Concurrent Object-Oriented Programming

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Exercise Session 3: Introduction
Overview

• solutions
  • Prisoners: Synchronization
  • Safety vs. Liveness
  • Amdahl’s Law
Prisoners: Synchronization

I will
• do nothing.
• toggle the light switch.
• announce that all prisoners have been interrogated.
One of the prisoners gets selected as the counter.

All non-counting prisoners follow the following protocol.

- The first time they enter the room when the light is off, they turn it on.
- On all other occasions, they do nothing.

The counter follows a different protocol.

- The first $n-2$ times that the light is on when he enters the room, he turns it off.
- The next time he enters the room when the light is on, he (truthfully) announces that everybody has been interrogated.
Prisoners: Synchronization: Light Unknown

- One of the prisoners gets selected as the counter.
- All non-counting prisoners follow the following protocol.
  - The first two times they enter the room when the light is off, they turn it on.
  - On all other occasions, they do nothing.
- The counter follows a different protocol.
  - The first $2n - 3$ times that the light is on when he enters the room, he turns it off.
  - Then the next time he enters the room when the light is on, he (truthfully) announces that everybody has been interrogated.
Safety vs. Liveness

• safety: Nothing bad happens ever.
• liveness: Something good happens eventually.
Safety vs. Liveness

- Patrons are served in the order they arrive.
- What goes up must come down.
- If two or more processes are waiting to enter their critical sections, at least one succeeds.
- If an interrupt occurs, then a message is printed within one second.
- If an interrupt occurs, then a message is printed.
- The cost of living never decreases.
- Two things are certain: death and taxes.
- You can always tell a Harvard man.
Amdahl’s Law

\[ S_u = \frac{\text{old execution time}}{\text{new execution time}} = \frac{1}{1/5} = 5 \]

\[ S_m = \frac{1}{1 - p + \frac{p}{n}} \text{ where } n = 10 \]

\[ S_m > S_u \]

\[ p > \frac{4n}{5(n-1)} \]

\[ p > 0.89 \]
Dining Philosophers: Synchronization