



Natural Human-Robot
Cooperation in Dynamic
Environments

DR 8.4.8: Public release of the open source NIFTi software. (R; M48)

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And the NIFTi consortium

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This document describes the project website which lists all the tools that have been developed in the project, with pointers to the background papers relative to each tool, the contact person for each tool, licensing requirements for using the tool, whether the tool is undergoing further development, and how a researcher can access code for that tool.

Open source NIFTi software

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Annexes

Open source NIFTi software

In Yr3 the reviewers gave the following recommendation:

"Create a part of the project website which lists all the tools that have been developed in the project, with pointers to the background papers relative to each tool, the contact person for each tool, licensing requirements for using the tool, whether the tool is undergoing further development, and how a researcher can access code for that tool (if it is available for public use)."

This has been accomplished by creating a web page at <http://www.nifti.eu/results>.

During the term of the NIFTi project a considerable quantity of new modules have been developed related to information processing and robot human interaction in USAR scenarios. A selection of the reusable modules is published as open source. All code should be usable in matching projects covering similar fields. This document first lists all published modules arranged in four main topics: User Interface, Robot Navigation, Robot Perception, and System Infrastructure:

- The User Interface topic includes all modules that concern the aspects of the NIFTi system that are related to the end user, e.g. GUI, speech recognition, high level control, and user requirements.
- The Robot Navigation topic addresses modules that enable USAR robots to navigate in difficult terrain and basic capabilities for their localization.
- The Robot Perception topic demonstrates modules for evaluation and interpretation of various robot sensor data, e.g. object detection, mapping, and image processing.
- The System Infrastructure topic includes a dataset of indoor and outdoor experiments as well as tools and drivers for the hardware components used in NIFTi.

Second, the annexes of this document show the entry page of the each external repository. This is the page reached under the item *link to software* in the list of modules below.

User Interface

Operator Control Unit

- description
 - The Operator Control Unit (OCU) is a multi-modal control software for the NIFTi robots.
 - contact person
 - Benoit Laroche (DFKI)
 - licensing requirements
 - BSD
 - Link to software
 - https://github.com/talkingrobots/NIFTi_OCU
 - Link to background information/papers
 - [Multi-view operator control unit to improve situation awareness in USAR missions](#)
-

TRex

- description
 - A geographical information system for visualizing robot locations, areas of interest, etc.
 - RosConnectionApp.exe, Bidirectional_trex_connection.exe (compiled code) (this is server software).
 - Trex Client (compiled code) This is client software.
 - contact person
 - (TNO)
 - licensing requirements
 - Not applicable
 - Link to software
 - Not applicable
 - Link to background information/papers
 - [Content-based Design and Implementation of Ambient Intelligence Applications](#)
-

CLES

- description
 - This is a prototype for cognitive workload estimation.
 - contact person
 - (TNO)
 - licensing requirements
 - Not applicable
 - Link to software
 - Not applicable
 - Link to background information/papers
 - Colin, T. R., Mioch, T., Smets, N. J., & Neerincx, M. A. (2012, September). Estimating an operator's cognitive state in real time: A user modeling approach. In RO-MAN, 2012 IEEE (pp. 627-633). IEEE.
-

SCET

- description
 - A user requirement management tool
 - contact person
 - (TNO)
 - licensing requirements
 - Not applicable
 - Link to software
 - Not applicable
 - Link to background information/papers
 - [SCET](#)
-

Abductive Reasoning for Continual Dialogue Understanding

- description
 - The abducer is a weighted abduction inference engine with an Ice interface.
 - contact person
 - Miroslav Janíček (DFKI)
 - licensing requirements
 - GNU Lesser General Public License v2.1
 - Link to software
 - <https://github.com/mjanicek/abducer>
 - Link to background information/papers
 - [Abductive Reasoning for Continual Dialogue Understanding](#)
-

MRCP4J

- description
 - A client library for connecting to speech recognisers using the MRCP protocol. An extended fork of an (apparently abandoned?) open-source project.
 - contact person
 - Miroslav Janíček (DFKI)
 - licensing requirements
 - GNU Lesser General Public License v3.0
 - Link to software
 - [The original library](#)
 - *Our extended fork to be made available soon*
 - Link to background information/papers
 - [RFC 6787 describing the protocol](#)
-

The Talking Robots Toolkit

- description
 - Tarot: The Talking Robots Toolkit provides functionality for building robots capable of communicating with human users using natural spoken dialogue. Tarot is based on a core API which provides the primary functionality for building up processes for comprehending and producing spoken dialogue.
 - contact person
 - Miroslav Janíček (DFKI)
 - licensing requirements
 - GNU Lesser General Public License v3.0 or later
 - Link to software
 - <http://tarot.opendfki.de>
 - Link to background information/papers
 - None yet
-

CAST

- description
 - CAST Instantiation of the UGV Robot Cognitive Architecture for planning, dialogue, functional mapping and high level control.
 - contact person
 - Mario Gianni (Roma), Miroslav Janíček (DFKI), Shanker Keshavdas (DFKI)
 - licensing requirements
 - BSD
 - Link to software
 - <https://github.com/alcor-lab/cast>
 - Link to background information/papers
 - https://github.com/alcor-lab/cast/blob/master/cast_overview.pdf
-

Robot Navigation

Trajectory control

- description
 - Augmented Reality based path planning integrating a trajectory tracking control for the UGV.
 - contact person
 - Mario Gianni (Roma)
 - licensing requirements
 - BSD
 - Link to software
 - <https://github.com/alcor-lab/trajectory-control>
 - Link to background information/papers
 - M. Gianni, G. Gonnelli, A. Sinha, M. Menna and F. Pirri. An Augmented Reality approach for trajectory planning and control of tracked vehicles in rescue environments. In Proceedings of the 11th IEEE International Symposium on Safety, Security and Rescue Robotics. Linkoping, Sweden, 2013.
 - <http://www.dis.uniroma1.it/~alcor/site/index.php/publications.html>
-

Mesh-based path planning and high level control

- description
 - Mesh-based path planning and high level control
 - contact person
 - Bruno Cafaro (ROMA), Federico Ferri (Roma), Mario Gianni (ROMA), Matteo Menna (ROMA)
 - licensing requirements
 - BSD
 - Link to software
 - <https://github.com/alcor-lab/mesh-based-path-planning>
 - Link to background information/papers
 - none
-

TF to Path Converter

- description
 - The TF to Path Converter listens to the ROS TFs to accumulate the robot's position over time and publish it as a path
 - contact person
 - Benoit Larochelle (DFKI)
 - licensing requirements
 - BSD
 - Link to software
 - https://github.com/talkingrobots/NIFTi_TFToPathConverter
 - Link to background information/papers
 - None
-

LB3 Visual odometry

- description
 - Robot pose estimation from images. Point based approach - features, keypoints, landmarks, bundle adjustment.
 - contact person
 - Tomas Svoboda (CTU)
 - licensing requirements
 - BSD
 - Link to software
 - Under active development, not yet in a release form
 - Link to background information/papers
 - http://cmp.felk.cvut.cz/nifti/sw/pose_estimation/
-

LB3 Visual compass

- description
 - Computationally undemanding alternative for the visual odometry which provides information about the robot rotation in the horizontal plane (z-axis).
 - contact person
 - Tomas Nouza, Michal Reinstein (CTU)
 - licensing requirements
 - BSD
 - Link to software
 - http://cmp.felk.cvut.cz/nifti/codes/visual_compass.zip
 - Link to background information/papers
 - https://cw.felk.cvut.cz/wiki/misc/projects/nifti/sw/visual_compass
-

INSO - Kalman filter for IMU and odometry fusion

- description
 - Inertial navigation aided by caterpillar track odometry using Kalman filtering
 - contact person
 - Vladimir Kubelka, Michal Reinstein (CTU)
 - licensing requirements
 - BSD
 - Link to software
 - <http://cmp.felk.cvut.cz/nifti/codes/inso.zip>
 - Link to background information/papers
 - <https://cw.felk.cvut.cz/wiki/misc/projects/nifti/sw/inso>
-

Referential tracking system for MATLAB

- description
 - Extracts position of the robot from a video recording provided robot has two color markers attached.
 - contact person
 - Vladimir Kubelka, Vladimir Burian, Premysl Kafka (CTU)
 - licensing requirements
 - BSD
 - Link to software
 - <http://cmp.felk.cvut.cz/nifti/codes/tracker.zip>
 - Link to background information/papers
 - https://cw.felk.cvut.cz/wiki/misc/projects/nifti/sw/reference_tracking_system
-

Robot Perception

Car detector

- description
 - contact person
 - Karel Zimmermann (CTU)
 - licensing requirements
 - BSD
 - Link to software
 - not yet in a release form
 - Link to background information/papers
 - K. Zimmermann, D. Hurych, T. Svoboda. Non-Rigid Object Detection with Local Interleaved Sequential Alignment (LISA). In IEEE Transactions on Pattern Analysis and Machine Intelligence, [pdf](#)
-

Multi-modal sensor fusion and victim detection

- description
 - Asus Xtion + Thermo synchronous ROS driver (capturing of color depth and thermal images)
 - laser_render (Semi-dense depth reconstruction from rotating laser scans for a given viewpoint using OpenGL)
 - Victim detector using multimodal input
 - contact person
 - Alexander Shekhovtsov (CTU)
 - licensing requirements
 - BSD
 - see p4p/COPYRIGHT for calibration
 - Link to software
 - http://cmp.felk.cvut.cz/nifti/codes/openni_cam.zip
 - Link to background information/papers
 - http://cmp.felk.cvut.cz/nifti/sw/openni_cam/; [openni_cam/doc](#)
-

Object Detection

- description
 - Multi-Resolution Surfel Maps for image registration, object modelling and tracking, and SLAM. The work done in the NiFTi project is used in further projects and extended by our colleagues.
 - contact person
 - Erik Zimmermann (Nenad Biresev) (Fraunhofer IAIS)
 - licensing requirements
 - BSD
 - Link to software
 - <http://code.google.com/p/mrsmap>
 - Link to background information/papers
 - <http://publica.fraunhofer.de/dokumente/N-221239.html>
 - Jörg Stückler, Benedikt Waldvogel, Hannes Schulz, and Sven Behnke: [Dense Real-Time Mapping of Object-Class Semantics from RGB-D Video](#)
-

icp mapping

- description
 - Modular library for point cloud registration using ICP.
 - contact person
 - François Pomerleau, Stéphane Magnenat (ETH)
 - licensing requirements
 - BSD
 - Link to software
 - [ethzasl icp mapping](#)
 - Link to background information/papers
 - [F. Pomerleau, "Applied Registration for Robotics - Methodology and Tools for ICP-like Algorithms", Ph.D Thesis, ETH Zurich, 2013](#)
-

Point cloud coloring

- description
 - Package for coloring point clouds using calibrated cameras.
 - contact person
 - Tomas Petricek (CTU)
 - licensing requirements
 - BSD
 - Link to software
 - http://cmp.felk.cvut.cz/nifti/codes/point_cloud_color.zip
 - Link to background information/papers
 - http://cmp.felk.cvut.cz/nifti/sw/point_cloud_color/
-

Fusion of Thermo-Cam and 3DLS

- description
 - Fusion of thermo camera data with 3D laser scan data
 - contact person
 - Erik Zimmermann (Tom Liebelt, Hartmut Surmann) (Fraunhofer IAIS, University of Applied Science Gelsenkirchen)
 - licensing requirements
 - BSD
 - Link to software
 - <https://github.com/NIFTi-Fraunhofer/Fusion-of-Thermo-Cam-and-3DLS>
 - <https://github.com/roblab-wh-ge>
 - Link to background information/papers
 - <https://github.com/NIFTi-Fraunhofer/Fusion-of-Thermo-Cam-and-3DLS>
-

Virtual PTZ camera

- description
 - The package contains a nodelet rendering virtual views from calibrated ROS cameras. It supports multiple camera models and synchronization of camera feeds.
 - contact person
 - Tomas Svoboda, Tomas Petricek (CTU)
 - licensing requirements
 - BSD
 - Link to software
 - http://cmp.felk.cvut.cz/nifti/codes/virtual_camera.zip
 - Link to background information/papers
 - http://cmp.felk.cvut.cz/nifti/sw/virtual_camera/
-

Image processing node

- description
 - The package provides adaptive image processing functions, as a nodelet.
 - contact person
 - Tomas Petricek (CTU)
 - licensing requirements
 - BSD
 - Link to software
 - http://cmp.felk.cvut.cz/nifti/codes/nifti_image_proc.zip
 - Link to background information/papers
 - http://cmp.felk.cvut.cz/nifti/sw/nifti_image_proc/
-

System Infrastructure

DATASET for multi-modal data fusion

- description
 - UGV sensor data captured during 4km of indoor and outdoor experiments. Stored in ROS Fuerte bag files.
 - contact person
 - [Vladimir Kubelka](#), Michal Reinstein(CTU)
 - licensing requirements
 - BSD
 - Link to software
 - [Multimodal data fusion dataset](#)
 - Link to background information/papers
 - *to be published*
-

In-Field Pictures Server

- description
 - The In-Field Pictures Server is a central hub to exchange pictures between different actors connected to a ROS network.
 - contact person
 - Benoit Larochelle (DFKI)
 - licensing requirements
 - BSD
 - Link to software
 - https://github.com/talkingrobots/NIFTi_InFieldPicsServer
 - Link to background information/papers
 - B. Larochelle et al., ?Experiences with USAR Mobile Interfaces: the Need for Persistent Geo-Localized Information?, in Proceedings of the International Conference on Intelligent Robots and Systems, IEEE/RSJ, pp. 0?0, 2013. Accepted.
-

Ladybug 3 grabbing

- description
 - Nodes, classes, services and messages to support Ladybug 3 omnicaamera.
 - contact person
 - Tomas Petricek (CTU)
 - licensing requirements
 - BSD (omnicaamera), LGPL (camera1394)
 - Link to software
 - <http://cmp.felk.cvut.cz/nifti/codes/omnicaamera.zip>,
<http://cmp.felk.cvut.cz/nifti/codes/camera1394.zip>
 - Link to background information/papers
 - <http://cmp.felk.cvut.cz/nifti/sw/omnicaamera/>,
<http://cmp.felk.cvut.cz/nifti/sw/camera1394/>
-

xsens driver

- description
 - ROS Driver for XSens MT/MTi/MTi-G devices.
 - contact person
 - Francis Colas (ETH)
 - licensing requirements
 - BSD
 - Link to software
 - [xsens driver](#)
 - Link to background information/papers
 - [XSens website](#)
-

A C/C++ library that provides an interface with the platform actuators

- description
 - Library providing an API to control the UGV actuators, e.g. platform speed and direction, individual flippers angle, laser scanner rotation speed. Battery level is also available.
 - contact person
 - Patrick Balmer (Bluebotics)
 - licensing requirements
 - GPL
 - GPL licence for EMS Thomas Wuensche
 - Link to software
 - <https://github.com/NIFTi-BlueBotics/Librover>
 - Link to background information/papers
-

NIFTi-Arm

- description
 - The NIFTi arm is a hardware extension module for the NIFTi-UGV
 - contact person
 - Erik Zimmermann (Fraunhofer IAIS)
 - licensing requirements
 - BSD
 - Link to software
 - https://github.com/NIFTi-Fraunhofer/nifti_arm
 - IAIS-repository at ROS.org
 - Link to background information/papers
 - https://github.com/NIFTi-Fraunhofer/nifti_arm
-

NIFTi-UAV

- description
 - A collection of software and information about how to run a NIFTi UAV
- contact person
 - Erik Zimmermann (Fraunhofer IAIS)
- licensing requirements
 - BSD
- Link to software
 - https://github.com/NIFTi-Fraunhofer/nifti_uav
 - IAIS-repository at ROS.org
- Link to background information/papers
 - https://github.com/NIFTi-Fraunhofer/nifti_uav