

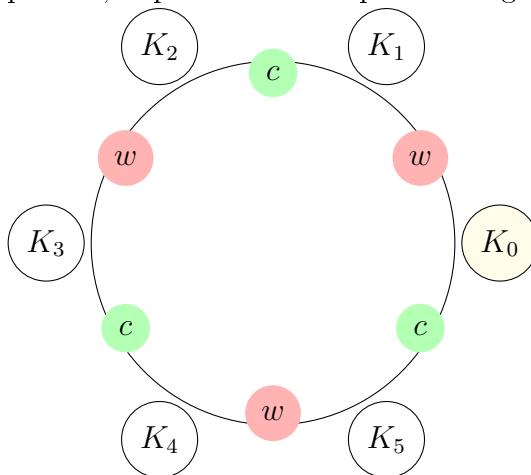
Parallel Programming – task 2

19.03.2018

Design and implement the synchronization protocol for the following problem. Use the monitors (locks, conditionals).

Problem

1. King Arthur and his Knights sit around the Round Table. The number of Knights is $n \geq 4$, assume that n is even. This includes the King, in general, if not stated explicitly, the King is also a Knight.
2. Each Knight alternately: sleeps, drinks, and tells (mostly made up) stories about their victories. Sleeping and telling stories takes some random time.
3. If someone is telling a story, his neighbors (including the King) will not start talking. If the King is telling a story, no-one will start talking (but sleeping and drinking is fine). If a Knight starts telling a story, he finishes, even if the King starts telling his story in the meantime.
4. Between the Knights there are cups for (non-alcoholic) wine and plates with cucumbers (see the picture, cups are red and plates are green).



5. To start drinking, the Knight has to hold his cup and his plate (at the same time), note that cups and plates are shared by neighboring knights.
6. Knights cannot drink from empty cups. There is a bottle of wine on the table, which can hold w units (cups) of wine. When the Knight takes the cup (and the plate of course), he pours the wine from the bottle to the cup and drinks the wine. If the bottle is empty, the Knight waits.
7. Immediately after drinking, the Knight eats a cucumber. If there are no cucumbers on the plate, he does not even start drinking. The plate has space for up to c cucumbers.
8. There are two Waiters that come in random intervals of time. The first Waiter fills the bottle (even if it was not totally empty), the second one fills all plates with fresh cucumbers.
9. After drinking 10 cups of wine, the Knight falls under the table. This does not move the other Knights, in particular does not change the neighborhoods.

Technical aspects

1. The solution should offer the maximum parallelism. If all Knights want to start drinking and all resources are available, roughly $n/2$ should be able to do it.
2. If one Knight's cucumbers are not available, he should not block his neighbors, who may have cucumbers.
3. Avoid busy waiting and starvation. Take the cups and plates only if you are sure you can start drinking. Also, do not take wine and cucumbers when you cannot start drinking.
4. Print the current status of the processes in the console.
5. Adjust parameters and time intervals, so that we can see what is happening. The intervals should not play any role in the synchronization protocol.

Deadline for submitting your solution: 09.04.2018 (7.00 AM)