09/04/2024

FACTORIAL

Prepared For :

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Problem Description:

The problem is to implement a MIPS assembly program that calculates the factorial of a given input number recursively.

Input:

The program prompts the user to enter a value.
Output:

The program prints the result of the factorial calculation.

Example:

Sample Input:

Sample Output:

Updates Added to Make the Example Work:

1. Defined input and output strings using .asciiz.
2. Implemented a main function to:
- Print the prompt asking the user to enter a value.
- Read the input value.
- Call the factorial function to calculate the factorial of the input.
- Print the result.

3. Defined the factorial function fact:
- Implemented recursion to calculate the factorial.
- Saved necessary registers ($ra, $a0) onto the stack.
- Restored saved registers before returning from the function.

Report:

Description of the Problem:
The problem requires implementing a MIPS assembly program to calculate the factorial of a given input number. The program should prompt the user to enter a value, calculate the factorial of the input using recursion, and print the result.

Solution Approach:

1. **Input Prompt and Reading Input:**

- The program starts by printing a prompt asking the user to enter a value using the .asciiz directive and the li and la instructions.
- It then reads the input value using syscall 5 and stores it in register $v0.

2. **Factorial Calculation:**

- The main function moves the input value to register $t0.
- It calls the fact function, passing the input value as an argument.
- The fact function implements recursion to calculate the factorial.
- It saves the return address and the argument onto the stack.
- It checks if the input value is less than 2. If true, it returns 1.
- Otherwise, it decrements the input value and recursively calls itself.
- After the recursive call, it restores the argument and the return address from the stack and calculates the factorial.

3. **Printing the Result:**

- After returning from the factorial function, the main function prints the result using the .asciiz directive and the li and la instructions.

4. **Exiting the Program:**

- Finally, the program exits gracefully using syscall 10.

Conclusion:

The MIPS assembly program successfully calculates the factorial of a given input number using recursion. The program follows a structured approach, separating input/output handling, factorial calculation, and program flow control.