```
from collections import deque
tree_graph = {
    "A": ["B", "C", "D"],
    "B": ["E"],
    "C": ["F", "G"],
    "D": ["H"],
    "E": ["I", "J"],
    "F": [],
    "G": ["K", "L"],
    "H": ["M"],
    "I": [],
    "J": [],
    "K": [],
    "L": [],
    "M": []
}
def bfs(graph,start):
  queue=deque([start])
  visited=set([start])
  while queue:
    node=queue.popleft()
    print(node, end=" ")

    for neighbour in graph[node]:
      if neighbour not in visited:
        queue.append(neighbour)
        visited.add(neighbour)
print("BFS traversal")
bfs(tree_graph,"A")

def dfs(graph,start,visited):
  if start not in visited:
    print(start,end=" ")
    visited.add(start)
    for neighbour in graph[start]:
      dfs(graph,neighbour,visited)

visited=set()
print("\nDFS traversal")
dfs(tree_graph,"A",visited)
```

```
BFS traversal
A B C D E F G H I J K L M
DFS traversal
A B E I J C F G K L D H M
```

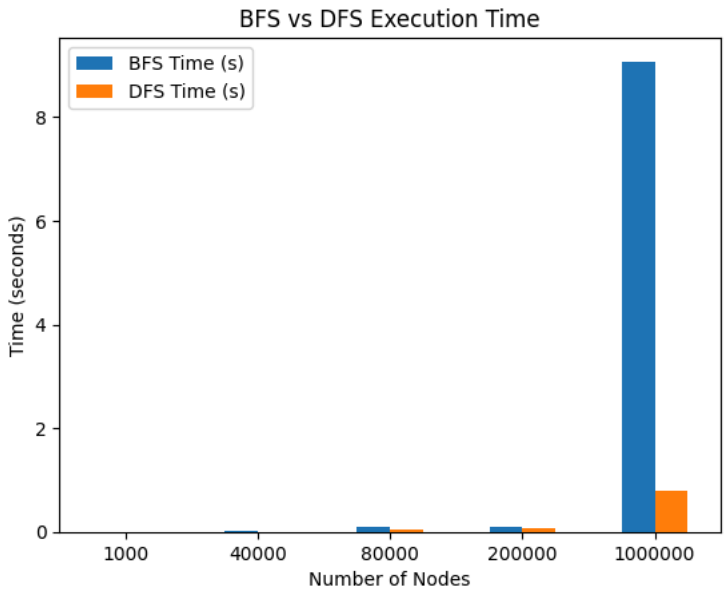
```
from collections import deque
def bfs(graph,start,goal):
  queue=deque([(start, [start])])
  visited=set([start])
  while queue:
    node, path = queue.popleft()
    if node == goal:
      return path
    for neighbour in graph[node]:
      if neighbour not in visited:
        queue.append((neighbour, path + [neighbour]))
        visited.add(neighbour)

city_graph = {
    "Islamabad": ["Rawalpindi", "Lahore", "Peshawar"],
    "Rawalpindi": ["Islamabad", "Peshawar", "Quetta"],
    "Peshawar": ["Islamabad", "Rawalpindi", "Quetta"],
    "Lahore": ["Islamabad", "Multan", "Quetta"],
    "Multan": ["Lahore", "Karachi", "Quetta"],
    "Quetta": ["Rawalpindi", "Peshawar", "Multan", "Karachi"],
    "Karachi": ["Multan", "Quetta"]
}
start_city = "Islamabad"
goal_city = "Karachi"
path = bfs(city_graph, start_city, goal_city)
if path:
  print("Path from", start_city, "to", goal_city, ":", " -> ".join(path))
else:
  print("No path found from", start_city, "to", goal_city)
```

```
Path from Islamabad to Karachi : Islamabad -> Rawalpindi -> Quetta -> Karachi
```

```
import random
import time
```

```
import pandas as pd
import matplotlib.pyplot as plt

# Step 1: Generate Random Unique Numbers
def generate_unique_numbers(size, range_start, range_end):
    return random.sample(range(range_start, range_end), size)

# Generate sets
sets = {
    1000: generate_unique_numbers(1000, 1, 10000),
    40000: generate_unique_numbers(40000, 1, 1000000),
    80000: generate_unique_numbers(80000, 1, 1000000),
    200000: generate_unique_numbers(200000, 1, 1000000),
    1000000: generate_unique_numbers(1000000, 1, 10000000)
}

# Step 2: Build a Binary Search Tree
class TreeNode:
    def __init__(self, key):
        self.left = None
        self.right = None
        self.val = key

def insert(root, key):
    if root is None:
        return TreeNode(key)
    else:
        if root.val < key:
            root.right = insert(root.right, key)
        else:
            root.left = insert(root.left, key)
    return root

def build_tree(numbers):
    root = None
    for number in numbers:
        root = insert(root, number)
    return root

# Step 3: Implement BFS and DFS
def bfs(root, goal):
    if root is None:
        return False
    queue = [root]
    while queue:
        node = queue.pop(0)
        if node.val == goal:
            return True
        if node.left:
            queue.append(node.left)
        if node.right:
            queue.append(node.right)
    return False

def dfs(root, goal):
    if root is None:
        return False
    if root.val == goal:
        return True
    return dfs(root.left, goal) or dfs(root.right, goal)

# Step 4: Measure Execution Time
results = []

for size, numbers in sets.items():
    tree = build_tree(numbers)
    goal = numbers[len(numbers) - 220]

    # Measure BFS
    start_time = time.time()
    bfs(tree, goal)
    bfs_time = time.time() - start_time

    # Measure DFS
    start_time = time.time()
    dfs(tree, goal)
    dfs_time = time.time() - start_time

    results.append({
        'Size': size,
        'BFS Time (s)': bfs_time,
        'DFS Time (s)': dfs_time
    })
```

```
# Step 5: Create a DataFrame
df = pd.DataFrame(results)

# Step 6: Plot the Results
df.set_index('Size')[['BFS Time (s)', 'DFS Time (s)']].plot(kind='bar')
plt.title('BFS vs DFS Execution Time')
plt.ylabel('Time (seconds)')
plt.xlabel('Number of Nodes')
plt.xticks(rotation=0)
plt.show()
```



Start coding or generate with AI.

+ Code + Text

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