RVSN Kickoff Meeting:

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Goals of this meeting

- Get acquainted with one another
- Summarize themes of group's research
- Discuss platforms, sensors, actuators, algorithms, and systems
- Determine goals for summer and beyond
- Identify synergies across efforts

- [Reminder: connect YB, DH via skype]
- [Reminder: need volunteer to take photos]

Introductions

- Other participants:

Yoni Battat (former Meng student, now working remotely)

David Hayden (PhD student joining the group in fall 2011)

Research Themes

- Machines that assist people
  - … while interacting naturally with people
  - … while in close proximity to people
  - … while in environments occupied by people

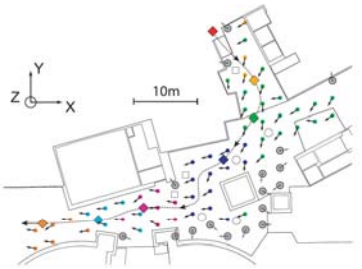
Self-driving (autonomous) passenger vehicle

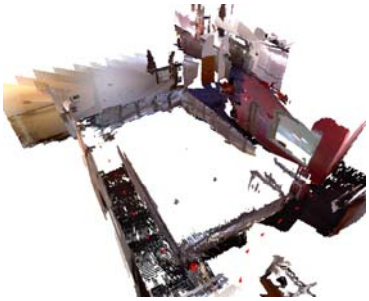
Joint work with J. Leonard (CSAIL/MechE), E. Frazzoli, J. How (LIDS/Aero-Astro) et al.

Handheld navigation guidance and conveyance classification

Joint work with J. Ledlie (Nokia), D. Curtis (CSAIL) et al.

Led by Jun-geun Park





Human-portable mapping and navigation guidance

Led by Olivier Koch

Voice-commandable robotic wheelchair that can learn from tours
… with a voice-based interface to provide information access
… and a voice-commandable robot arm to manipulate objects

Joint work with N. Roy (CSAIL/Aero-Astro), J. Glass (CSAIL), B. Reamer (AgeLab) et al.

Led by Sachi Hemachandra, William Li

Videator

Wearable device for blind people, with speech/gesture/Braille interface

Joint work with R. Miller, A. Torralba (CSAIL/EECS), J. Glass (CSAIL), N. Roy (CSAIL/Aero-Astro) et al.

Envoy

- Greets guests, escorts them to destination

Led by Matt Walter

Voice-commandable robotic forklift

Joint work with R. Davis (EECS), J. Glass (CSAIL), M. Cummings, E. Frazzoli, J. How, N. Roy (Aero-Astro) et al.

Led by Matt Walter, Stefanie Tellex

Stevedore

- Device that handles objects on command

Joint work with MIT AR team

Proxy

- Contact-free command of remote manipulator

Led by Mike Fleder

Technical Challenges

- Situational awareness
  - Spatiotemporally extended model of surround, including places, objects, people, events, …
- Natural interaction
  - Detection and interpretation (& generation!) of speech, gesture, gaze, body language, …
  - Appropriate turn-taking, dialogue, initiative, …
- Acceptance by people
  - Safety (bedrock requirement)
  - Competence (rookie metaphor)
  - Predictability (repeatability, annunciation etc.)

Platforms

- Handheld devices
- Body-worn devices
- Conveyances
- Mobile manipulators










Sensors (partial list)

- Lidar (SICK, Hokuyo)
- Monocular cameras, wide-FOV lenses
- Point grey ladybug omnidirectional camera
- Point grey bumblebee stereo camera
- Long-wave IR camera
- Kinect depth imager
- IMU
  - Linear accelerations
  - Rotation rates
- Wifi / bluetooth radio
- Shotgun microphone
- Array microphone
- USB barometer
- Nokia sensorbox
- Encoders (shaft, linear, integrated)

Actuators (partial list)

- Displays
- Speakers
- Braille displays
- Tactile arrays
- Servomotors
- Mobile bases
- Robot arms, grippers

Algorithms, tools, modules

- LCM inter-process communication, logging, playback
- LCMGL
- Geometry: convex hulls, CDTs, …
- Camunits
- Wikis, SVN
- Voice recognition
- Kinect handling
- Lidar handling
- IMU handling
- Wheel odometry
- GPS+IMU+odo dead reckoning
- Local frame egomotion
- SIFT features
- Stereo
- Kinect egomotion estimation
- SLAM
  - Metrical
  - Topological
  - Semantic
  - Visual gist
- Octomap
- Isomap (manifolds in high-DOF data)
- Graphviz
- Text-spotting (leget)
- Speech synthesis (festival)
- Visual odometry
- Person detection
- Face detection and recognition
- Object classification
- Object segmentation and reacquisition
- Motion estimation
- Fixation prediction & salience (Tilke Judd)
- RRT/RRT* sample-based motion planning
- Grounded language interpretation
- Inference, search, machine learning, …

Goals and synergies

- What can we achieve this summer and fall?
  - Storyboard scenarios (capabilities, interaction)
  - Prototype platforms (massing, power, interfaces)
  - Wizard-of-Oz interfaces (Videator, Proxy, …)
  - Preliminary user studies
- Identifying synergies across efforts
  - Drivers: sensors, actuators
  - Low-level classifiers: egomotion, objects, people…
  - Representations: surround, events, …
  - Interfaces: speech, gesture, …

Key purposes of this meeting

- Awareness of whole group's activities
- Exhortation to communicate with each other
- Catalyze broad team-based activity
  - Sharing information and tools
  - Helping each other with stumbling blocks
  - Building on each others' successes