

Robot Development

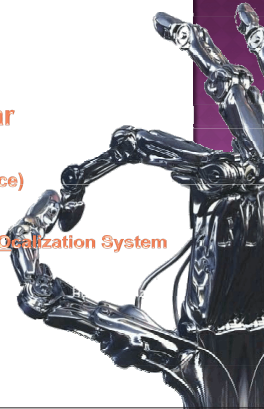
UC-win/Road for RoboCar

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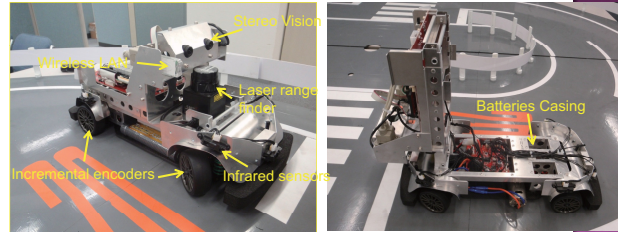
*From "Theory of Applied Robotics", Reza N.Jezar

Summary

- RoboCar
- UC-win/Road for RoboCar
- MindSet (EEG based input device)
- AURELO Augmented Reality Localization System
- Robotics at Forum8



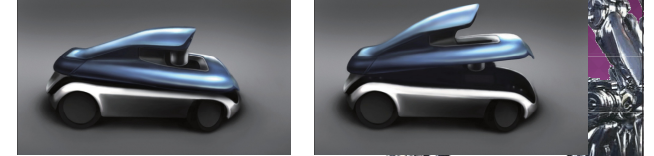
RoboCar



Current version of RoboCar

RoboCar: Modifications

Cover

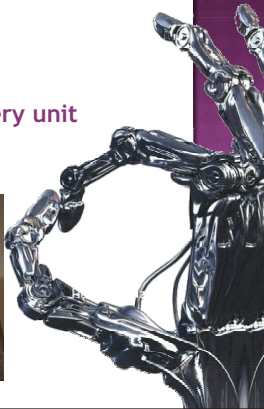


Sketches for RoboCar's Cover

RoboCar: Modifications

Batteries

- ⦿ Development of a single battery unit (easier to replace/recharge)



RoboCar: Manual control (Joystick)

Cyborg Force Evo

- ⦿ Use for tests, to have direct access to RoboCar
- ⦿ Force feedback applications: environment sensing for RoboCar (teleoperation), MindSet practice....



Saitek Cyborg Force Evo



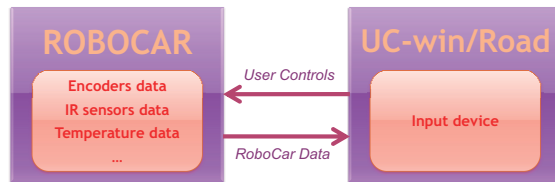
UC-win/Road for RoboCar



View of UC-win/Road for RoboCar
(Top view and user view)

UC-win/Road for RoboCar

Principle



Communication between RoboCar and UC-win/Road

MindSet: Investigation on Handless Control

- Measures the EEG
- Two headphones, one microphone. Communication using a Bluetooth USB dongle
- Three electrodes on the left ear headphone and one electrode on the user's forehead



Bluetooth dongle



MindSet Unit (Neurosky)

MindSet: Investigation on Handless Control

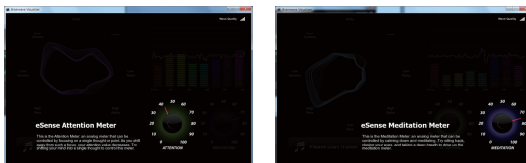
- Analysis of the EEG components (Alpha wave, Beta wave, Gamma wave)



"Brainwave Vizualizer" (from Neurosky)

MindSet: Investigation on Handless Control

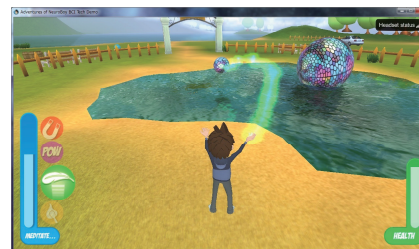
- Control of the RoboCar (tentative) using the level of concentration and the level of relaxation of the user



"Brainwave Vizualizer" (from Neurosky):
Attention and Meditation parameters

MINDSET: INVESTIGATION OF HANDLESS CONTROL

- Example of brain controlled game

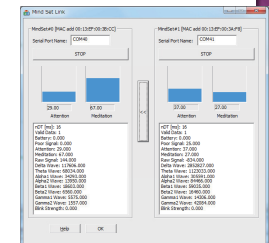


Brain controlled game (NeuroBoy from Neurosky)

MindSet: Investigation on Handless Control

- Current development: simultaneous reading of 2 mindsets units in real time (@60Hz)

Reading of 2 MindSet units (on left and right) with extraction of the Meditation and Attention factors for each unit (in blue)

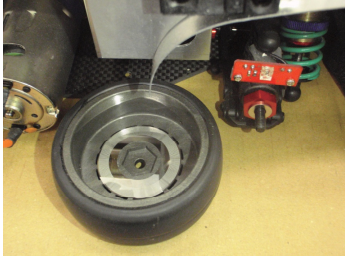


AURELO: 3D Localization

(Augmented Reality Localization System)

Context:

RoboCar is equipped with
1 rotary encoder on each wheel + 1 on main motor

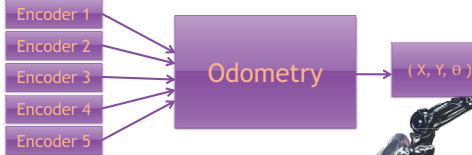


(Optical) Rotary encoder within a RoboCar wheel

AURELO: 3D Localization

(Augmented Reality Localization System)

Context:



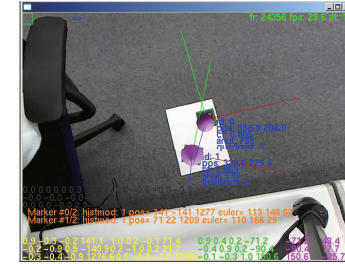
→ Accumulative Errors (Integration, Slipping, Dimensions Uncertainties,...)

→ Needs an absolute localization system to re-localize the robot

AURELO: 3D Localization

(Augmented Reality Localization System)

3D Localization based on Augmented Reality tools



3D localization of 2 markers:
Estimation Error ($d < 1.5m$)
Position: **+7mm**
Orientation: **+2degrees**

AURELO: 3D Localization

(Augmented Reality Localization System)

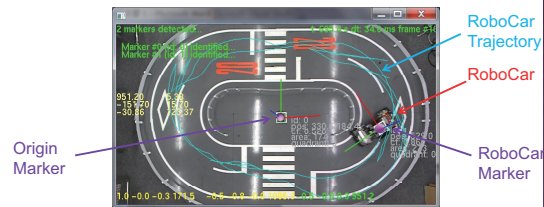
DEMO

AURELO: 3D Localization

(Augmented Reality Localization System)

Current version: tracking of the RoboCar over a
2.7m x 1.8m course

Next version: multi camera to cover a wider area
(target is one to several rooms)



View from AURELO top camera

Robotics at Forum8

Mobile Robotics project started at Forum8

Current target: Office Robot

Main Purpose:

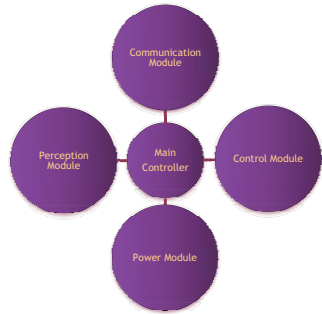
Improve the Quality Of Work in office

✓ Autonomous transport/delivery of
small payloads (documents, drinks, ...)

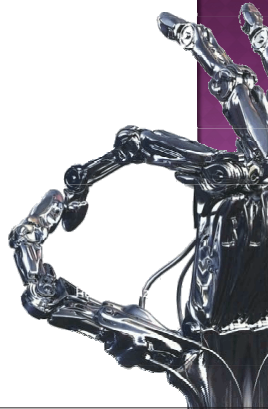
✓ Telepresence

Robotics at Forum8

Office Robot Concept

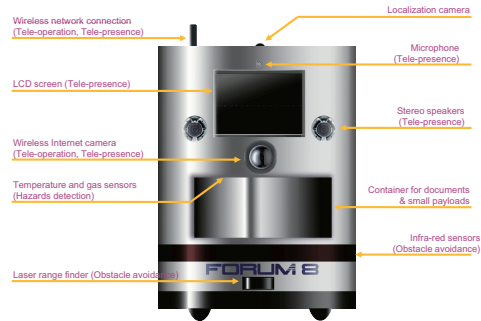


System overview



Robotics at Forum8

Office Robot Concept



Robotics at Forum8

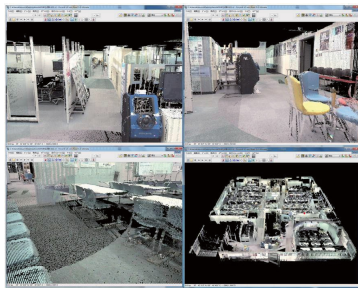
Office Robot Concept



Control Interface

Robotics at Forum8

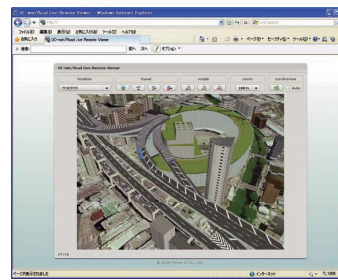
Office Robot Concept



3D reconstruction of office environment from a point cloud (obtained from a 3D scanner)

Robotics at Forum8

Office Robot Concept



Interface of UC-win/Road for SaaS (Software as a Service)

CONCLUSION

- Current developments mainly oriented to improve usability of RoboCar
- Development of a 3D Localization system based on camera: AURELO
- Robotics at Forum8: small to medium size mobile robots

