Networks and Graphs lecture 5

Euler tour

a **trail** is a walk that traverses **every edge at most once**.

a **closed walk** is a walk if **u=v**.

> *a **tour** is a closed walk that **traverses all edges**(can be more than once).*
>
> > *a **Euler tour** is tour that traverses each **edge exactly once**.(start and finish must be the same)*
> >
> > *a **Euler trail** is a trail that traverses each **edge exactly once**.*

> *a connected graph has an **Euler tour** if and only if **all** vertices have an **even degree**.*
>
> *a connected graph has an **Euler trail** if and only if it has **only 2** vertices of **odd degree**.(the rest of the vertices have to be even)*

Fleury's algorithm

Fleury's algorithm is an algorithm to find an **Euler tour**.

1. select a vertex **u** for the start of the **trail P**.
2. select a **edge** connecting u to one of its neighbors and call this vertex **v**, add it to trail P.
3. choose an **edge from v to a neighbor w** that is **not in the trail P** and add it to P(w becomes the new v) ***a cut edge is a last resort option*** in this case(avoid cut edges until no longer possible).

Hierholzer's algorithm

Hierholzer's algorithm is a **more efficient** algorithm to find a **Euler tour**.

1. select a **vertex v** in a *connected* graph G and **build a trail P** until **no new edges** can be traversed.
2. then **remove trail P** from G, if G is *not* empty **repeat step 1** on the ***new* G**.
3. if G is empty then merge the trails found in step 1 to get an Euler tour.