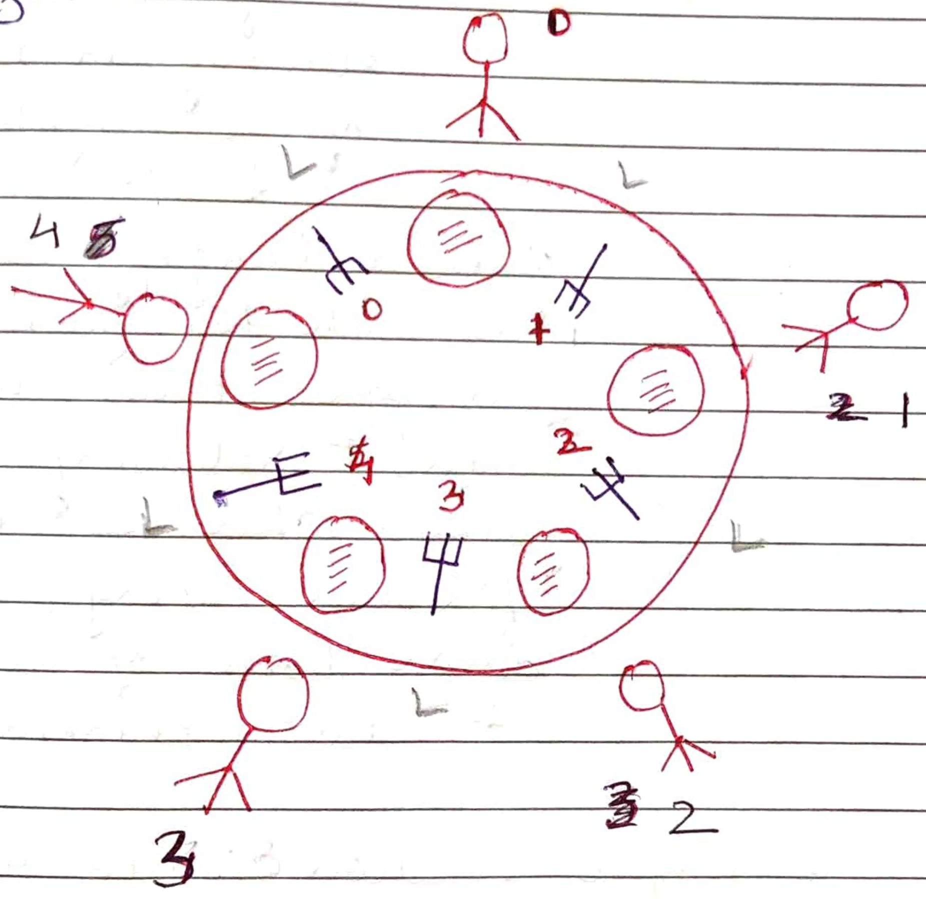
* Dining Philosophers Problem

Imp It is classic problems of synchronization



$$\begin{tikzcd}
 & \text{Philospher either} \arrow[dl] \arrow[dr] & \\
\boxed{\text{Thinks}} \arrow[d] & & \boxed{\text{Eats}} \arrow[d] \\
\text{} & & \text{}
\end{tikzcd}$$

When a philosopher thinks, he does not interact with his colleagues.

When a philosopher gets hungry he tries to pick up the 2 forks that are closest to him (left & right). A philosopher may pick up only 1 fork at a time

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$\boxed{\text{Eats (Conti....)}}$

$\downarrow$

One cannot pick up a fork that is already in the hand of a neighbour.

$\downarrow$

When a hungry philosopher has both his forks at the same time, he eats without releasing his forks. When he has finished eating, he puts down both of his forks & starts thinking again.

One simple solution is to represent each fork/chopstick with a semaphore.

A philosopher tries to grab a fork/chopstick by executing a wait () operation on that semaphore.

He releases his fork / chopsticks by executing the signal () operation on the appropriate semaphores.

Thus, the shared data are

datatype

```
semaphore chopstick[5];
```

where all the elements of chopstick are initialized to 1.

The Structure of philosopher i

P_0	0	1
P_1	1	2
P_2	2	3
P_3	3	4
P_4	4	0

```
do {
wait ( chopstick[i] );
wait ( chopstick[(i+1)% 5]);
....
  // eat
signal ( chopstick [i]);
signal ( chopstick[(i+1)% 5]);
// think
   } while (TRUE);
```

Although this solution guarantees that no two neighbours are eating simultaneously, it could still create a deadlock.

Suppose that all five philosophers become hungry simultaneously & each grabs their left chopstick. All the elements of ~~chock~~ chopstick will now be equal to 0.

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when each philosopher tries to grab his right chopstick, he will be delayed forever.

Some possible remedies to avoid deadlocks:

1) Allow at most four philosophers to be sitting simultaneously at the table.

2) Allow a philosopher to pick up his chopsticks only if both chopsticks are available.

3) An odd philosopher picks up ~~his~~ first his left chopstick & then his right chopstick, whereas an even philosopher picks up his right chopstick & then his left chopstick.