A Distributed Search Engine for Personalized Networked Spaces

Personalized Networked Spaces (PNets)
A PNet is a collection of heterogeneous nodes, embedded in the environment, connected via a dynamic network topology.

Key Features:
- Generation and consumption of vast quantities of data
- Highly dynamic information
- Information has high degree of spatiotemporal locality
  - Me, Here, Now
- Fluid network topology
- Unpredictable events and interactions

In a PNet, people and machines collaboratively interact:
- To reach a goal.
- To enable new behaviors.
- To make the physical environment more accessible.

Search in a PNet
PNet search is fundamentally different from Internet search.

Internet Search:
- Query
- Search engine
- Results (index, content)

PNet Search:
- Query
- Relevance determination
- Results (distributed processing)
  - PNet

Potential Applications
PNets possess significant spatiotemporal demands. Connectivity to resources and information is focused on the here and now.

- Intelligent Amusement Park
- Intelligent City Guide
- Live Social Network
- Hospital Coordination of Personnel, Patients, Supplies
- Knowledge Expertise Locator

Gander Conceptual Model
Gander is a distributed search engine that meets human needs for searching a PNet.

Example Query:
"Rollercoaster near vegetarian food"

Data Constraints:
- Location: rollercoaster & within 100 feet of restaurant
- Restaurant has veggie options

Possible Relevance Metrics:
- Rollercoaster thrill
- Wait time
- Distance
- Amount of veg. options
- Data freshness

Query Processing:
- How to distribute a query and its responses using local interaction.

Relevance Determination:
- Given a set of results, how to relate their relevance to the original query.

Utility of myGander:
- Serve as a testbed for theoretical models and protocols in real and simulated PNet searches.
- Explore how users interact with and what they expect from a PNet search engine.
- In parallel development a software framework and developer tools for PNet searches.

Research Objectives
1. Define the formal model of a PNet.
2. Redefine the notion of relevance.
3. Enable efficient in-network search processing.
4. Explore user expectations of search in a PNet.
5. Provide a software framework and tools for developers.

The State of the Art
- Distributed Sensor and Ad Hoc Networks
- Mobile/Pervasive Computing Applications
- Ad-hoc Internet Search
- Mobile/Ad Hoc: MobiQuery, MANETKit
- Self-assessing protocols
- Directed Diffusion

myGander: A Mobile Application
We are actively developing myGander, a prototype mobile application that enables simple searches in a PNet of devices running Apple’s iOS.