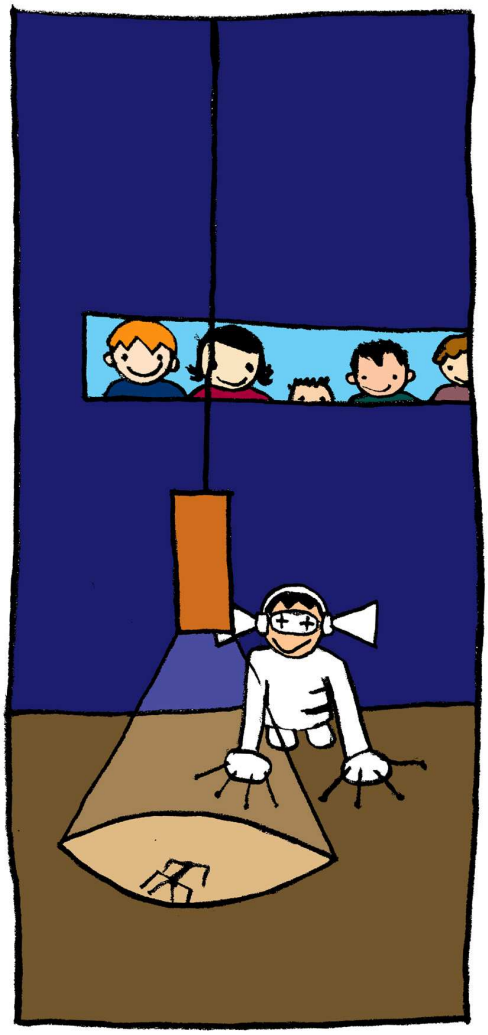
How it feels to be a Robot—Interaction with Reduced Perception

Reduced perception is about finding an adequate interface to machines with minimal cognitive abilities, and to propose a new view on what interaction with machines could be like.

We think, that by reducing peoples' sensory input to the level of simple machines, we enable people to develop and experience stories together with machines. In this context stories means that people and machines engage in a performance, without a defined outcome and always with different constellations.



The installation consists of a structured room, two robots, two wearable sensor-suits for two people. The performance inside the room can be attended to through a window and also be altered through an control-interface to that room.

Both robots are walking robots, based on Mark Tilden's Analog Gait Controller, equipped with light-, sound- and touch-sensors. They can be configured to be photophile or photophobe and phonophile or phonophobe. If they touch something they move backwards for a while.

The wearable sensor-suit mimics the robots' sensors and its sensory processing by removing the natural sensory information and replacing it by a simple signal. As an example for vision we use blinded goggles, which sense and visualize the lighter side, by lighting up one single LED for one eye.

The structured room consist of light and sound sources, the intensities of these source can be controlled through the room's control-interface.

People from outside can change the structure of the room by modulating the intensities of the light and sound sources. Depending on their configuration, the robots will start to move away or towards these sources. If they want to, the people inside will move around as well, try to interpret their reduced sensory information, eventually meet the robots and have the chance to discover how the robots work.

We imagine that with the different players (the outside controllers, the inside robots and the inside people) different stories will emerge as well as the feeling of developing a story together with machines.

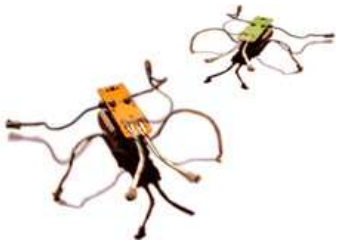
Our approach is in contrast to most research in man-machine-interaction, which focuses to enlarge the "perception" of the mechanical artefact. Perception here means the sensory-interfaces using sound, vision, and touch. All efforts go towards reaching the capabilities of humans, like recognizing movements, gestures, faces or understanding natural speech.

Assuming these sensory-interfaces working perfectly, a machine equipped with such perceptual systems would have an interface at the level of humans.
Of course the machine itself would not by consequence be at the level of humans and there will be a gap between the cognitive state of the machine and its perception. As in interaction device such a machine will absolutely not be interesting.

Detailed description of the components

The robots

The robots are walking robots driven by Marc Tilden's Analog Gait Controller. They exhibit lifelike behaviors due to some randomness as well as adaptation in the signal processing of the analog controller.



The robots are equipped with touch sensors made of keyboard switches. They are attached to the legs and to the front of the robot. Whenever these simple switches close, the robot runs backward for a fixed time.
The light sensors are attached to each side of the robot, their input is fed into an analog comparator, which measures the difference of each sensor to a defined reference. If this difference exceeds a certain threshold, it is assumed, that on the corresponding side there is more light. The robot can now be be either setup to turn towards this side or to turn away from it.

The light detection circuit works best close to darkness, due to the characteristics of the light sensors. In the robots world this leads to light searching behavior in darkness and random walking in bright light.

As sound sensors we use 2 microphones attached to the side of the robot. The circuitry for the sound sensors is not yet finished. As a base we have a circuit that detects when sound exceeds a certain level.

We are currently working on a comparator, analogue to the light searching circuit.

The sensor-suit:

Until now we have already finished and tested the blinded goggles. They work very well and people using them have a lot of fun. The light sensing circuit is exactly the same as on the robot. To transmit the information two LED's inside the blinded goggles can be lit to visualize on which side is more light.

As a touch sensor replacement we plan to use boxer-gloves for the hands and knee-protectors, with touch-sensors attached. Whenever a touch-sensor switches a motor inside the glove is activated to generate haptic stimulus.

For sound we plan to use noise-protection headphones, with little speakers inside and microphones outside. For processing the same circuitry as on the robot will be used. When a difference of sound-level is detected, a sound on the corresponding side of the stronger input, will be generated.

The structured-room

For our installation we will a very simple room of about 20-30 square meters. The interface is very simple too. As light sources lights with sharply localized spots are best suited. As sound source any loudspeaker is suitable. 4-5 light and 4-5 sound sources will be enough. They must be installed hanging.
It is important that the room is nearly dark, otherwise the light sensors won't work. For Controlling switches and dimmers outside the room fixed on a panel are sufficient.