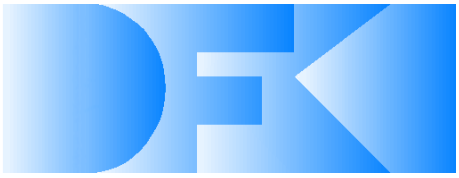

German Research
Center for Artificial
Intelligence GmbH

# 50 Years AI

## PROGRAM

## OPEN LAB

## PRESENTATIONS

| Room | Presentations |
|---|---|

002 **Electronic- and Measurement Technology Laboratory (DFKI Bremen)**
The electronics laboratory is responsible for development and assembling of electronic systems for robots. The electronic and measurement technology laboratory provides technical devices for assembling miniaturized SMD components on printed circuit boards. Manageable package sizes range from 0402 to BGA . They are handled with different soldering technologies: iron, hot air, and IR reflow soldering. Additionally, high-end measuring devices are available for analog and digital signal measurements. They are used for system and component tests.
*Contact: Robotics Lab (robotics@dfki.de)*

012A **Components Test Laboratory (DFKI Bremen)**
In the components test laboratory premounted leg systems of robots are tested. Both short- and long-time electromechanical tests up to 24 hours are performed, especially under high load conditions. Different kinds of measuring values are acquired: electrical voltage and current of the actuators, temperature, energy storage. The motion is generated either by predefined pattern generators or with user-defined traces.
*Contact: Robotics Lab (robotics@dfki.de)*

013 **Flying Robots Lab (DFKI Bremen)**
The flying robot project deals with the autonomous control and pose stabilization of a miniaturized indoor helicopter. In contrast to larger UAVs for outdoor applications, indoor helicopters have to stabilize their pose without GPS. Our approach uses a sensor fusion between inertial and optical sensors in order to correct the drift of the helicopter. Another scope of the project is collision avoidance for indoor flying systems. Due to the limited payload of an indoor flying system, we use a bio-mimetic visual approach which can be found in insects. As an experimental platform we use an indoor blimp which is equipped with custom-designed electronics in order to implement reflex-based behaviors for collision avoidance.
*Contact: Robotics Lab (robotics@dfki.de)*

013A **A6[Reactive Space] Exploiting Sensorimotor Coordination in Learning to Recognize Objects (SFB-TR8)**
In this demonstration we present an embodied recognition of objects where the body plays an important role in both the learning and recognition processes. The recognition system makes use of a learning architecture that integrates a reactive system with a high-level deliberative system. The system manipulates objects and records both proprioceptive and exteroceptive data during manipulation phase. The perceived data is statistically analyzed in order to extract relevant and distinctive features of an object. The extracted features are used in both learning and recognition phases.
*Contact: Robotics Lab (robotics@dfki.de)*

014 **Humanoid "BIN-HUR" (DFKI Bremen)**
"Controlling the locomotion of a humanoid robot, robust against external interferences and applicable for uneven terrain, based on a biologically inspired architecture" (Diploma Thesis).
A modified Kondo KHR-1 (humanoid robot) is presented which is already able to react to external interferences and balances the system.
*Contact: Robotics Lab (robotics@dfki.de)*

014 **Robot "Pithekos" - An ape-like 4 legged robot (DFKI Bremen)**
This diploma thesis concentrates on several biologically inspired walking patterns in connection with a flexible hip. A four-legged ape-like robot is shown which was built with the very flexible "AG Robotik Construction Kit".
*Contact: Robotics Lab (robotics@dfki.de)*

016 **A1[RoboMap]/I3[SharC] (SFB-TR8)**
The demonstration to be proposed exhibits practical results of a joint work between the SFB-TR8 Spatial Cognition projects A1-[RoboMap] and I3-[SharC]. By means of selected case studies that are going to be processed by our demonstrator, the autonomous wheelchair Rolland, and an accompanying off-line video presentation, we address the recognition, semantic interpretation and the autonomous execution of coarse verbal route descriptions like: "Leave the room, turn left and go to the door left of the vending machine."
*Contact: Dr. Thomas Roefer (roefer@informatik.uni-bremen.de)*
*Prof. Dr Bernd Krieg Brückner (bkb@informatik.uni-bremen.de)*

019 **SCORPION - An Eight-Legged Walking Robot (DFKI Bremen)**
The SCORPION robot is a biomimetic walking robot for outdoor terrain. It is programmed with the bio-inspired PCR-control approach which combines rhythmic motion control via CPGs, with reflex and posture control. Thereby very agile and robust locomotion over various terrains can be achieved.
We will present the system live in our indoor test-bed.
*Contact: Robotics Lab (robotics@dfki.de)*

| Room | Presentations |
|---|---|

107A **Framework for Evaluation of Reinforcement Learning Concepts (DFKI Bremen)**
Diploma thesis: An important task in the field of Reinforcement Learning is the automatic decomposition of MDP problems. This framework supports the evaluation process of such concepts. It comprises an editor for defining Mazeworld-MDPs, a simulator for the execution and archiving of experiments, and a plot interface which facilitates displaying and plotting the experiment results.
*Contact: Robotics Lab (robotics@dfki.de)*

107A **MEHEN - A Shielded Swimming Snake-Robot (DFKI Bremen)**
The Snake-Robot is a flexible dynamic system with morphological intelligence. This project deals with building and programming a multi-functional, multi-degree of freedom, ambulating swimming snake-like robot for underwater exploration.
*Contact: Robotics Lab (robotics@dfki.de)*

107A **Artificial Hand (DFKI Bremen)**
The design shows a flexible dynamic bio-inspired system with swappable joints like a human hand. The goal of this dissertation is to classify objects and sure faces only with tactile information's, about the finger position, temperature and sure face.
*Contact: Robotics Lab (robotics@dfki.de)*

112 **ARAMIES - A four-legged walking robot for steep terrain (DFKI Bremen)**
ARAMIES is an Ambulating Robot that is built for Martian Investigation, Exploration and Science funded by ESA and DLR. The goal is to develop a robust system for steep inclinations, e.g. for crater exploration.
The live presentation will show four-legged bio-inspired walking based on Central-Pattern-Generators and a Reactive Control Loop.
*Contact: Robotics Lab (robotics@dfki.de)*

117 **HETS - The Heterogeneous Tool Set Hets (DFKI Bremen)**
Formal methods and formal verification of software are becoming increasingly important in safety-critical areas. Complex systems require the integration of different formalisms and prover tools. The heterogeneous tool set Hets allows
such an integration. As an example, we demonstrate the verification of a composition table of a calculus for qualitative spatial reasoning (relevant e.g. for robot control), using the provers SPASS and Isabelle.F
*Contact: PD Dr. Till Mossakowski (Till.Mossakowksi@dfki.de)*

117 **Simulator for Kinematically Complex Walking Robots (DFKI Bremen)**
The goal of this project is to develop a realistic physical simulation of kinematically complex walking robots. The purpose of the simulator is to reduce the cost of hardware and development time of learning algorithms since they have to be carried out for a large number of times for different conditions of learning and adaptation experiments.
It requires a lot of time and energy to execute all the experiments on real robots until one gets agents with satisfactory behaviours.
*Contact: Robotics Lab (robotics@dfki.de)*

117 **A Toolkit for the Formal Development of Dialogue Systems (DFKI Bremen)**
Spoken Dialogue Systems are natural language interfacing frameworks of a wide variety of domestic and industrial applications such as autonomous vehicles and robotic systems. In such safety-critical applications, system modelling, testing, and verification is of course crucial.
In this demo we show a formal method CSP based toolkit for the development, testing and verification of the core component of any spoken dialogue system, i.e., the Dialogue Manager.
*Contact : Dr. Shi Hui (Shi.Hui@dfki.de)*

102 **A2-[ThreeDSpace] / I1-[OntoSpace] (SFB-TR8)**
3D-Object Recognition and Scene Interpretation combined with Dialog-Based User-Interaction Using a Domain Ontology
The combination of vision and speech, together with the resulting necessity for formal representations, builds a central component of an autonomous system. The presented systems therefore comprises two subsystems: The recognition system is based on three-dimensional range data. It segments and classifies objects within an office scene. The dialog system uses a domain ontology and helps among others to label unidentified objects. Thus it implements the central user-robot interaction module of a robot system.
*Contact: Prof. Dr. John A. Bateman (bateman@uni-bremen.de)*

## Room Presentations

117 **I2-[MapSpace] (SFB-TR8)**

The project I2-[MapSpace] of the Transregional Collaborative Research Center SFB/TR 8 Spatial Cognition is concerned with (map-based) way finding assistance.
A basic assumption is that schematization of presented information facilitates usage of such systems. For way finding assistance, one possible way of schematization is to adapt the presented information to a user's previous knowledge of an environment. A prerequisite for incorporating individual previous knowledge is to make it accessible for the system in the first place. We will demonstrate how this can be done for users' day-to-day travel routines: a clustering algorithm extracts meaningful places and decision points from GPS data streams based on stay duration and frequency of visits.
*Contact: Prof. Christian Freksa (freksa@sfbtr8.uni-bremen.de)*

117 **R1-[ImageSpace] (SFB-TR8)**

Computational Modeling of Mental and External Reasoning with Sketches
Diagrams and mental imagery play pivotal roles for many spatial reasoning tasks, and the close functional coupling of spatial reasoning with diagrams and imagery is often crucial for successful problem solving. Problem solving by way of model (e.g., diagram) construction is a frequent strategy. We present the computational model NEVILLE which proposes a visual model of the interplay between mental images and external sketches in human problem solving for geographic tasks. NEVILLE aims at behavioural adequacy for a selected set of phenomena such as limited working memory capacity and mental rotation of objects.
S. Bertel, T. Barkowsky, P. König, H. Schultheis, C. Freksa
*Contact: Thomas Barkowsky (barkowsky@sfbtr8.uni-bremen.de)*

117 **Intelligent Container (SFB 637) (TZI)**

"Autonomous Cooperating Logistic Processes - A Paradigm Shift and its Limitations" is a large-scale research (about 45 researchers from four faculties) funded as the Collaborative Research Center 637 by the Deutsche Forschungsgemeinschaft (DFG). The demonstrator "Intelligent Container" illustrates this approach of increasing autonomy in transportation logistics using autonomous sensor modules as well as intelligent agents for decision-making.
*Contact: Dr. Marc Ronthaler (ronthaler@tzi.de)*

117 **IntaPS (TZI)**

The IntaPS project is demonstrating agent technologies for flexible manufacturing. The agents are representing orders and resources and negotiating resource allocation dynamically. The flexibility is increased by bridging the conventional gap between process planning and production control. IntaPS is funded within the Priority Research Program 1083 on "Intelligent Agents and Business Applications" by the Deutsche Forschungsgemeinschat (DFG).
*Contact: Dr. Marc Ronthaler (ronthaler@tzi.de)*

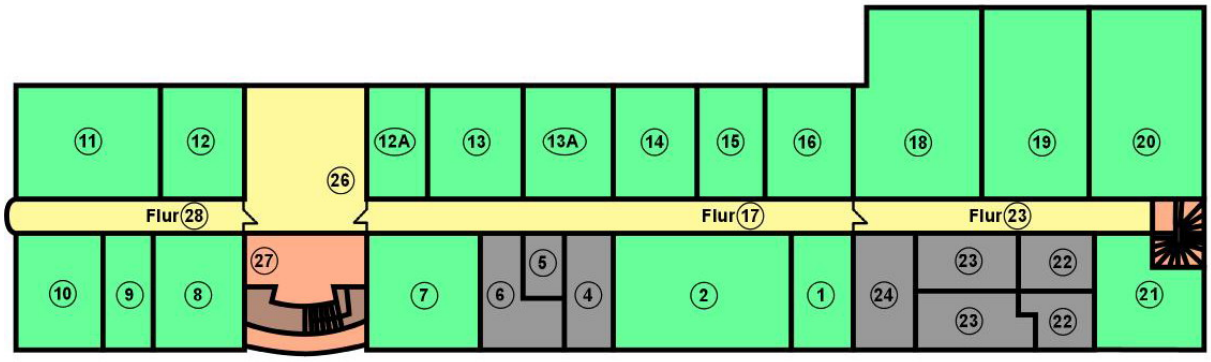


*Figure 1: First floor at DFKI Bremen—Robotics Lab*

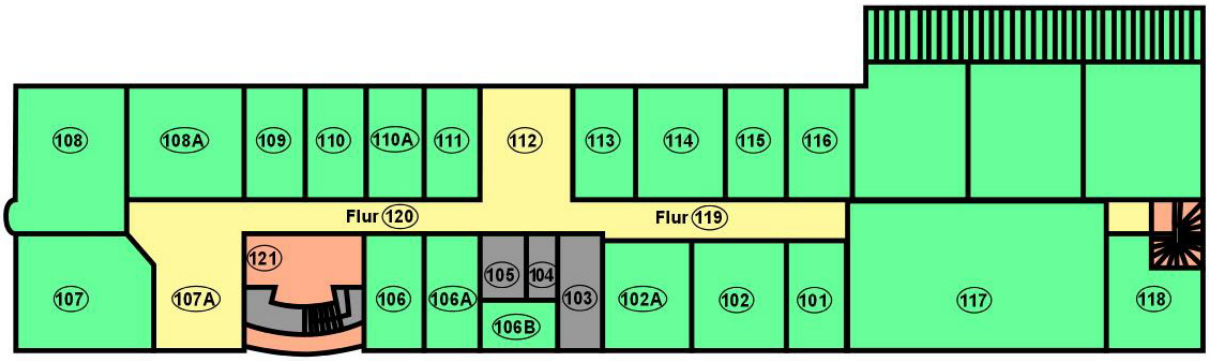


*Figure 2: Second floor at DFKI Bremen—Robotics Lab*