Application of arborescence packing

Presentation 1.

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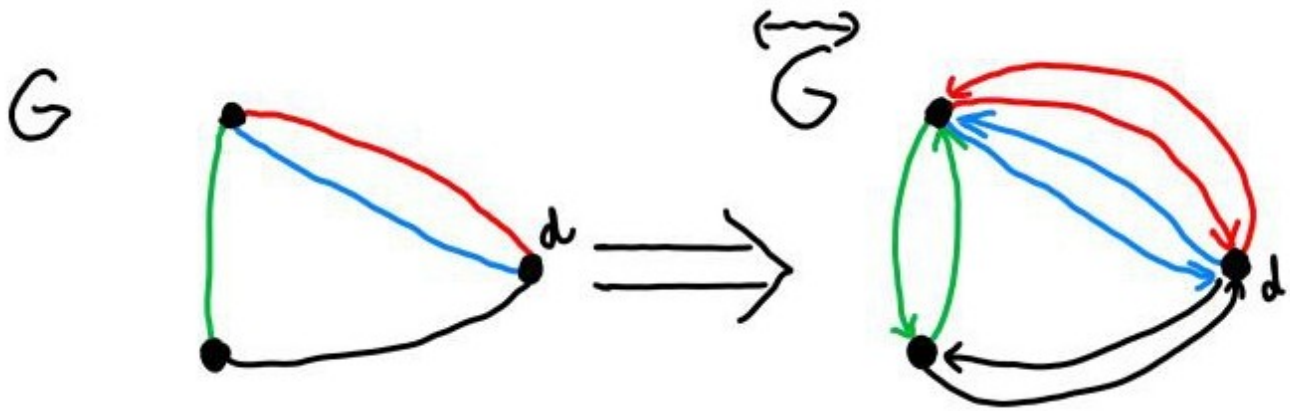
2025/26

Beginning

- G is undirected, k-edge-connected multigraph (router=vertex, link=edge)
- $\overleftrightarrow{G}$ its directed copy
- d vertex is the destination, goal: from every vertex the packet has to be sent to d (routing function)
- failed edges, f-resilient
- circular-in-arborescence routing: Given $T = \{T_1, T_2, \ldots T_k\}$ set of k d-rooted arc-disjoint spanning in-arborescences of $\overleftrightarrow{G}$. Start with T_1. If the packet hits a failed arc at a vertex u, then reroute along $T_{(i+1) \mod k}$.



Main results based on [1], [2]

- circular-in-arborescence routing is efficient for $k = 2, 3, 4$

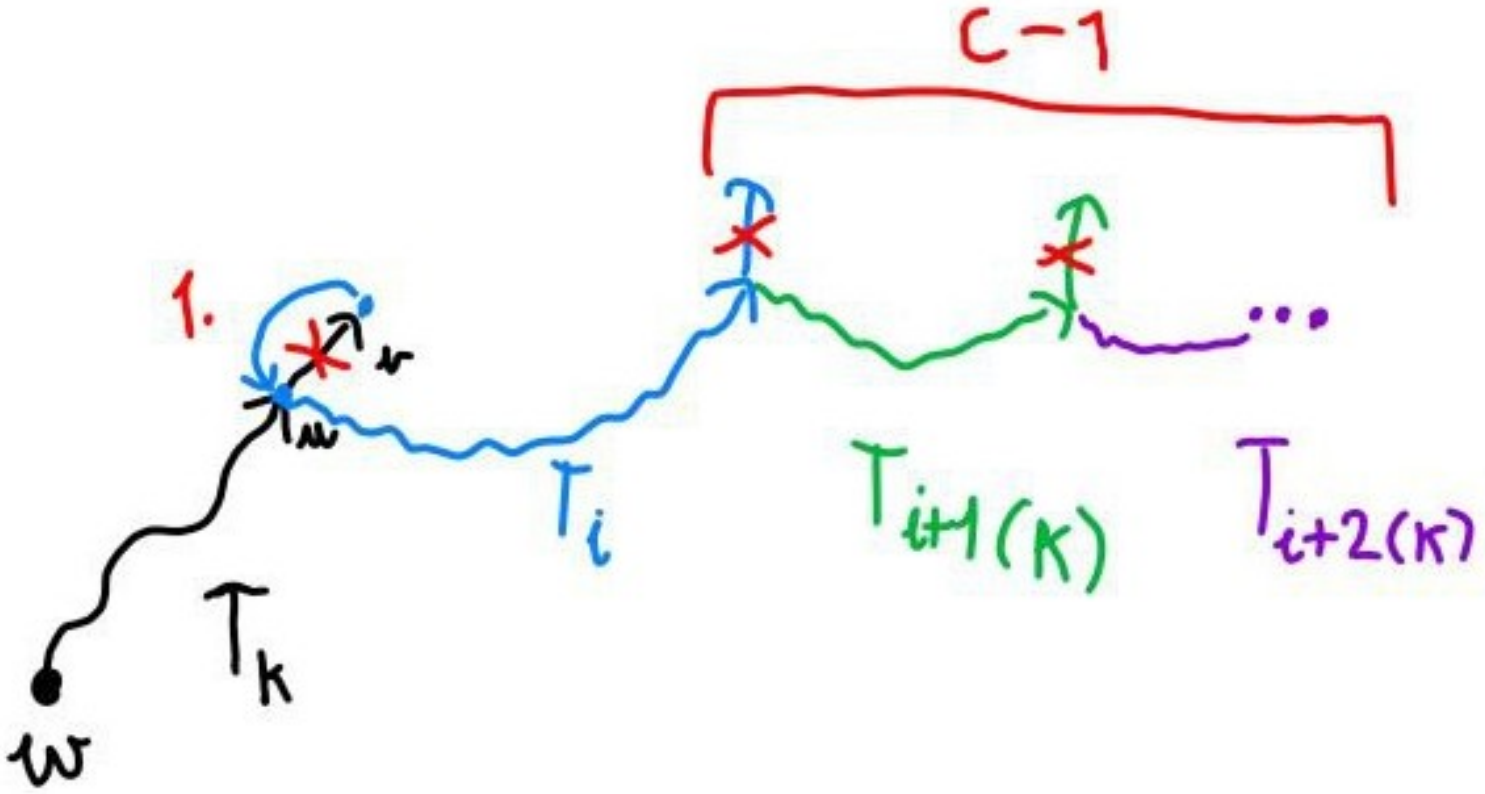
Proposition

(Proposition 2.) For any undirected k-edge-connected graph G, with $k \geq 1$, and any vertex $d \in V$, in $\overleftrightarrow{G}$ there exist k arc-disjoint spanning in-arborescences $T_1, ..., T_k$ rooted at d such that, if k is even (odd), $T_1, ..., T_{\frac{k}{2}}$ $(T_1, ..., T_{\lfloor \frac{k}{2} \rfloor})$ are edge-disjoint with each other and $T_{\frac{k}{2}+1}, ..., T_k$ $(T_{\lfloor \frac{k}{2} \rfloor + 1}, ..., T_k)$ are edge-disjoint with each other.

Theorem

(Theorem 1.) Assume that G is an undirected k-edge-connected graph and $\overleftrightarrow{G}$ has k arc-disjoint in-arborescences: $T_1, ..., T_{k-1}, T_k$. Futhermore, the circular-in-arborescence routing based on $T_1, ...T_{k-1}$ is $c-1$-resilient $(k-2)$, where $c < k$. Then there exists routing which is c-resilient $(k-1)$.

Figure



Using of AI

During my work I only used AI (ChatGPT) as an English dictionary and I asked some Latex codes too.

References

Marco Chiesa, Andrei Gurtov, Aleksander Madry, Slobodan Mitrovic, Ilya Nikolaevskiy, Aurojit Panda, Michael Schapira, and Scott Shenker.
Exploring the limits of static resilient routing.
In *Proc. IEEE INFOCOM*, 2016.

Marco Chiesa, Ilya Nikolaevskiy, Slobodan Mitrović, Andrei Gurtov, Aleksander Madry, Michael Schapira, and Scott Shenker.
On the resiliency of static forwarding tables.
IEEE/ACM Transactions on Networking, 25(2):1133–1146, 2016.

Thank You for Your attention!