Sensors

Computational topology - group project

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Outline

Problem description

Number of sensors on the sphere of radius 1:

- each sensor gathers data from the surrounding area in the shape of a circle of radius R,
- each sensor can communicate with other sensors which are at most r away.

Goals

1. Values of r and R are as small as possible.
2. The sensor network is connected.
3. The sensor network covers the whole sphere.
4. Removal of obsolete sensors.
5. Find optimal distribution of 50 sensors on the sphere.

Vietoris-Rips complex

Connected sensor network $\longrightarrow$ Vietoris-Rips complex $VR_\delta(S)$ is connected.

- sensors: S $(S_i = (r_i, \phi_i, \theta_i))$,
- sensor connections $\{S_i, S_j\} \subset S; d(S_i, S_j) \leq 2\delta$,
- $F \subset S$ is a simplex in $VR_\delta(S)$, if diam $F \leq 2\delta$.

Čech complex

The sensor network covers the whole sphere $\longrightarrow$ Euler characteristic of Čech complex should be that of a sphere.

- sensors: S $(S_i = (r_i, \phi_i, \theta_i))$,
- $B_\delta(x)$ closed ball with radius δ around x,
- $\check{\mathrm{C}}_\delta = \{\sigma \subset S, \cap_{x \in \sigma} B_\delta(x) \neq \emptyset\}$.

Second Slide Title

- First item.

Second Slide Title

- First item.
- Second item.

Second Slide Title

- First item.
- Second item.
- Third item.

Second Slide Title

- First item.
- Second item.
- Third item.
- Fourth item.

Second Slide Title

- First item.
- Second item.
- Third item.
- Fourth item.
- Fifth item.

Second Slide Title

- First item.
- Second item.
- Third item.
- Fourth item.
- Fifth item. Extra text in the fifth item.

Blocks

Block Title

You can also highlight sections of your presentation in a block, with it's own title

Theorem

There are separate environments for theorems, examples, definitions and proofs.

Example

Here is an example of an example block.

Summary

- The first main message of your talk in one or two lines.
- The second main message of your talk in one or two lines.
- Perhaps a third message, but not more than that.

- Outlook
  - Something you haven't solved.
  - Something else you haven't solved.

For Further Reading I

A. Author.
Handbook of Everything.
Some Press, 1990.

S. Someone.
On this and that.
Journal of This and That, 2(1):50–100, 2000.