL

It is a functional programming language which is specially designed for handle list processing and symbolic computations. It is based on mathematical functions.[4]

It is the best programming language to develop artificial intelligence. It is fit for writing genetic programming, graphical models and neural networks etc. There are some features of Haskell Language for choice artificial intelligent developers:[5]

1. It is used to develop domain-specific languages.
2. When we use Haskell, then we can separate pure actions from the input and output.[9]
3. There are some types of good libraries like hmatrix.

AIML (ARTIFICIAL INTELLIGENCE MARKUP LANGUAGE)

- It was developed by Dr. Richard S. Wallace and Alicebot free software community during 1995-2000.[10]
- It is based on the XML.
- It is used to creating artificial intelligent applications.[13]
- AIML also used to create human interfaces which are keeping the highly maintainable,

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easy to understand and the implementation simple to program.[14]

- Artificial Intelligence Markup Language is used to create chat box application which is based on Artificial Linguistic Internet Computer Entity (ALICE) free software.[9]

FORMAT OF ARTIFICIAL INTELLIGENCE MARKUP LANGUAGE (AIML)

```
< aiml version="1.0" >
< topic name=" the topic" >
<category>
  <pattern>PATTERN</pattern>

  <template>Template</template>
</category>
  ..
</topic>
</aiml>
```

AIML Tags:

- **<aiml> tag:** This tag is used to define the starting and ending of AIML Document. [5]

Syntax Of <aiml> tag:

<aiml ----------></aiml>

- **<topic> tag**=It is used to store context.[6]

Syntax Of <topic> tag:

```
<topic>
        ------------------------
        ------------------------
        ------------------------
    </topic>
```

- **<category> tag**:

It is used to define the peace of knowledge.

Syntax Of <topic> tag:

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```
<topic>
                ------------------------
                <category>
                        ------------------------
                        ------------------------
                </category>

        </topic>
```

- **<pattern> tag:**

```
topic>
                ------------------------
                <category>
                        <pattern>------------------------</pattern>
                        ------------------------
                </category>
  </topic>
```

It is used to define the pattern which is the match to the what a customer may input in Alicebot.

- **<template> tag:**

It is used to define the response of the user input in the Alicebot software.

```
    <topic>
                ------------------------
        <category>
                <pattern>------------------------</pattern>
                <template>----------------------</template>
                </category>
  </topic>
```

EXAMPLE OF AIML

```
1  <aiml version = "1.0.1" encoding = "UTF-8"?>
2     <category>
3        <pattern> HELLO Manju </pattern>
4
5        <template>
6           Hello User!
7        </template>
8
9     </category>
10 </aiml>
```

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CONCLUSION

Artificial intelligent is at the middle of a brand fresh enterprise to create process models of intelligence. The most assumption is that intelligence (human or then else) will be pictured in terms of image structures and symbolic operations which might be programmed in a very computing machine. There's a lot of discussion on whether or not such Associate in Nursing befittingly programmed laptop would be a mind, or would simply simulate one, however, artificial intelligent researchers needn't look ahead to the conclusion to its discussion, nor for the hypothetic laptop that would model all of the human intelligence. Aspects of intelligent behavior, like determination issues, creating inferences, learning, and understanding language, have already been coded as laptop programs, and inside terribly restricted domains, like characteristic diseases of soybean plants, AI programs will exceed human consultants. currently, the good challenge of AI is to seek out ways in which of representing the reasonable data and knowledge that alter individuals to hold out everyday activities like holding a wide-ranging spoken language or finding their method on a busy street.

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