#### **TCES 202**

# Advanced Computer Programming Assignment 3 – Recursion

## Submit a single file, assassin\_list.c on Canvas. 25 Points

This assignment will give you practice with recursion. You are to rewrite the functions in the file assassin\_list.c that allows a client to manage a game of assassin using recursion. Use your solution from Assignment 1 to rewrite. If you had bugs, fix before you rewrite the functions. The functions that you need to rewrite are

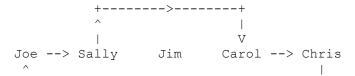
list\_add print\_kill\_ring print\_grave\_yard grave\_yard\_contains kill\_ring\_contains

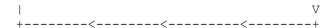
You may want to consider using helper functions to implement recursion.

Each person playing assassin has a particular target that he/she is trying to assassinate. One of the things that makes the game more interesting to play is that initially each person knows only who they are assassinating (they don't know who is trying to assassinate them nor do they know who other people are trying to assassinate). You are working on a program for the "game administrator" who needs to keep track of who is stalking whom and the history of who killed whom.

The game of assassin is played as follows. You start out with a group of people who want to play the game. For example, let's say that we have five people playing whose names are Joe, Sally, Jim, Carol and Chris. A circular chain of assassination targets is established (what is called the "kill ring" in the sample log of execution). For example, we might decide Joe should stalk Sally, Sally should stalk Jim, Jim should stalk Carol, Carol should stalk Chris and Chris should stalk Joe.

When someone is assassinated, the chain needs to be relinked by "skipping" that person. For example, suppose that Jim is assassinated first (obviously this would have been by Sally). Sally needs a new target, so we give her Jim's target: Carol. Thus, the chain becomes:





The main program has been written for you and is called main.c. It reads a file of names, shuffles the names, and creates a variable of type *alist*. The main program then asks the user for the names of the victims in order until the game is over (until there is just one player left alive), calling functions of the assassin\_list to carry out the tasks involved in administering the game.

Your assassin\_list will keep track of two different lists: the list of those currently alive and the list of those who are dead. Each is to be stored in a linked list. I am requiring you to use my node struct which is called anode (assassin\_node.h). The **anode** struct has three data fields: one for the name of the person, one for the name of the killer and a "next" field to keep track of the next value in the list.

For this particular program, it can be convenient to store the kill ring in what is known as a "circular" linked list. Normally lists have the value "null" stored in the next field of the last node of the list. Such lists are known as "null terminated" lists. In a circular list, the final element stores a reference to the first element in the list. The assassin task involves a circular chain of targets, so this can be a convenient structure to use. It can also lead to infinite loops and other problems.

You will probably want to write your own testing program. When your code is in good shape, you can use the main program to make sure it works properly. A log of execution for program appears at the end of this write-up. Your program should exactly reproduce the format and general behavior demonstrated in the log, although you won't exactly recreate this scenario because of the "shuffling" of the names that main performs.

In terms of correctness, your program must exhibit the behavior in the executable. In terms of style, I will be grading on your use of comments, good variable names, consistent indentation and good coding style to implement these operations.

**Submission Instructions:** Submit the code on Canvas under Assignment 3 Submission link as *assassin\_list.c*.

### Log of execution (user input underlined)

```
Current kill ring:

Bobby Warner is stalking Joe Martin
Joe Martin is stalking Ruth Martin
Ruth Martin is stalking Tad Martin
Tad Martin is stalking Phoebe Wallingford
Phoebe Wallingford is stalking Erica Kane
Erica Kane is stalking Anita Santos
Anita Santos is stalking Jackson Montgomery
Jackson Montgomery is stalking Bobby Warner
Current graveyard:

next victim? Joe Martin

Current kill ring:
Bobby Warner is stalking Ruth Martin
```

Ruth Martin is stalking Tad Martin
Tad Martin is stalking Phoebe Wallingford
Phoebe Wallingford is stalking Erica Kane
Erica Kane is stalking Anita Santos
Anita Santos is stalking Jackson Montgomery
Jackson Montgomery is stalking Bobby Warner
Current graveyard:

Joe Martin killed by Bobby Warner

next victim? <u>Joe Martin</u> Joe Martin is <u>already dead</u>.

#### Current kill ring:

Bobby Warner is stalking Ruth Martin
Ruth Martin is stalking Tad Martin
Tad Martin is stalking Phoebe Wallingford
Phoebe Wallingford is stalking Erica Kane
Erica Kane is stalking Anita Santos
Anita Santos is stalking Jackson Montgomery
Jackson Montgomery is stalking Bobby Warner
Current graveyard:

Joe Martin killed by Bobby Warner

#### next victim? Tad Martin

#### Current kill ring:

Bobby Warner is stalking Ruth Martin Ruth Martin is stalking Phoebe Wallingford Phoebe Wallingford is stalking Erica Kane Erica Kane is stalking Anita Santos Anita Santos is stalking Jackson Montgomery Jackson Montgomery is stalking Bobby Warner Current graveyard:

Tad Martin killed by Ruth Martin Joe Martin killed by Bobby Warner

#### next victim? Bobby Warner

#### Current kill ring:

Ruth Martin is stalking Phoebe Wallingford Phoebe Wallingford is stalking Erica Kane Erica Kane is stalking Anita Santos Anita Santos is stalking Jackson Montgomery Jackson Montgomery is stalking Ruth Martin Current graveyard:

Bobby Warner killed by Jackson Montgomery Tad Martin killed by Ruth Martin Joe Martin killed by Bobby Warner

#### next victim? Erica Kane

#### Current kill ring:

Ruth Martin is stalking Phoebe Wallingford Phoebe Wallingford is stalking Anita Santos Anita Santos is stalking Jackson Montgomery Jackson Montgomery is stalking Ruth Martin Current graveyard:

Erica Kane killed by Phoebe Wallingford Bobby Warner killed by Jackson Montgomery Tad Martin killed by Ruth Martin Joe Martin killed by Bobby Warner

#### next victim? Anita Santos

#### Current kill ring:

Ruth Martin is stalking Phoebe Wallingford Phoebe Wallingford is stalking Jackson Montgomery Jackson Montgomery is stalking Ruth Martin Current graveyard:

Anita Santos killed by Phoebe Wallingford Erica Kane killed by Phoebe Wallingford Bobby Warner killed by Jackson Montgomery Tad Martin killed by Ruth Martin Joe Martin killed by Bobby Warner

 $\begin{array}{c} \text{next victim?} \ \underline{\text{Menaka Abraham}} \\ \text{Unknown person.} \end{array}$ 

#### Current kill ring:

Ruth Martin is stalking Phoebe Wallingford Phoebe Wallingford is stalking Jackson Montgomery Jackson Montgomery is stalking Ruth Martin Current graveyard:

Anita Santos killed by Phoebe Wallingford Erica Kane killed by Phoebe Wallingford Bobby Warner killed by Jackson Montgomery Tad Martin killed by Ruth Martin Joe Martin killed by Bobby Warner

#### next victim? Phoebe Wallingford

#### Current kill ring:

Ruth Martin is stalking Jackson Montgomery Jackson Montgomery is stalking Ruth Martin Current graveyard:

Phoebe Wallingford killed by Ruth Martin Anita Santos killed by Phoebe Wallingford Erica Kane killed by Phoebe Wallingford Bobby Warner killed by Jackson Montgomery Tad Martin killed by Ruth Martin Joe Martin killed by Bobby Warner

#### next victim? Ruth Martin

Game was won by Jackson Montgomery Final graveyard is as follows:

Ruth Martin killed by Jackson Montgomery Phoebe Wallingford killed by Ruth Martin Anita Santos killed by Phoebe Wallingford Erica Kane killed by Phoebe Wallingford Bobby Warner killed by Jackson Montgomery Tad Martin killed by Ruth Martin Joe Martin killed by Bobby Warner