Rover Technology
Implementation of a Scalable Context-Aware Computing System

Rover enables the automatic access to information and services based on the location, the current time, and user interests.

**A Museum Scenario**

- **Users**: tourists at the museum
- **Devices**: off-the-shelf handhelds
- **Access Infrastructure**: wireless 802.11 WLAN, Bluetooth, Cellular, IrDA
- **Example functionality**
  - Automatic tailoring of information
  - Audio/video streaming on exhibits
  - Directional services
  - Map routes for museum tour
  - Emergency services
  - Locate the nearest fire exit in the West Wing
  - Group Coordination
  - Locate missing members when bus is about to leave

**Rover Architecture**

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**Location Determination using Joint Clustering**

**Example functionality**

- **Marginal Distributions**
  \[ P(\mathcal{A}_1, \mathcal{A}_2, \ldots, \mathcal{A}_k | s) = \sum_{\mathcal{A}_1, \mathcal{A}_2, \ldots, \mathcal{A}_k} P(s, \mathcal{A}_1, \mathcal{A}_2, \ldots, \mathcal{A}_k) \]

- **Likelihood Estimator**

**Performance Assessment**

**Performance Model**

- Run server and database on a machine
  - Pentium IV 1.5 GHz desktop
- Run client loader on another machine
  - Pentium III 800 MHz laptop
- Collect response time statistics at different points (database, server and client)
- Collect statistics for individual operations
- Vary think time and number of clients and observe response time behavior

**Experimental Results**

Get All Login users (GAL) operation Analysis:

- (a) Rover client running the client software showing the mall map.
- (b) A notification to the client about a nearby food stall. The user associated with the client had previously set a trigger notification request when he is close to a food stall.
- (c) The user had issued a query operation about the sites of interest in his vicinity. On receiving the response from the Rover system, the client has highlighted the relevant sites.
- (d) An active chat session between this user and another user is marked as a dotted line connecting both users.

**Logical Architecture of Rover Controller**

**Physical Architecture of A Multi-Rover System**

**Rover Demo**

Rover client screen shots taken from a demonstration at the McKeldin mall of the University of Maryland campus.