CSCI 592
LAB ASSIGNMENT – 4

Written by

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OBJECTIVE:

The objective of this lab assignment is to display a vector using assembly language programming for the 68K microprocessor. The program manipulates memory addresses and registers to move data efficiently.

TECHNOLOGY USED

- Easy68K Assembler software to run the code.
- Hypothetical or real CPU with registers and memory
- Hexadecimal Memory Addressing

PROCEDURE

- Define the memory addresses and load data into registers.
- Use the LEA instruction to load effective addresses into registers.
- Perform byte-level data movement using MOVE.B instructions.
- Store the manipulated values in the designated memory locations.
- Execute the program in a simulator to observe the results.

OPERATIONS

- Loading Addresses: LEA.L is used to load effective addresses into address registers.
- Byte Movement: MOVE.B transfers byte values from one memory location to another.
- Post-Increment and Pre-Decrement: Registers are modified accordingly to adjust data storage locations.
- Halt Execution: The program halts after execution to display results.

ALGORITHM

- Load memory locations into address registers A1, A2, A3, and A4.
- Retrieve a byte from the source vector (A1) and store it in D0.
- Move bytes from one address (A2) to another (A3) while reversing order.
- Store the retrieved value into another address (A4).
- Repeat the process for all vector elements.
- End execution.

CODE LISTING

```
ORG $1500
START: ; first instruction of program
 LEA.L $004AC4, A1
 LEA.L $004ACE, A2
 LEA.L $004AE0, A3
 LEA.L $004AEA, A4
 MOVE.B (A1)+, D0
 MOVE.B -(A2), (A3)+
 MOVE.B D0, -(A4)
 MOVE.B (A1)+, D0
 MOVE.B -(A2), (A3)+
 MOVE.B D0, -(A4)
 MOVE.B (A1)+, D0
 MOVE.B -(A2), (A3)+
 MOVE.B D0, -(A4)
 MOVE.B (A1)+, D0
 MOVE.B -(A2), (A3)+
 MOVE.B D0, -(A4)
 MOVE.B (A1)+, D0
 MOVE.B -(A2), (A3)+
 MOVE.B D0, -(A4)
          ; halt simulator
          * Variables and Strings
 ORG $004AC4
 DC.L 'ABCDEFGHIJ'
 END START ; last line of source
```

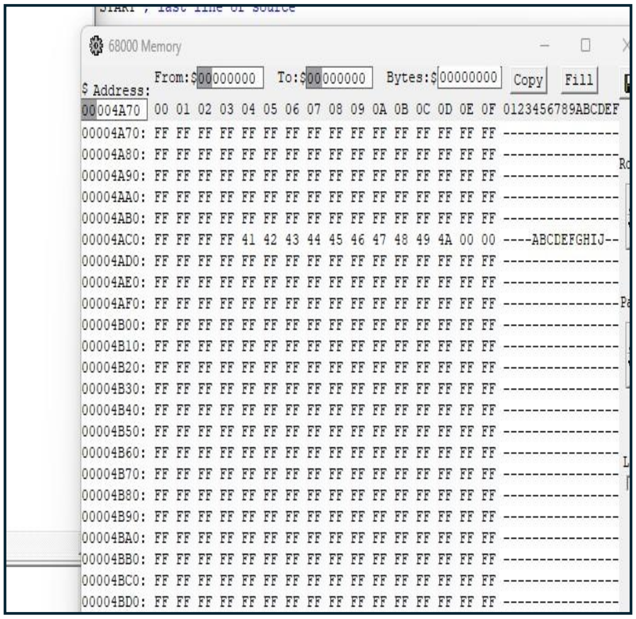
DESCRIPTION

This program initializes memory addresses and processes a vector by reading and writing data using assembly language instructions. It moves bytes between registers, ensuring correct data manipulation.

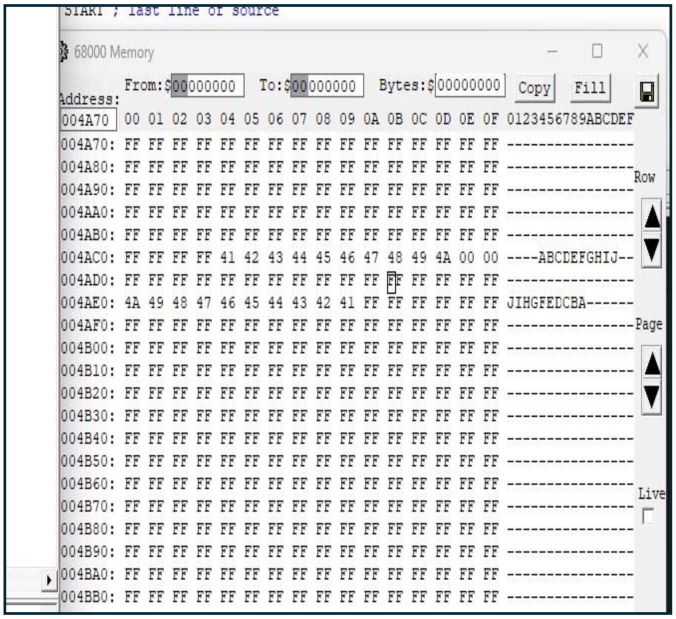
OBSERVATIONS

- The program successfully loads and modifies vector elements.
- The order of values is reversed when moved between memory locations.
- The MOVE.B instruction efficiently transfers bytes.

RESULTS



```
START ; last line of source
          From:$00000000  To:$00000000  Bytes:$00000000
$ Address:
00004A70  00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F 0123456789ABCDEF
00004A70: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
00004A80: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
00004A90: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
00004AA0: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
00004AB0: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
00004AC0: FF FF FF FF 41 42 43 44 45 46 47 48 49 4A 00 00 ----ABCDEFGHIJ--
00004AD0: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
00004AE0: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
00004AF0: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
00004B00: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
00004B10: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
00004B20: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
00004B30: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
00004B40: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
00004B50: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
00004B60: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
00004B70: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
00004B80: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
00004B90: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
00004BA0: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
00004BB0: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
00004BC0: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
00004BD0: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
```



```
START ; last line of source
          From:$00000000  To:$00000000  Bytes:$00000000
Address:
004A70  00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F 0123456789ABCDEF
004A70: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
004A80: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
004A90: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
004AA0: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
004AB0: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
004AC0: FF FF FF FF 41 42 43 44 45 46 47 48 49 4A 00 00 ----ABCDEFGHIJ--
004AD0: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
004AE0: 4A 49 48 47 46 45 44 43 42 41 FF FF FF FF FF FF JIHGFEDCBA------
004AF0: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
004B00: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
004B10: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
004B20: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
004B30: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
004B40: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
004B50: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
004B60: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
004B70: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
004B80: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
004B90: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
004BA0: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
004BB0: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF ----------------
```

LOG FILES

Before Execution:

Memory Address	Value
$004AC4	A
$004AC5	B
$004AC6	C
$004AC7	D
$004AC8	E
$004AC9	F
$004ACA	G
$004ACB	H
$004ACC	I
$004ACD	J

After Execution:

Memory Address	Value
$004AE0	**J**
$004AE1	**I**
$004AE2	**H**
$004AE3	**G**
$004AE4	**F**
$004AE5	**E**
$004AE6	**D**
$004AE7	**C**
$004AE8	**B**
$004AE9	**A**

CONCLUSIONS

This lab assignment demonstrates memory manipulation techniques in 68K assembly language. The use of effective addressing modes, register operations, and byte transfers enables efficient vector handling. The program successfully achieves its objective of displaying and modifying a vector using assembly instructions.