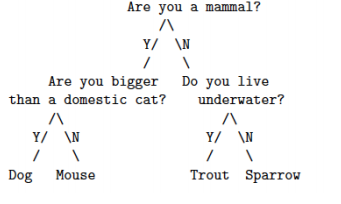
# Problem Definition

The goal of the program is to implement one of the most famous game “Animal Guess”. Here, a player thinks of an animal; the program tries to guess the animal depending on the responses the player provides. Eg: The program asks the player whether the animal is larger than a cat? If the player provides a response, the program goes on diving further deep into the tree node. When the program reaches the leaf node, there would have been enough evidence to guess the animal correctly.



# Methodology

## Data Structure

The data structure preferred is a linked list. The nodes of linked list have been implemented as instances of Node Class.

Public class Node {

Node leftChild;

Node rightChild;

String value;

Integer id;

}

Here,

leftChild → represents left Child of the node

rightChild → represents right Child of the node

value → represents value inside the node, may be a question

id → id that represents the node, easy to identify

## Algorithm

1. Start
2. Store all the data to be input into the linked list in such a way that you are following the trick mentioned above.
3. Add the data of the array as nodes of the linked list following a recursive function call technique. That is, starting by adding the middle index array value as node of the linked list, then calling the recursive function for elements to the left of the middle index and doing the same for the elements to the right of the middle index, continuing till start index != end index.
4. After linked list is formed, the game is started. Until the leaf node is reached, the questions (data in nodes) are asked and depending upon the response (yes/no), traversal is done to the left or right sub-tree.
5. Final response is given based on which leaf node is reached through traversal.
6. End

## Source Code / Implementation

public class Node {

Node lChild,rChild;

Integer id;

String value;

public Node(String value, int id) {

this.value = value;

this.id = id;

}

}

import java.util.Scanner;

public class AnimalGuessGame {

public Node addRootNode(String question,int id)

{

Node root=new Node(question,id);

return root;

}

public void addLeftNode(Node root, int parentId, int id, String question) {

if (root.id == parentId) {

Node newNode = new Node(question, id);

root.lChild = newNode;

return;

}

else {

if (root.lChild != null) {

addLeftNode(root.lChild, parentId, id, question);

}

if (root.rChild != null) {

addLeftNode(root.rChild, parentId, id, question);

}

}

}

public void addRightNode(Node root, int parentId, int id, String question) {

if (root.id == parentId) {

root.rChild = new Node(question, id);

return;

} else {

if (root.lChild != null) {

addRightNode(root.lChild, parentId, id, question);

}

if (root.rChild != null)

addRightNode(root.rChild, parentId, id, question);

}

}

public static void main(String[] args) {

AnimalGuessGame addNode = new AnimalGuessGame();

Node rootNode=addNode.addRootNode("Are you a mammal",0);

addNode.addLeftNode(rootNode, 0, 1, "Are you bigger than a cat?");

addNode.addLeftNode(rootNode, 1, 3, "Dog");

addNode.addRightNode(rootNode, 1, 4, "Mouse");

addNode.addRightNode(rootNode, 0, 2, "Do you live underwater?");

addNode.addLeftNode(rootNode, 2, 5, "Trout");

addNode.addRightNode(rootNode, 2, 6, "Sparrow");

System.out.println("Press 1 for yes and 0 for No");

startGame(rootNode);

}

public static boolean checkLeaf(Node node)

{

boolean isLeaf=false;

if(node.lChild==null && node.rChild==null)

{

isLeaf=true;

}

return isLeaf;

}

public static void startGame(Node node) {

Scanner input = new Scanner(System.in);

while (1==1) {

System.out.println(node.value);

int answer = input.nextInt();

if (answer == 1) {

node=node.lChild;

} else if (answer == 0) {

node=node.rChild;

} else {

System.out.println("Invalid entry");

}

if(checkLeaf(node) == true)

{

System.out.println("The animal guessed is:\t"+node.value);

break;

}

}

}

}

## Output:

Press 1 for yes and 0 for No

Are you a mammal

0

Do you live underwater?

1

The animal guessed is: Trout

Press 1 for yes and 0 for No

Are you a mammal

0

Do you live underwater?

0

The animal guessed is: Sparrow

# Analysis

In the above program, we start the game at the root node. For every YES, we visit left child and for every NO we visit the right child – until the leaf node is reached. In the output above, the program traverses right when we say NO for the question, “Are you a mammal?”. The next node contains the question, “Do you live underwater?” . When we say YES the node next node is the leaf node. Here, the program has collected enough evidence to guess an animal properly. Thus, the program spits out the animal name as : “Trout”.