JABA (Joint Autonomous Browsing Agents)

- An implementation of SOMIK (System of Mobile Interactive Knowledge)
- Consists of:
  - A large number of expendable nodes
  - An external setup providing for synchronization, data pickup, and location information

JABA Nodes

- Capable of:
  - Limited processing,
  - Limited state,
  - Locomotion,
  - Communiction (transciever with limited range),
  - Sensing the local state of the world.
- Unreliable.
- Interchangeble.

External Setup

- Three special nodes ("Towers")
  - Powerful transmitter (can be heard over the whole range)
  - Sygnals are used for:
    - Synchronization
    - Location triangulation
- A node with large computing power generalizing the data sent by the Jabas and received by the "towers"

Communication Protocol

- TDMA(or FDMA) based
  - Synchronization provided by one of the towers
- Each message has an error detecting CRC.
- Each tower has a reserved TDMA cell
  - Sends a message containing its coordinates (and the strength of the transmission)
- Each Jaba randomly picks a cell number (other than that of the towers).
  - A message contains Jaba's coordinates and some information about its state.

Communication Protocol (cont'd)

- Transmission assumption:
  - A distance between sender and receiver may be approximated using the difference of transmission and reception strength.
  - The size of the space of operation is small compared to the speed of light.

Implementation

- Purpose: maze explocation.
- Sensing: bump sensors (tuned to sense the hit at the direction $< 45^0$ to the normal).
- Local state:
  - Current position (estimated by triangulation using tower signals).
  - Current motion direction (estimated from current and last posions)

Simulation Assumptions

- Maze can be approximated by ideal (unpenetrable, with straight edges) rectangles.
- Jabas are negligebly small compared to the size of the maze.
- Maze is small relative to the speed of light (makes synchronization elementary).

Communication Simulation

- All nodes are queried for the messages to be sent.
- A list of all messages is compiled.
- At each node the list is evaluated.
  - A message is considered received if its strength if greater than the threshold.
  - If two received messages have the same cell id, they are considered garbled, and are discarded.

Message Data

- **Sender Position** (as estimated by sender)
- **Signal Strength** (estimated by sender, usually hardwired).

- Local State:
  - **Collusion/No collusion,**
  - **Collusion Position** (not necessarily sender's position)**,**
  - **Assumed Wall Normal.**

Mobile Jaba operation cycle

- Use messages from cells 0, 1, 2 to approximate the currect location using triangulation
- If the node has collided with a wall on a previous cycle, send out a message to this effect.
- If no collusion was registred, resend a random collusion message, assuming that it is located closer to a tower then previous sender.
- Generate new direction.

Direction Generation

- If a collusion has occured, turn 180 degrees,
- If a collusion has occurred 2 cycles ago, randomize direction,
- If the closest jaba is dangerously far away, move towards it.
- At random cycles randomize direction.