

Robot Interaction Using Cricket

An Indoor Positioning System

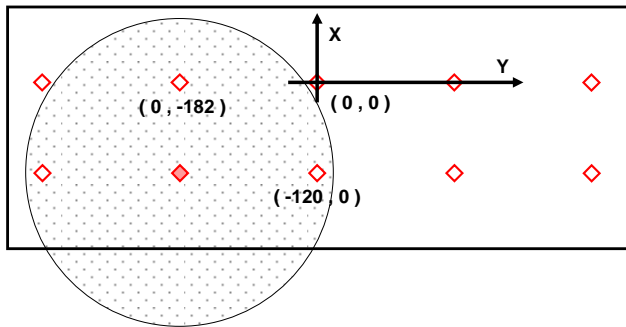
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What is the Cricket Indoor Positioning System?

- A system that enables devices to determine their position while indoors.
- Cricket units are programmed as either beacons or clients.
- Beacons are mounted on a ceiling above the mobile clients.
- Cricket units give positions as precise as 2 cm.

Experimental Environment

- The Cricket setup consists of 10 ceiling-mounted beacons.
- Beacon units can detect ultrasonic signals within a 40° cone, which translates to a 205 cm radius.
- To determine orientation, one client is placed on the front of the robot, and one is placed on the back.

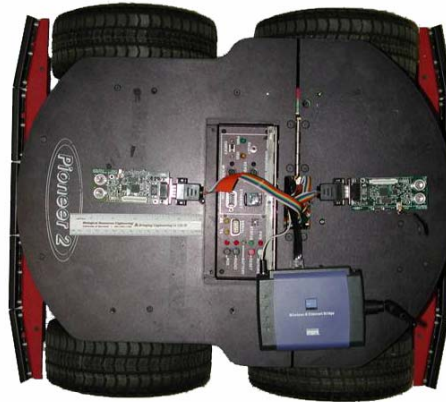


Cricket Technology

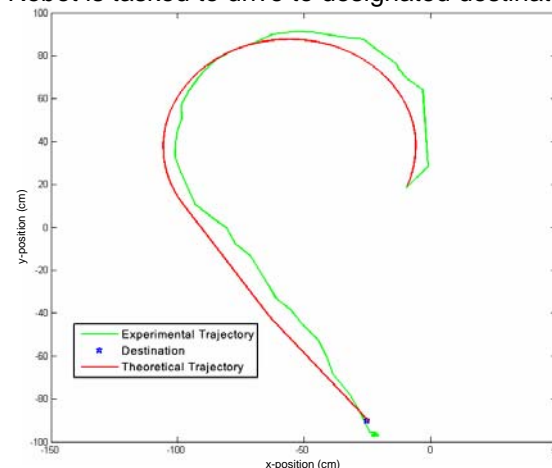
- A master client synchronizes all Cricket units by sending an RF clock pulse.
- Each client has a time slice during this clock pulse to send an ultrasonic signal to beacons in range.
- Beacons in range respond with distance from client over RF.
- Client then determines its position by using distance data from three beacons.

Algorithms and Software

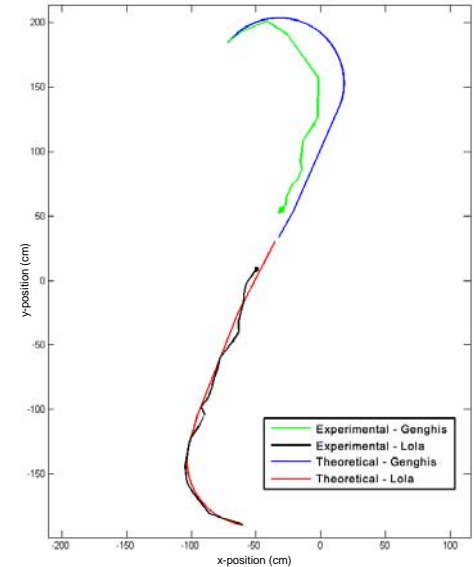
- Cricket units use Bancroft's algorithm for triangulating a client's position using distances from three beacons within range.
- A Kalman Filter is planned to improve position estimates when noise is present.
- Communication between robots is accomplished through CORBA-enabled server/client platform.
- MDLe (motion description language) motion control software is used to specify a robot's task.
- Robot's in-the-feedback-loop control is simulated using Matlab depending on specific task.



Robot is tasked to drive to designated destination.



Robots Genghis and Lola are both tasked to drive towards each other.



Practical Applications

- Guidance systems for robotic assistants in the home or workplace.
- Task completion through cooperation with other robots.
- Cricket technology simulates GPS indoors for applications to unmanned aerial and ground vehicles.

