TITLE 33

Write a program to find All-to-all Shortest paths in a Graph

OBJECTIVE:

Implementation using graphs

PROBLEM STATEMENT:

Finding the shortest distance using graph.

ALGORITHM:

START

INPUT: Read from the keyboard

COMPUTATION: Computing the All-to-all Shortest paths in a graph

DISPLAY: Displaying the output

STOP

PROGRAM:

#include <stdio.h>

#include <stdlib.h>

#define SIZE 40

struct queue {

int items[SIZE];

int front;

int rear;

};

struct queue\* createQueue();

void enqueue(struct queue\* q, int);

int dequeue(struct queue\* q);

void display(struct queue\* q);

int isEmpty(struct queue\* q);

void printQueue(struct queue\* q);

struct node {

int vertex;

struct node\* next;

};

struct node\* createNode(int);

struct Graph {

int numVertices;

struct node\*\* adjLists;

int\* visited;

};

void bfs(struct Graph\* graph, int startVertex) {

struct queue\* q = createQueue();

graph->visited[startVertex] = 1;

enqueue(q, startVertex);

while (!isEmpty(q)) {

printQueue(q);

int currentVertex = dequeue(q);

printf("Visited %d\n", currentVertex);

struct node\* temp = graph->adjLists[currentVertex];

while (temp) {

int adjVertex = temp->vertex;

if (graph->visited[adjVertex] == 0) {

graph->visited[adjVertex] = 1;

enqueue(q, adjVertex);

}

temp = temp->next;

}

}

}

// Creating a node

struct node\* createNode(int v) {

struct node\* newNode = malloc(sizeof(struct node));

newNode->vertex = v;

newNode->next = NULL;

return newNode;

}

// Creating a graph

struct Graph\* createGraph(int vertices) {

struct Graph\* graph = malloc(sizeof(struct Graph));

graph->numVertices = vertices;

graph->adjLists = malloc(vertices \* sizeof(struct node\*));

graph->visited = malloc(vertices \* sizeof(int));

int i;

for (i = 0; i < vertices; i++) {

graph->adjLists[i] = NULL;

graph->visited[i] = 0;

}

return graph;

}

void addEdge(struct Graph\* graph, int src, int dest) {

struct node\* newNode = createNode(dest);

newNode->next = graph->adjLists[src];

graph->adjLists[src] = newNode;

newNode = createNode(src);

newNode->next = graph->adjLists[dest];

graph->adjLists[dest] = newNode;

}

struct queue\* createQueue() {

struct queue\* q = malloc(sizeof(struct queue));

q->front = -1;

q->rear = -1;

return q;

}

int isEmpty(struct queue\* q) {

if (q->rear == -1)

return 1;

else

return 0;

}

void enqueue(struct queue\* q, int value) {

if (q->rear == SIZE - 1)

printf("\nQueue is Full!!");

else {

if (q->front == -1)

q->front = 0;

q->rear++;

q->items[q->rear] = value;

}

}

int dequeue(struct queue\* q) {

int item;

if (isEmpty(q)) {

printf("Queue is empty");

item = -1;

} else {

item = q->items[q->front];

q->front++;

if (q->front > q->rear) {

printf("Resetting queue ");

q->front = q->rear = -1;

}

}

return item;

}

void printQueue(struct queue\* q) {

int i = q->front;

if (isEmpty(q)) {

printf("Queue is empty");

} else {

printf("\nQueue contains \n");

for (i = q->front; i < q->rear + 1; i++) {

printf("%d ", q->items[i]);

}

}

}

int main() {

struct Graph\* graph = createGraph(6);

addEdge(graph, 0, 1);

addEdge(graph, 0, 2);

addEdge(graph, 1, 2);

addEdge(graph, 1, 4);

addEdge(graph, 1, 3);

addEdge(graph, 2, 4);

addEdge(graph, 3, 4);

bfs(graph, 0);

return 0;

}