Andy Zhou

Lab #5 Report

In this lab, students were given two files, “bank.c” and “sem.h”. We are assigned to fix the bank.c file to fix logic issues as well as prevent race conditions. To do this. we are required to add semaphores as well as adding the P and V functions to the proper locations. The P and V functions acts as an increment and decrement to the semaphores respectively and are given in the sem.h file.

The first issue is adding the semaphores to the proper locations. I have created two semaphores, one which I named “sem”, to allow two users to access the ATM at the same time (created in line 31). The second semaphore, which I named “bankAccess”, is used to allow one person to withdraw/deposit money at a time (created in line 33). The first semaphore decrements when a person uses the ATM and allows a maximum of 2 people to use the ATM (can be seen in line 72). this prevents all 3 processes from using the ATMs. After a process stops using the ATM, the semaphore will increment, showing that an ATM is free. The second semaphore allows a single process to withdraw or deposit money at a certain time. This prevents the race condition and stops processes from updating the shared file so that they may not conflict with each other (can be seen in line 84).

I have also created condition statements checking if the balance is less than or equal to 0 or if the withdraw amount exceeds what is inside the account (can be seen in line 142 and 212). If this case is correct, it will prevent the two child processes from withdrawing money. If this is not the case, then the two child processes can withdraw money from the account.

There was also a case where the dad and the child processes may have an outdated record of the account balance or the number of attempts. The most common situation is when the dad process views and stores how much money is in the account and then takes a few seconds later to add more money in. Because the dad process takes a few seconds before adding money, the balance that the process had stored before may now be outdated. This will happen if a child process withdraws money right before the dad process deposits money. To solve this, I made sure all processes check the bank balance and the number of attempts before they withdraw or deposit money inside a critical section (can be seen in line 152). This is to ensure all process has the updated balance before they make any changes to it.