

CS471: Program 7

The Producer/Consumer Problem

Finish the C program `producerconsumer.c` found in `/u1/junk/cs471`. You will need to write the `producer` and `consumer` functions as given in *The Little Book*, but in C. You should fill the buffer with zeros (to indicate that all slots are empty) before you start creating threads. A producer thread will add an item to the buffer by storing its thread number in one of the slots. The `spaces` semaphore is used to guarantee that an empty slot is available. A consumer thread will remove an item from the buffer, and replace the content of the slot with a zero. The `items` semaphore is used to guarantee that the buffer is not empty. You will need to keep track of how many slots in the buffer are in use, which slots are in use, and record (i.e., print) the actions taken by the threads.

The output should look like this:

```
thread 1 (producer) stored item 1 in buffer
thread 2 (producer) removed item 1 from buffer
thread 3 (producer) stored item 3 in buffer
thread 4 (producer) stored item 4 in buffer
thread 5 (consumer) removed item 4 from buffer
```

The output should be inside the mutex that protects access to the buffer – after the thread waits, and before it signals. So the output will be in the order the buffer changes are made, not necessarily the order in which the threads start.

Create a subdirectory of your home directory named `Mole`, and save your program there (using the original filename) before 6:02PM on National Mole Day ¹.



Figure 1: Amadeo Avogadro (1776 – 1858).

¹National Mole Day is celebrated annually on October 23 from 6:02 a.m. to 6:02 p.m., Mole Day commemorates Avogadro's Number (6.02×10^{23}), which is a basic measuring unit in Chemistry. Schools throughout the United States and around the world celebrate Mole Day with various activities related to Chemistry, moles and/or semaphores.