

# DSIP

## Convolutions

### Code:

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#include <conio.h>
#include <graphics.h>
#include <stdio.h>
#define origX 320
#define origY 240

void axis(int type, int x, int y, int length) {
    int i;
    if (type == 0) {
        line(x - length, y, x + length, y);
        outtextxy(x + length, y + 10, "Time Steps");
    }
    else {
        line(x, y - length, x, y + length);
        outtextxy(x - 10, y - length, "X(n)");
    }
}

void impulse(int x, int val) {
    int new_x = origX + 30*x;
    int new_y = origY - 30*val;
    char x_label[2], y_label[2];
    y_label[0] = (char) (abs(val) + 48);
    y_label[1] = '\0';
    x_label[0] = (char)(abs(x)+48);
    x_label[1] = '\0';
    line(new_x, origY, new_x, new_y);
    outtextxy(new_x, new_y - 10, y_label);
    outtextxy(new_x, origY + 10, x_label);
}

void show_graph(int x[50][2], int l, int colour) {
    int i;
    if (colour == 0)
        setcolor(RED);
    else
        setcolor(YELLOW);
    for (i = 0; i < l; i++)
        impulse(x[i][0], x[i][1]);
    setcolor(WHITE);
}

void reverse(int x[50][2], int l, int result[50][2]) {
    int i;
    for (i = 0; i < l; i++) {
```

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        result[i][0] = -x[l-i-1][0];
        result[i][1] = x[l-i-1][1];
    }
}

int main() {
    int gd = DETECT, gm;
    int i, j, k, len_x, len_h;
    int min_h, max_h;
    int min_x;
    int x[50][2], h[50][2], temp_h[50][2];
    int result[50][2];
    initgraph(&gd, &gm, "");
    axis(0, origX, origY, 240);
    axis(1, origX, origY, 200);
    printf("Enter the length of the signal: ");
    scanf("%d", &len_x);
    printf("Enter the values of the signal in the form (index, value)\n");
    for (i=0; i<len_x; i++)
        scanf("%d %d", &x[i][0], &x[i][1]);
    show_graph(x, len_x, 0);
    printf("Enter the length of the impulse: ");
    scanf("%d", &len_h);
    printf("Enter the values of the signal in the form (index, location)\n");
    for (i=0; i<len_h; i++)
        scanf("%d %d", &temp_h[i][0], &temp_h[i][1]);
    reverse(temp_h, len_h, h);
    //show_graph(h, len_h, 1);
    i = 0;
    for (j = -h[len_h-1][0] + x[0][0]; j <= -h[0][0]+x[len_x-1][0]; j++) {
        result[i][0] = j;
        result[i][1] = 0;
        min_x = x[0][0];
        for (k = 0; k < len_h; k++) {
            if ((h[k][0]+j) >= x[0][0] && (h[k][0]+j) <= x[len_x-1][0])
                result[i][1] += h[k][1] * x[h[k][0]+j-min_x][1];
        }
        i++;
    }

    printf("Result\n");
    for (i = 0; i < (len_x+len_h-1); i++)
        printf("%d --> %d\n", result[i][0], result[i][1]);
    show_graph(result, (len_x + len_h - 1), 1);
    getch();
    closegraph();
    return 0;
}

```

## Output:

