

Assignment 1: Legacy Fortran (25%)

OVERVIEW

Consider the Fortran program described in the following paper:

Main, W.A., "Computer calculation of fire danger", *Research Note NC-79*, U.S. Dept. of Agriculture, (1969) Available: http://nrs.fs.fed.us/pubs/rn/rn_nc079.pdf

The paper describes a Fortran program to calculate the *National Fire Danger Rating Index* first introduced in 1964 in the U.S. The paper outlines all the formulas required to calculate six key indices : Fine fuel moisture, Adjusted fuel moisture, Buildup index, Fine fuel spread, Timber spread index, and Fire load index. The program is given in the form of a Fortran subroutine, which takes the following as input:

- dry-bulb and wet-bulb readings
- a yes-no decision regarding snow on the ground
- the preceding 24-hour precipitation
- the current windspeed
- yesterday's build-up index
- the current herbaceous stage of vegetation

TASK

Convert the legacy Fortran subroutine into a Fortran-95, or a later release. You must also create a program which will call the subroutine and perform I/O with appropriate usability characteristics. Properly document the program. You should attempt modularize the subroutine by decomposing it into smaller subroutines. Your program should compile using `gfortran`.

Make sure to convert/remove any structures which are relevant/irrelevant. Your code should be clean and easy to understand (unlike the existing code). The program contains a number of structures which should be modified or removed to make the program more maintainable. Some examples include:

- computed GO TO which could be replaced by the SELECT CASE structure.
- arithmetic IF statements
- Hollerith characters which are replaced by a character string
- Improved identifier names
- Labels

Discuss your re-designed program in 2-3 page *design document*, explaining decisions you made in the re-engineering process. Identify the legacy structures/features and how you modernized them. Would it have been easier to re-write the program from scratch in a language such as C? What were the greatest problems you faced? Is your program shorter or longer? Why? Consider the design document a synopsis of your re-engineering process.

SKILLS

Fortran programming, re-engineering, program comprehension, ability to review specifications