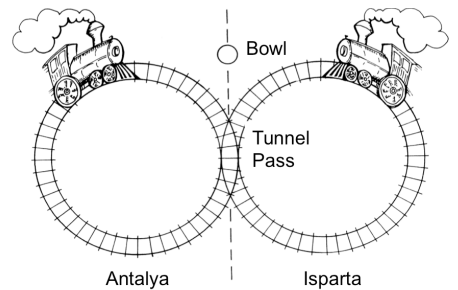Lecture 10 – COMP 304 Handout by Didem Unat

- High in the Toros mountains, there are two circular railway lines. One line is in Antalya, the other in Isparta.
- The Antalya train runs twenty times a day, the Isparta train runs ten times a day.
- They share a common section of track where the lines cross a tunnel pass that lies on the city border.
- Unfortunately, the two trains occasionally collide when simultaneously entering the common section of track (the tunnel pass).
- The problem is that the drivers of the two trains are both blind and deaf, so they can neither see nor hear each other.
- Three OS students suggested the following methods to prevent accidents. For each method, explain if the method **prevents collision, whether it is starvation-free and respects the train schedule.**

1) First method suggests that they set up a large bowl at the entrance to the tunnel.
> Before entering the tunnel, a driver must stop his train, walk over to the bowl, and reach into it to see if it contains a rock.
> If the bowl is empty, the driver finds a rock and drops it in the bowl, indicating that his train is entering the tunnel;
> once his train has cleared the tunnel, he must walk back to the bowl and remove his rock, indicating that the tunnel is no longer being used. Finally, he walks back to the train and continues down the line.
> If a driver arriving at the tunnel finds a rock in the bowl, he leaves the rock there; he repeatedly takes a nap and rechecks the bowl until he finds it empty. Then he drops a rock in the bowl and drives his train into the pass.

2) This method uses the bowl in a different way.
> The driver from the Isparta train must wait at the entry to the pass until the bowl is empty, drive through the pass and walk back to put a rock in the bowl. The driver from Antalya must wait at the entry until the bowl contains a rock, drive through the pass and walk back to remove the rock from the bowl.

3) The third method suggests to use two bowls, one for each driver:
> When a driver reaches the entry, he first drops a rock in his bowl, then checks the other bowl to see if it is empty.
> If he finds a rock in the other bowl, he goes back to his bowl and removes his rock. Then he takes a nap, again drops a rock in his bowl and re-checks the other bowl, and so on, until he finds the other bowl empty.
> If the bowl is empty, then he drives his train through the tunnel pass. Stops and walks back to remove his rock.