

Tekkotsu

Robotics Application Framework

tekkotsu.org

Goals

- > Develop a common research platform for the Aibo
- > Reduce barrier to entry for new Aibo programmers
- > Encourage hobbyists to become developers

Open Source Model

- > Why start a new code base?
- > RoboCup competition is good...
 - Drives rapid development
 - Optimizes real-time performance
- > ...and bad
 - Source is "closed" for most of the year
 - Single task causes specialization

Open Source Model

- > Our answer: Tekkotsu
 - First release March 4, 2003
 - Three releases in first two months
 - New features released as soon as they are ready
 - Support for cygwin and ERS-220 contributed by one of our users

Out of the Box

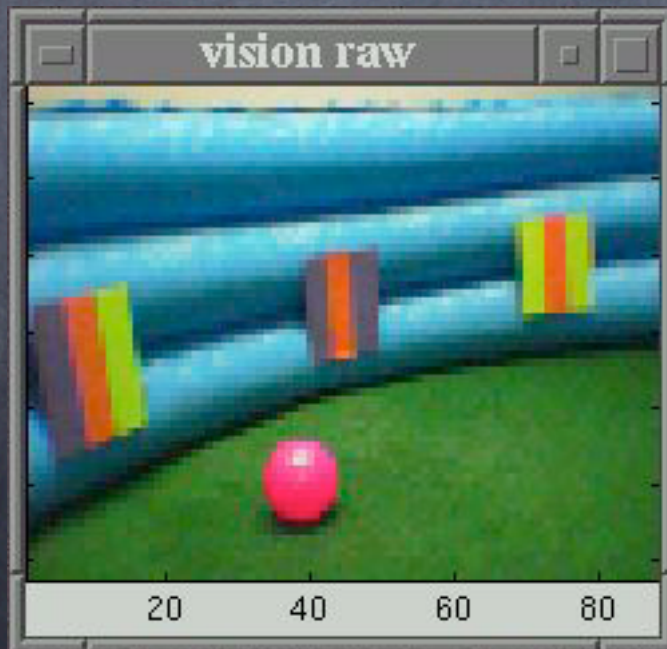
- > Vision processing (uses CMVision)
- > Wireless interfaces
- > Motion primitives
 - Walk (from CMPack), poser, keyframed playback, emergency stop, etc.
- > Mapping and localization
- > Sound Playback (with mixing)

Architectural Overview

- > 3 processes: Main, Motion, Sound
- > Event-based interface; no polling
 - Flexible state machine formalism
- > Modular “plug-and-play” organization
- > Utility functions: timers, mutex, event logging, profiling
- > Online documentation & tutorials

Remote Monitoring

- > Raw and color-segmented video
- > Full 25 frames per second over wireless



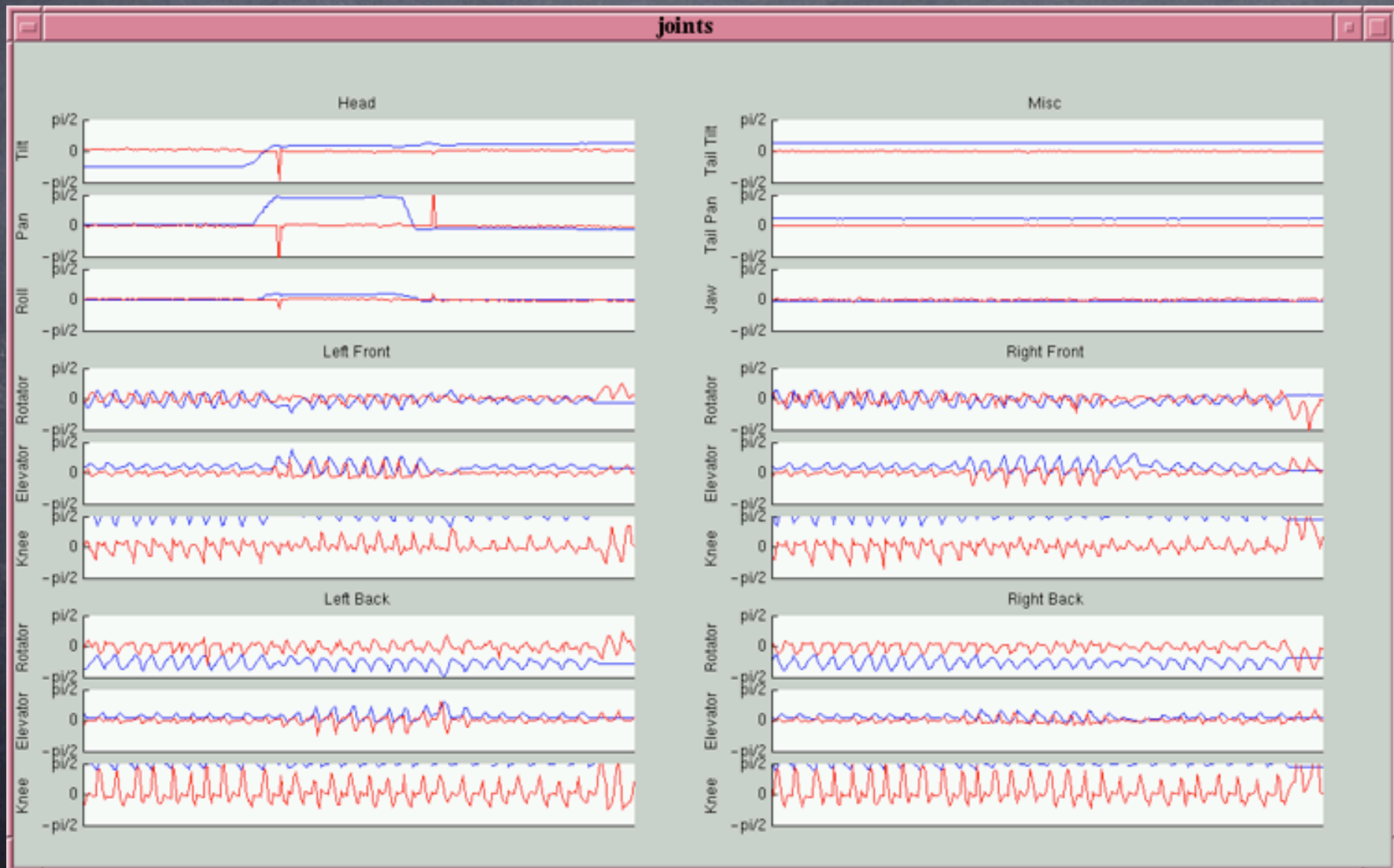
Teleoperation



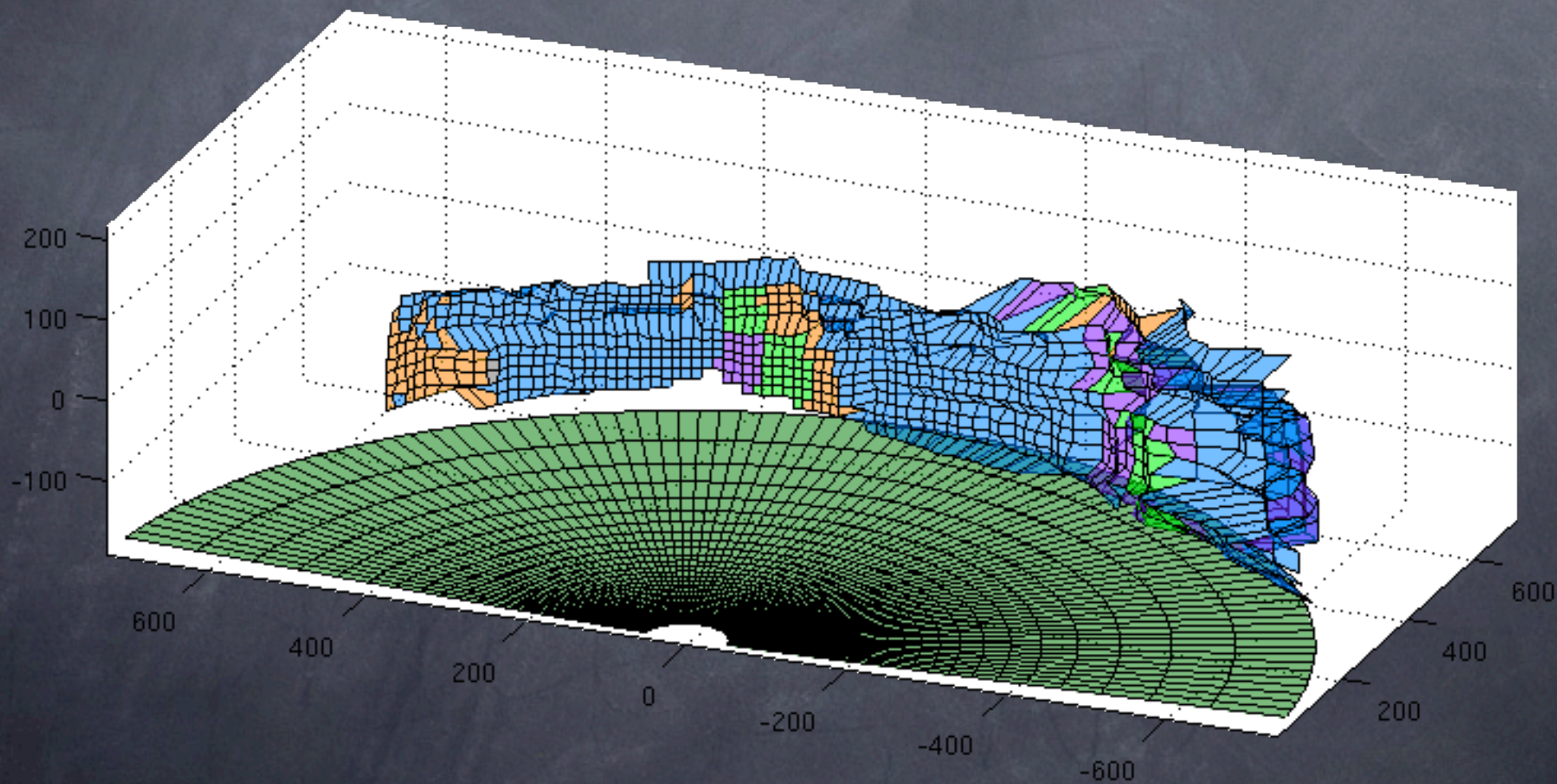
(coming soon)

Joint Monitoring

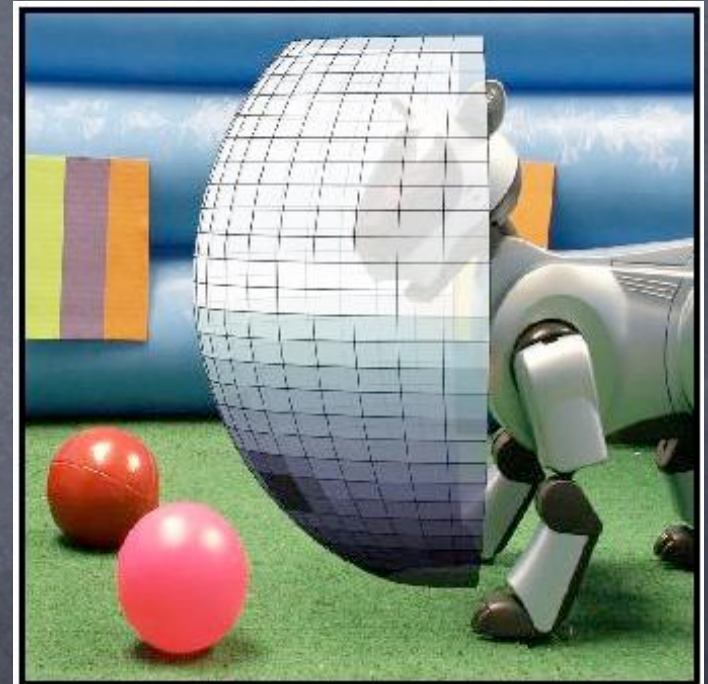
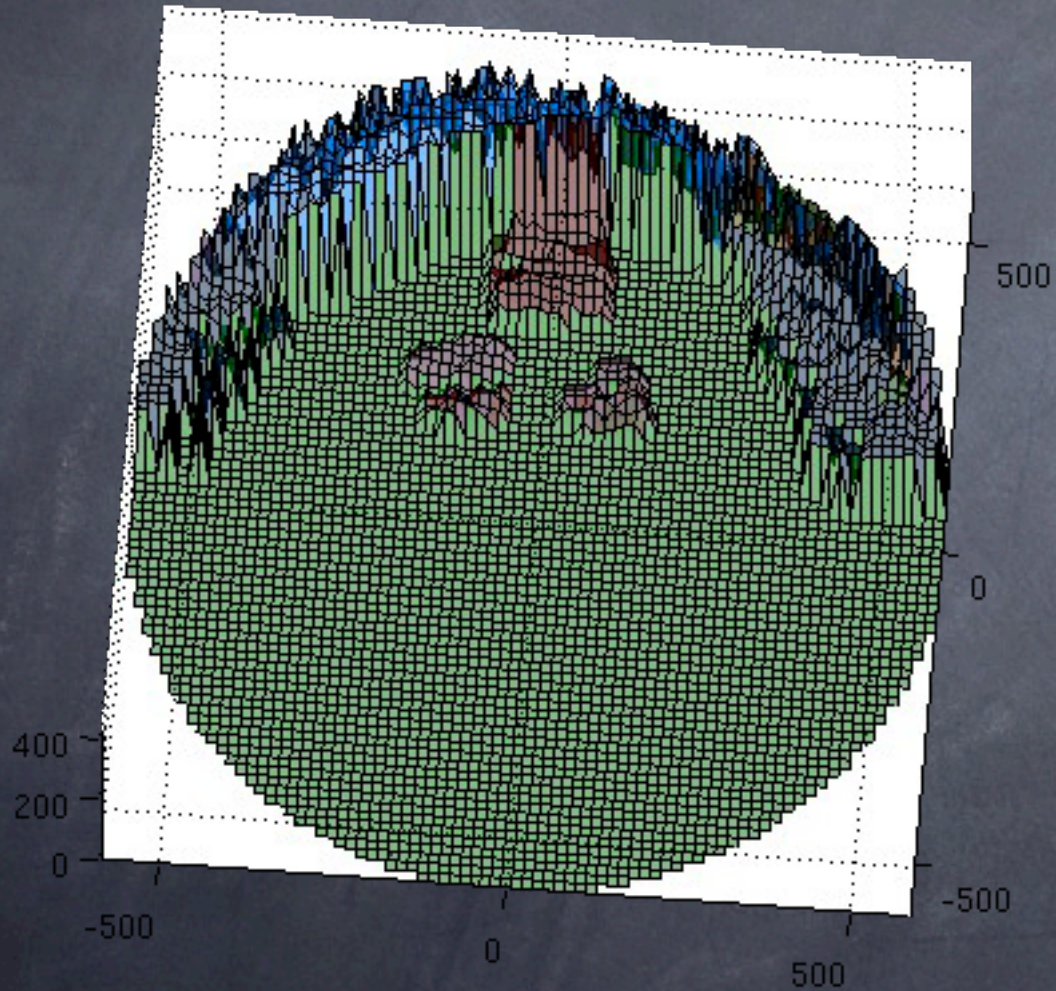
Joint position and force graphs



Spherical Depth Map



Horizontal Height Map



Future Development

- > Fast**SLAM** for Aibo
 - **S**imultaneous **L**ocalization **A**nd **M**apping (Montemerlo et al.)
 - Efficient particle filtering technique
 - Allows the robot to track position in a relatively unstructured environment

Future Development

- > New representations for behaviors
 - Hierarchical state machines
 - Automated problem solving through keyframe based task descriptions
 - Visual routines for parsing world maps
- > New animal learning models
 - Train Aibos just like real dogs

Credits

- > Tekkotsu developers
 - Ethan Tira-Thompson, Alok Ladsariya, Tom Stepleton, Neil Halelamien, David Touretzky at Carnegie Mellon University
- > Funded by Sony Corporation
- > Thanks to Manuela Veloso and her Robosoccer group for use of their CMPack'02 code