Spatial Social Community

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Overview

1. Preliminary
   - Trusses
   - Triangle connected k-truss
   - K-truss community
   - Finding k-truss communities

2. Spatial Constraints
   - An example
   - Basic solution
   - Example

Trusses

Definition

A k-truss is a none-trivial, one-component subgraph such that each edge is reinforced by at least k-2 pairs of edges making a triangle with the edge. (Non-trivial here excludes an isolated vertex as a truss)

Triangle connected k-truss

- k $\geq$ 3
- Triangle adjacency: given two triangles, they are adjacent if and they share a common edge
- Triangle connectivity: given any two triangles $\triangle_s$ and $\triangle_t$ in G, they are connected if there exist a series of triangles $\triangle_1, ..., \triangle_n$ in G, where n *ge* 2, such that, $\triangle_1 = \triangle_s$, $\triangle_n = \triangle_t$ and for $1 \leq i < n$, $\triangle_i$ and $\triangle_{i+1}$ are adjacent

K-truss community

Definition

K-truss community: 1)k-truss, 2)triangle connected, and 3)maximal subgraph

Basic

- Edge trussness index: running k-truss decomposition
- Query k-truss communities from a vertex v: running BFS search from edges containing v

Better

- TCP index: it is built on top of edge trussness index
- Query k-truss communities from a vertex v: running BFS search from v

Finding k-truss communities

- Observation: Given a k, a edge e in $G = (V, E)$ can only be contained by at most one k-truss community
- Finding k-truss communities: For each unvisited edge e with trussness no less than k in $G = (V, E)$, we run BFS from it.

- Observation: A spatial constrained k-truss community must be contained by a k-truss community or equal to a k-truss community
- Based on the observation, in the following part, the discussion focuses on finding spatial constrained k-truss communities in a k-truss community.
- A k-truss community may contain a set of two-vertexes-pairs. Any pair of vertexes in the set, the distance of the two vertexes is larger than d.
- Observation: for each pair of vertexes, we only need to remove one of the vertex (different removal choices induce different combinations)
- Observation: For the set of pairs of vertexes, the processing order of pairs of vertexes does not affect the result but affects the performance
- Observation: After dealing with all pairs of vertexes whose distances are larger than d, the remaining of k-truss community is subgraph of the k-truss community (could be disconnected). K-truss communities in the remaining subgraph are spatial constrained k-truss communities if they exist.

Table

Treatments	**Response 1**	**Response 2**
Treatment 1	0.0003262	0.562
Treatment 2	0.0015681	0.910
Treatment 3	0.0009271	0.296

Table: Table caption