CPSC 321
Programming Assignment - 2
"A Study of Synchronization and Deadlock Avoidance"

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1 Introduction

The goal behind CPSC 321 is to introduce the concepts and fundamentals of the structure and functionality of Operating Systems. There are four main components to the course: Scheduling, Deadlock detection, Memory management, and File Systems. The purpose of this project was to turn our attention to the topic of *synchronization* and *deadlock avoidance*. These topics will be studied through the implementation of two programs, one to simulate **Glucose synthesis** and the other an implementation of the **Banker's algorithm** with *first-fit* and *best-fit* policies.

There are two problems that we are addressing in the assignment dealing with synchronization and deadlock avoidance. The algorithms to be implemented using java are:

- Synchronization Problem in Glucose Synthesis.
- The Bankers Algorithm for Deadlock Avoidance with
  - First-Fit Policy
  - Best-Fit Policy

2 Synchronization: (Glucose Synthesis)

2.1 Problem Statement

There are three types of atoms needed to form a molecule of glucose. These atoms are Carbon, Hydrogen and Oxygen. We need to simulate a glucose generation "machine" where an atom generator is continuously creating atoms and a molecule generator is collecting and combining these atoms to create a new molecule. As the above heading indicates, there are six carbon, twelve hydrogen and six oxygen atoms in a glucose molecule. We need to create a barrier using a monitor that synchronizes the two threads to form a new molecule whenever enough atoms are present in order to synthesize a glucose molecule. We will terminate the simulation when a predetermined number of molecules are formed and measure the average time between syntheses for use in our *performance metrics*. In this implementation we will not be concerned with the process of molecule formation.

2.2 Solution Strategy

2.3 Solution Design

2.3.1 Class Diamgram

2.3.2 Class Descriptions

2.4 User Guide

2.5 Results

2.5.1 Simulation Outputs

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2.6.1 Analysis

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3 The Bankers Algorithm for Deadlock Avoidance)

3.1 Problem Statement

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