Lab Assignment: Dictionary using Binary Search Tree

Objective

To implement a dictionary of word–meaning pairs using a Binary Search Tree (BST). Each node of the tree stores a word as the key and its meaning as the associated value.

Problem Statement

Design and implement a dictionary where words are stored in lexicographic (alphabetical) order using a BST. The dictionary should allow insertion, deletion, searching, and updating of word–meaning pairs.

Function Signatures

```
struct Node* insert(struct Node* root, char* word, char* meaning);
struct Node* deleteNode(struct Node* root, char* word);
struct Node* search(struct Node* root, char* word);
void updateMeaning(struct Node* root, char* word, char* newMeaning);
void inorderTraversal(struct Node* root);
```

Details

- Each node contains a word, its meaning, and pointers to the left and right subtrees.
- Words are inserted in lexicographic order:
  - If the new word is smaller than the current node's word, insert in the left subtree.
  - If the new word is larger, insert in the right subtree.
- Searching compares the word lexicographically and traverses left or right accordingly.
- Deletion follows BST deletion rules:
  - If the node is a leaf, delete it directly.
  - If it has one child, replace the node with its child.
  - If it has two children, replace the node with its inorder successor and delete the successor node.
- Updating a meaning requires first locating the word, then replacing the meaning field.
- Inorder traversal prints the dictionary in sorted order by words.

Example Walkthrough

Insert the following word–meaning pairs:

- `‘apple’’` → ‘a fruit”
- `‘cat’’` → ‘an animal”
- `‘ball’’` → ‘a round object”

The BST structure will be: [apple → *cat* → *ball*]

Search Example: Searching for ‘ball” returns `‘a round object’’`. **Traversal Example:** Inorder traversal prints the dictionary in sorted order: [apple → *ball* → *cat*]

Expected Output

The program should:

- Insert word–meaning pairs into the BST.
- Search for a word and return its meaning.
- Delete a word from the dictionary.
- Update the meaning of an existing word.
- Print the dictionary in sorted order using inorder traversal.