National University of Computer and Emerging Sciences

Laboratory Manual

for

Computer Organization and Assembly Language Programming

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OBJECTIVES:

- Learn to manipulate and handle Programmable Interrupt Controller (PIC) ports.
- Experiment with interrupt chaining and unhooking interrupts for custom handling.
- Explore the basics of the Programmable Interval Timer (PIT) and its integration with interrupts.
- Gain insight into terminating and staying resident (TSR) programs and their applications.

Task 1: Timer-Controlled Asterisk Movement

Write a program to make an asterisk travel the border of the screen, from upper left to upper right to lower right to lower left and back to upper left indefinitely, making each movement after one second. You are not allowed to write any loop in your program. The Timer will move the star by one cell only. Do not lose the previous content of the cell.

Instructions:

1. Hook the timer interrupt (INT 08h) to control the asterisk's movement.
2. Set up a delay of approximately one second using the timer's count.
3. Use a buffer to save the content of the screen cell before placing the asterisk, restoring it after the asterisk moves to the next cell.
4. Avoid any explicit loop in your code to manage the movement.

Task 2: Adding User Control to Start/Stop the Animation and Keypad Filtering

Update previous program, star should start moving (from its previous position, initial position will be top left of screen) if user enters Left Shift key and it should stop on Right Shift Key. Other applications should work fine along with this functionality. Both shifts should work properly on command prompt. Number keys at the right side of keypad should not work on command prompt but number keys on top of the keypad should work properly.

Instructions:

1. Hook the keyboard interrupt (INT 09h) to monitor Shift key presses and enable or disable the animation accordingly.
2. Track the asterisk's current position so it resumes from the last stopped position.
3. Filter inputs to disable the numeric keypad keys in the command prompt but keep the top-row number keys functional.

4. Test to verify the functionality of both Shift keys, ensuring the asterisk movement responds accurately and does not affect other command prompt operations.

Practice / Homework
Task 3: Enable Background Functionality

Update the task 1 program: Star should keep moving, other applications (e.g. AFD etc) should work properly.

Instructions:

1. Use a TSR approach to retain the program in memory.
2. Implement a handler that allows the timer interrupt to continue updating the asterisk's position without interfering with other running applications.
3. Test the program by opening other applications to ensure the asterisk animation runs concurrently without disrupting other processes.