Indian Institute of Information Technology Allahabad

Assignment - C3 (May 2020)
Fourth semester B.Tech (IT) - All Sections

Course Name	Course Code	Deadline
Principles of Programming Languages	IPPL211C	May 13, 2021, 11:59 P.M. IST

Important Instructions*: Please prepare and submit a report on the assignment as a single pdf file. Your reports will be first analysed using a plagiarism tool and if found positive, strict action will be taken. This is an individual assignment i.e., not to be done in a team/group. Information regarding submission process will be communicated separately through email. Late submissions will not be entertained.*

There is a nice article on web regarding Understanding C by learning assembly. The article describe how we can learn more about C programs by looking at their assembly versions using a debugger (*gdb* in the article). We can see how *static* variables are different from *stack dynamic* variables by looking at the addresses of these variables in the assembly code. This assignment requires you to apply the same process to answer the following questions. **It is compulsory to justify all your answers using example C/C++ programs and their assembly versions**. You should use gdb the same way as used in the referenced article.

1. Take an example C program in which `main` function calls any other function with 3 or more call by value parameters. Find out how and when values of actual parameters are passed to the formal parameters in the called function. Also point out when and where `main` function (or any other function) copies return address to the called function. *Note: refer chapter 9 and 10 of the book*

2. Repeat question 1 first in C (using pointers) and later in C++ (by using reference variable) by making one of the parameters as pass by reference. Observe the change in the assembly version.

3. How C/C++ compilers handle fixed stack dynamic and stack dynamic arrays?

4. Create more than one heap dynamic variables in C/C++ and observe the difference in addresses of different heap dynamic variables and also compare them with static and stack dynamic variables.

5. On page number 359 of book Concepts of programming languages 10th edition, Prof. Sebesta has discussed three different strategies to implement a switch statement depending on the range of case constants. Find out which method is used by C/C++ in implementing switch statement. Try using different range of case constants to observe if the compiler selects different strategy depending on range of case constants.

6. Comment on how C/C++ compiler uses stack to implement a recursive program. Whether it uses the method described in the text book on page numbers $351 - 353$?