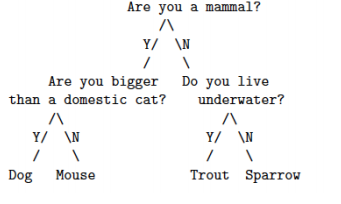
# Problem Definition

In this game, the player thinks of an animal and the computer tries to guess which animal the player is thinking of by asking questions which can be answered `yes' or `no'. Player thinks of an animal in beginning of each game. For example, if you think of a cat. The computer will generate the question at the root node “Are you a mammal?". The player answers yes or no as the answer. And computer produces another question according to the answer of first question. The game continues until the leaf node is reached. At the leaf node the computer will generate it’s guess (dog, mouse, trout or sparrow in our example).



# Methodology

Binary tree has been implemented to store the questions and animals name. A binary tree is a data structure where a node has at most two children, usually referred to as the “left" child and the “right" child.

**public class** Node {  
 Node **leftChild**,**rightChild**;  
 Integer **id**;  
 String **question**;  
 **public** Node(String question, **int** id) {  
 **this**.**question** = question;  
 **this**.**id** = id;  
 }  
}

And the root node is made with a root question. Then, the left and right node are added.

//root node

**public** Node addRootNode(String question,**int** id)  
{  
 Node root=**new** Node(question,id);  
 **return** root;  
}

//creation of left node

**public void** addLeftNode(Node root, **int** parentId, **int** id, String question) {  
 **if** (root.**id** == parentId) {  
 Node newNode = **new** Node(question, id);  
 root.**leftChild** = newNode;  
 **return**;  
 }  
 **else** {  
 **if** (root.**leftChild** != **null**) {  
 addLeftNode(root.**leftChild**, parentId, id, question);  
 }  
 **if** (root.**rightChild** != **null**) {  
 addLeftNode(root.**rightChild**, parentId, id, question);  
 }  
  
 }  
}

//creation of right node

**public void** addRightNode(Node root, **int** parentId, **int** id, String question) {  
 **if** (root.**id** == parentId) {  
 root.**rightChild** = **new** Node(question, id);  
 **return**;  
 } **else** {  
 **if** (root.**leftChild** != **null**) {  
 addRightNode(root.**leftChild**, parentId, id, question);  
 }  
 **if** (root.**rightChild** != **null**)  
 addRightNode(root.**rightChild**, parentId, id, question);  
 }  
  
}

Then in following ways questions an aswers are inserted into nodes:

**public static void** main(String[] args) {  
  
 GameImpletation addNode = **new** GameImpletation();  
 Node rootNode=addNode.addRootNode(**"Are you a mammal"**,0);*//Root node is created  
  
 //The nodes are added to the tree* 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);*//rootnode is passed to startGame*}

The value is checked as follows:

**public static boolean** checkLeaf(Node node)  
{  
 **boolean** isLeaf=**false**;  
 **if**(node.**leftChild**==**null** && node.**rightChild**==**null**)  
 {  
 isLeaf=**true**;  
 }  
 **return** isLeaf;  
  
}

The game is then played as follows:

**public static void** startGame(Node node) {  
 *//This loop runs until break is initiated* **while** (**true**) {  
  
 Scanner input = **new** Scanner(System.***in***);  
 System.***out***.println(node.**question**);  
 **int** answer = input.nextInt();  
 **if** (answer == 1) {  
 node=node.**leftChild**;*//switch to left child* } **else if** (answer == 0) {  
 node=node.**rightChild**;*//switch to right child* } **else** {  
 System.***out***.println(**"Invalid entry"**);  
 }  
 **if**(*checkLeaf*(node) == **true**)*//the current node is leaf node* {  
 System.***out***.println(**"The animal guessed is:\t"**+node.**question**);  
 **break**;*//Exit the loop* }  
  
 }  
 }  
}

## 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

At first we are at root node. For answer “yes” we visit left node and for “No” we visit left until the leaf node is reached. The program traverses in left and right direction according to the answer of previous node and reaches to another node and asks another question. At last node correct guess is made.