FORNUTS

FORest NUTrients Simulation

Software Requirements Document

Version 1.2

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1. Introduction

This document represents the requirements for FORNUTS. It will be used by the developers to design and implement the system and by the client to specify the system. This document may serve as the basis for a contract between these parties.

1.1 Purpose

Our client is a lab TA that teaches a soil lab. The client is looking to update old software that was written in Fortran, to be used in the lab that would make it easier to use, have more functionality, and run on newer platforms. This software will have the same functionality of the old program and it will have a graphical user interface and new functionality. This software will be modeled off the old codebase to fit the client's needs.

1.2 Definitions

Shall: requirement is desired but does not have to be part of the software.
Will: requirement is needed and does have to be part of the software.
Software: deliverable, consists of a binary and source code, that will be delivered to the client.
Client: our client Bob Van Veldhuizen.
User: our client, the students in the lab, and as well as anyone who will use this program.
CLI: command line interface, this will be accessed through the command prompt.
GUI: graphical user interface, this will be the default operation of the software.
Mode: either GUI based, CLI interactive based, or CLI file based.
Input: Variables defined in A.2
Stdout: The way of writing text to the screen

1.3 References

Based on a template provided by Prof. J Genetti and documentation provided by Bob Van Veldhuizen.

2. General Requirements

2.1 Overview

From the user's view the software will contain the functionality of the old Fortran software as well as a graphical user interface and new functionality. From the software a user could enter in the data from a file on the CLI, use the program interactively on the CLI, or use the program with a GUI. The user will also be able to access in software help if they are unsure about how the software functions or have questions regarding the internals of the software.

2.2 System Functions

The list below is the general software functions. The order of the list has no significance.

2.2.1 Deliver software that will produce the same results as the old Fortran software.

2.2.2 The software will provide access via CLI, both interactively and files, or a GUI.

2.2.3 The software will also produce a graph based on the outputs of the program depending on the input.

2.3 Users

The users of the software will be our client, as well as students in the lab, and anyone else that will use the software.

2.4 Operating Environment

The software will be runnable on any desktop or laptop. The software core will run on any modern operating system, such as Microsoft Windows 7, Macintosh OS X, or Ubuntu.

3. Requirements Specification

3.1 Functional Requirements

3.1.1 The software will do the following when a simulation is to be run, regardless of mode:

3.1.1.1 The software will get the user's input (inital conditions)

3.1.1.2 The software will produce results based on the user's input (after simulation)

3.1.1.3 The software will produce a csv from the simulation results.

3.1.1.4 The software will have help available to the user. This help will include how to use the software and details of the simulation.

3.1.2 The software will do the following in CLI mode

3.1.2.1 The software will get the mode choice, interactive or file based.

3.1.2.2 The software will prompt the user for input in interactive mode.

3.1.2.3 The software will get the input file name if file mode is chosen and will optionally get an out file name. If one is not specified then it will go to stdout.

3.1.3 The software will do the following in GUI mode

3.1.3.1 The software will display the graph based from the input in the GUI, as well as offer a method for the user to save the graph to a file.

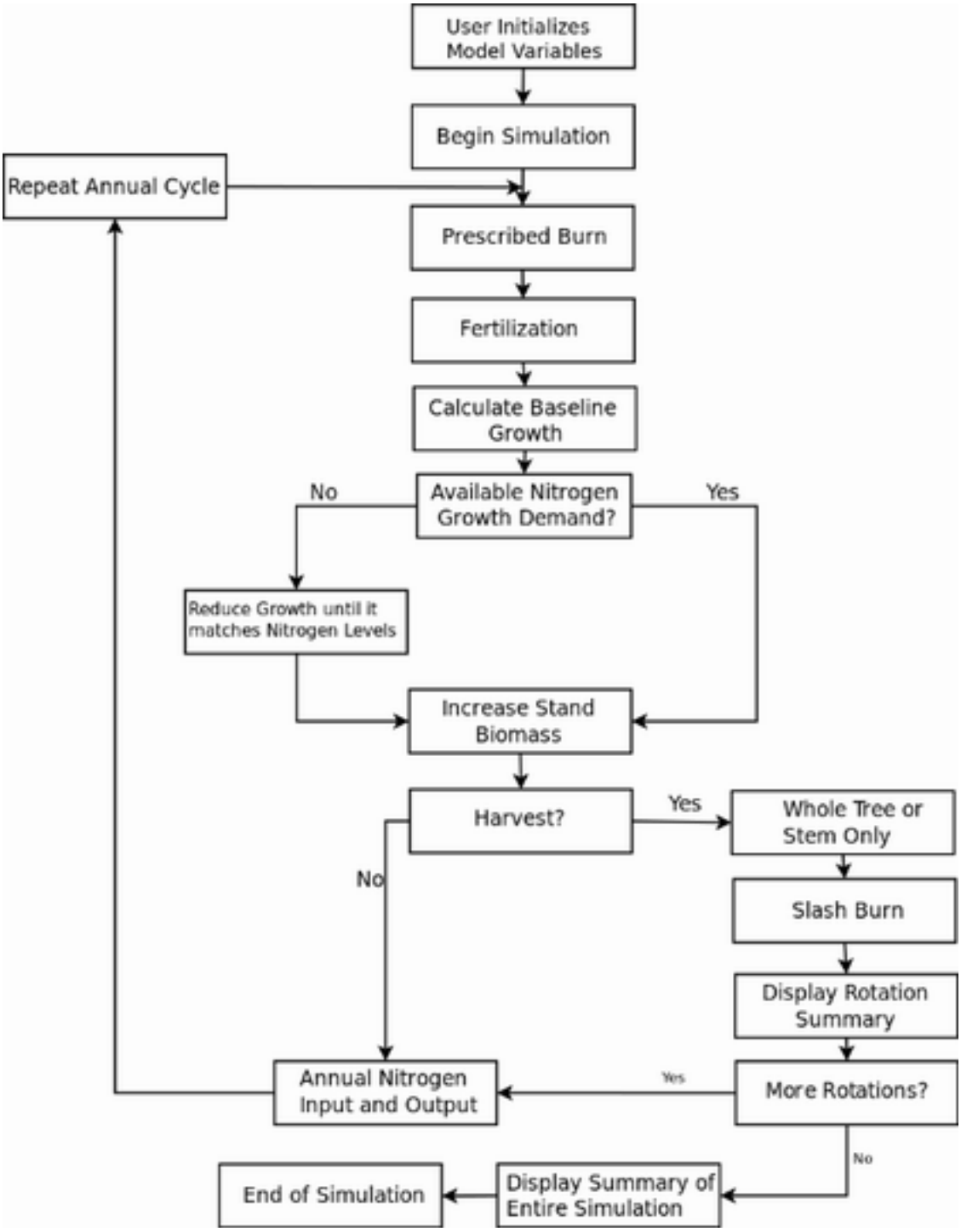
3.1.3.2 The software will offer to save the user's inputs for a current simulation to a valid input file that can be used in CLI file mode.

3.2 Non-Functional Requirements

3.2.1 The software shall complete as fast or faster than original FORTRAN code.

3.2.2 The software shall be intuitive to use.

4. System Architecture



5. User Stories

5.1 A user starts the software in GUI mode and supplies the inputs for the simulation. After the inputs are entered and verified the software will produce the corresponding output with a graph showing the model produced.

5.2 A user starts the software in CLI file mode and supplies an input and output file. The software will parse the input file and verify the values. Afterwards it will produce the corresponding output file and a graph of their results.

5.3 A user starts the software in CLI interactive mode and supplies the program with input. Once input is verified the simulation starts. After the simulation runs the user will be prompted to decide to save to a file or not.

5.4 A student is assigned a lab from the class NRM 380. Through this lab the student will experiment with getting the best tree growth from a plot. The student needs to be able to modify the input values several times and rerun the simulation to achieve the desired effect.

6. System Evolution

The core of the software will be portable, and will be runnable on any system with a C++ compiler. The GUI part of the software will be built with a cross platform toolkit. Using the toolkit will ensure that it can be run on newer versions, unless the toolkit is significantly changed.

A. Appendix

A.1 Revision History

Date	Version	Notes
02/07/13	1.0	Setup basic outline for document
02/18/13	1.1	Filled in initial outline with tentative properties.
03/14/13	1.2	Added User Story and edited document.

A.2 Glossary

Input Variable	Recommended Ranges
ENTER INITIAL RANGE	0 to 50 (years)
SITE INDEX	45,55,65 or 75 (Must be one of four)
ROTATION LENGTH	25 to 75 (years)
NUMBER OF ROTATIONS	1 to 5
AGE FOR FERTILIZATION	0 = no fert or anytime, but only once for each rotation
RATE OF FERTILIZATION	0 = not fertilizing or 100, 200 or 300 (kg/ha)
AGE OF FIRST PRESCRIBED BURN	0 = never or anything beyond 10 (years)

FREQUENCY OF BURN	0 = no burn or between 4 and 20 years
BURN INTENSITY	0 = no burn, 1 = warm burn, 2 = hot burn
HARVEST METHOD	1 = whole tree, 2 = stem only
SLASH BURN	0 = no burn, 1 = burn
SLASH FIRE INTENSITY	0 = no burn, 1 = warm burn, 2 = hot burn
PERCENT OF LEAF N REABSORBED	0. to 40. (include decimal point)
PERCENT OF ROOT N REABSORBED	0. to 40. (include decimal point)
RATIO ROOT BIOMASS:LEAF BIOMASS	50. to 200. (as %), (include decimal point)
TOTAL SOIL CARBON	15000 to 35000 (kg/ha)
TOTAL SOIL NITROGEN (C/N ratio ranges = 10:1 to 20:1)	1500 to 5000 (kg/ha)
PERCENT N IN FOLIAGE	0.8 to 2.0 (include decimal point)
PERCENT N IN FINE ROOTS	0.5 to 1.2 (include decimal point)
ANNUAL N INPUTS	5 to 20
ANNUAL N LOSSES	1 to 5