CSCI 320-54 – Assignment 4

Created by: Thomas Hoerger

Objectives

This program reverses the elements of a vector.

Equipment Used

EASY 68K simulator

Procedure

Your assignment here is to reverse the elements of a vector. The procedure is as follows:

1. Create a vector of the ASCII characters ‘A ... J’ at location $004AC4.
2. Construct a sequence of operations beginning at location $004ACE which will reverse the elements of the vector.
3. Display both the ASCII vector and the instructions.
4. Execute your program.
5. Display the vector to insure that it was indeed reversed.

In order for all of this to work, references to data must be PC relative. Turn in all items which you were asked to display along with your evaluation of the lab.

New Operations Learned

LEA VECTOR
MOVEQ
MOVE.L
DC.B
MOVE.B
ADDQ.L
SUBQ.L
CMP.L
BGE

Program Description

This program is designed to reverse the elements of a vector. It does this by swapping the first and last elements, then the second and second-to-last elements, and so on, until all elements have been reversed.

SOURCE CODE

```
*-----------------------------------------------------------
* Title      : Vector Reversal Program
* Written by : Thomas Hoerger
* Date       : 2/24/2024
* Description: This program reverses the elements of a vector.
*-----------------------------------------------------------

          ORG $004AC4             ; Set origin address

* Define ASCII vector
VECTOR    DC.B 'ABCDEFGHIJ',0     ; Define ASCII string 'ABCDEFGHIJ'

* Start of program
START     LEA VECTOR,A0           ; A0 points to the start of VECTOR
          MOVE.L #10,D1           ; Length of the vector (number of elements - 1)

REVERSE   MOVEQ #0,D2             ; Initialize D2 to 0
          MOVEQ #9,D3             ; Initialize D3 to 9 (the last index)

LOOP      MOVE.B (A0,D2),D4       ; Load byte from start of VECTOR to D4
          MOVE.B (A0,D3),D5       ; Load byte from end of VECTOR to D5

          MOVE.B D5,(A0,D2)       ; Store byte from D5 to start of VECTOR
          MOVE.B D4,(A0,D3)       ; Store byte from D4 to end of VECTOR

          ADDQ.L #1,D2            ; Increment start index
          SUBQ.L #1,D3            ; Decrement end index

          CMP.L D2,D3             ; Compare start and end indices
          BGE LOOP                ; Continue until start exceeds end

DONE      SIMHALT                 ; Halt simulator

          END START               ; End of program
```

Figure 1 shows the code properly entered in the simulator.

```
00004AC0: FF FF FF FF 41 42 43 44 45 46 47 48 49 4A 00 FF ----ABCDEFGHIJ--
00004AD0: 41 F8 4A C4 72 0A 74 00 76 09 18 30 20 00 1A 30 A-J-r-t-v--0 --0
00004AE0: 30 00 11 85 20 00 11 84 30 00 52 82 53 83 B6 82 0--- ---0-R-S---
00004AF0: 6C E8 FF FF FF FF FF FF FF FF FF FF FF FF FF FF l---------------
```

Figure 2 shows the vector at memory location $004AC4 before running the program.

Results

After Execution of the program:

```
00004AC0: FF FF FF FF 4A 49 48 47 46 45 44 43 42 41 00 FF ----JIHGFEDCBA--
00004AD0: 41 F8 4A C4 72 0A 74 00 76 09 18 30 20 00 1A 30 A-J-r-t-v--0 --0
00004AE0: 30 00 11 85 20 00 11 84 30 00 52 82 53 83 B6 82 0--- ---0-R-S---
00004AF0: 6C E8 FF FF FF FF FF FF FF FF FF FF FF FF FF FF l---------------
```

Figure 3 shows the vector reversed at memory location $004AC4 after running the program.