Logo

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Assignment 2: Static and Dynamic Analysis

SOFE 3980U

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**Introduction**

Program Slicing is a concept in software testing that involves selecting small segments or lines of program statements and performing tests on these statements to see if they affect the variables within them as expected. This assignment instructs us to perform slicing on variables from the Tic Tac Toe game created within the last assignment.

**Tic Tac Toe Program Slicing**

Manual slicing was used in this assignment. A slice for each variable was created in a separate class to see if the statements work accurately.

This meant one for *PlayerInput* variable:

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Another slice was created for the *GameBoard* array and the *DisplayBoard* method to see if the board layout and array element positioning is correct:

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Another slice for *PlayerChoice* variable:

Note that for this slice, the purpose is not to take, input, it is only to display the correct choice (X or O) in the message that asks for input in the console.

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Another slice for Restart variable:

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The final slice for the program tests the Row and Won Variables:

Table

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**Instrumentation**

Instrumentation is a dynamic analysis technique in which measurement probes are added to a program to monitor it’s execution or monitor it while it is running. In this assignment, a timer was added to the main Tic Tac Toe file and all program slices created in part a, to observe the amount of time it takes to execute the program. This is measured in nanoseconds as the execution window is usually under a second.

*TicTacToe.java*

For the game class, the main method is the method which fetches all other method functions, asks for input, and then displays output, which is why a variable to record current time value right before the first instruction and the last instruction before user input is required, was implemented in the main method. These start and end times were subtracted from each other to get the duration of execution. Note that in the execution, a side message in brackets indicating the time is displayed, as this is not a message that is needed to be interacted with and it is simply there to notify user of the duration. The rest of the program runs as before. This same strategy is used to calculate execution time of all the slices as well.

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*Slice1.java*

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*Slice2.java*

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*Slice3.java*

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*Slice4.java*

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*Slice5.java*

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**Challenges and Solutions Discovered**

The tasks to perform in this assignment went through many changes, so one of the main challenges was to adapt to the changing requirements of this assignment. Initially, we were tasked to create a program that reads our application for us and creates slices. However, this was changed later to allow manual slicing input as well, which is what this submission focuses on. Other than this, in part a, since this game did not have a lot of variables and classes to create slices of, it was a challenge to choose these variables, but with some changes and additions to the original game class it was solved. For part b, Instrumentation was to be used, however, when researching this concept in dynamic analysis, information seemed to be scarce on the internet. The main challenge was to understand it before coding, which was an extremely time-consuming task as these concepts seem to be outdated.