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HRI Caught On Film

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ABSTRACT
The Human Robot Interaction 2007 conference hosted a video session, in which movies of interesting, important, illustrative, or humorous HRI research moments are shown. This paper summarizes the abstracts of the presented videos. Robots and humans do not always behave as expected and the results can be entertaining and even enlightening - therefore instances of failures have also been considered in the video session. Besides the importance of the lessons learned and the novelty of the situation, the videos have also an entertaining value.

Categories and Subject Descriptors
H.5.0 [**Information Interfaces And Presentation**]: General

General Terms
Documentation, Human Factors

Keywords
Human, Robot, Interaction, Film

1. INTRODUCTION
In the following paragraphs summarize the abstracts of the films presented in the video session of the HRI2007. The contributions are sorted in alphabetical order of the movie titles.

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AIBO Attacked By A Belgium Shepard
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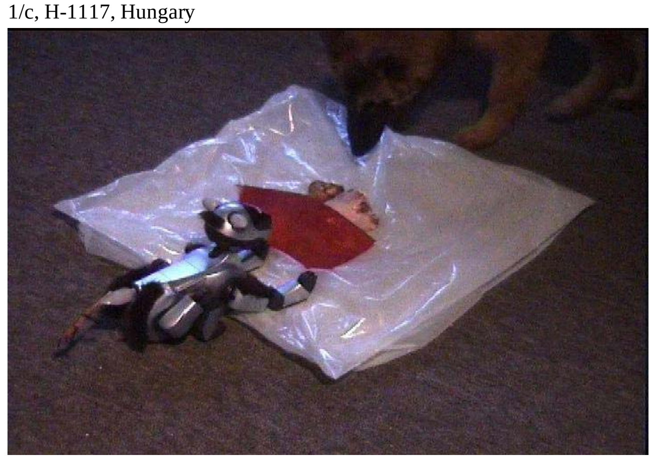

This video is part of a series of exploratory studies on animal robot interactions in collaboration with the ethnology group of the University of Eötvös University (Hungary). The purpose of these experiments is to investigate, from an ethological point of view, how much dogs see AIBO as a conspecific. The questions addressed are: what is the influence on the dog's reactions of movement, smell, presence or absence of eyes, sounds, etc. (more information on : http://www.fkaplan.com) *(Duration: 1:15)*

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Approaching Asimov's 1st Law of Robotics

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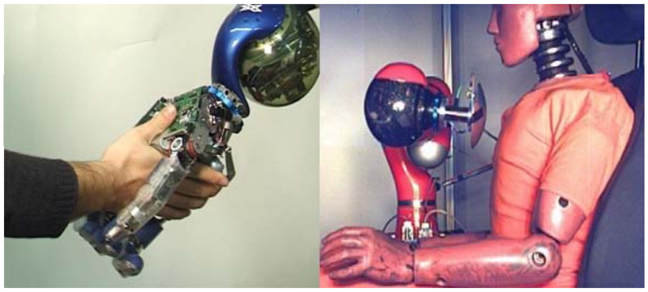

The desired coexistence of robotic systems and humans in the same physical domain, by sharing the same workspace and actually cooperating in a physical manner, poses the very fundamental problem of ensuring safety to the user and the robot. In order to quantify the potential danger emanating from the DLR lightweight-robot (LWRIII), impact tests at the Crash Test Center of the German Automobile Club ADAC were conducted and evaluated. A collision detection and reaction scheme, based on a disturbance observer is used. It utilizes only the proprioceptive capabilities of the robot and provides a filtered version of the external torque ext . This torque estimation is further used as an adaptive scaling of time increments in the trajectory generation and allows the user to push the robot intuitively forth and back along its desired trajectory. Combined, these mechanisms are used to distinguish between desired cooperation and collision in physical human-robot interaction. The outcome of the dummy crashtests indicated a very low injury risk posed by rigid impacts with the DLR LWRIII. This was confirmed by real human-robot impacts at robot velocities up to 2.5m/s. *(Duration: 2:59)*

Cats and Dogs

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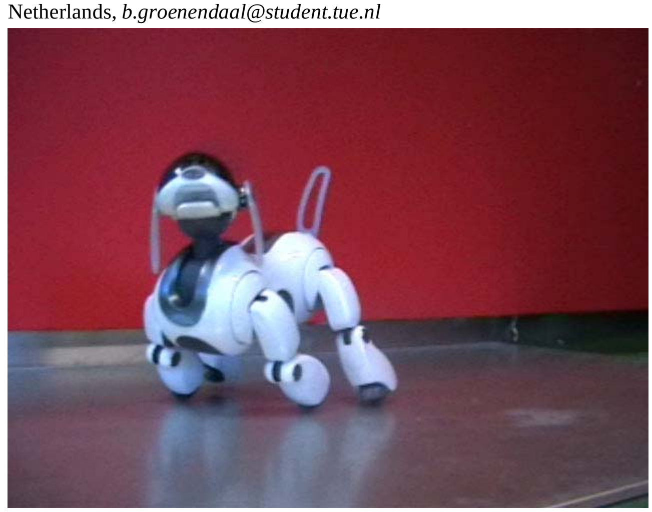

Robots will not only need to be able to provide positive feedback, but also negative. This project explored the abilities of the robotic dog Aibo and the iCat robot to express pain. For two different robots 30 different levels of pain expressions were designed and tested. The results showed that participants are able to recognize small differences in pain expressions. The movie shows several representative expressions. *(Duration: 1:39)*

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How to Break a Packbot

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Out-of-sight tele-operation has been, and will be, the initial step in many cases of robot deployment in real applications. This task is to large extent similar to driving a car or piloting RC-crafts, which both can be performed amazingly well. The difference consists of the amount of information that has to be perceived through the user interface. A crucial limitation seems to arise when the vehicle leaves line-of-sight of the operator and situational awareness has to be gained entirely through the user-interface.

This video illustrates a number of HRI-issues that arise when a Packbot is tele-operated through video feedback up a staircase, ultimately leading to a fatal crash. In order of appearance in the video, it was found that: 1. The friction in the transmission, which is normally high enough to keep the robot still when no steering commands are given, does not prevent gravity to start moving the robot in steep angles. Such unintentional movements need to be automatically prevented or clearly displayed to the operator. 2. The low placed-forward looking video camera makes it hard for the operator to regard negative obstacles and grasp the seriousness of for example heights. 3. The responses from steering commands change completely if one of the tracks looses ground contact or slips; feedback to the operator is necessary. 4. Bystanders do not know how to behave when dealing with robots. In this case the spectator does not take action to prevent the accident, as he probably would have considering a human at risk. 5. Industrial buildings have guardrails aimed for adults which might not hinder robots from falling down. *(Duration: 1:56)*

iCat as a Game Buddy for Children

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Soon personal robots will be present in the homes of many, due to advances in hardware, software and artificial intelligence. Although much work is done on technology, many open questions needs to be answered about the social impact of having a personal robot in a domestic environment. Philips Research is investigating technical and social aspects of user-interface robots and developed a prototype of an emotionally intelligent user-interface robot named iCat.

iCat is an experimentation platform for studying human-robot interaction research. Its interaction style is modeled after interaction between humans, using speech, facial expressions and intelligent behavior. iCat can help to control the Ambient Intelligent home – switching on lights, heating and other appliances. It can also help out in other duties, such as keeping track of everyone's calendars and messages.

In this video, iCat acts as a game buddy for children. A socially pleasant interaction style with emotional feedback is created through animated motion, lights, sounds and speech dialogs. Experiments were carried out to explore this enjoyable interaction between users and the robotic game buddy. The results indicate that children prefer to play games with iCat rather than to play these same games with a computer. In addition, the results show that an extravert and open personality is preferred for iCat over a more neutral personality. *(Duration: 2:56)*

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iCat in Eldercare

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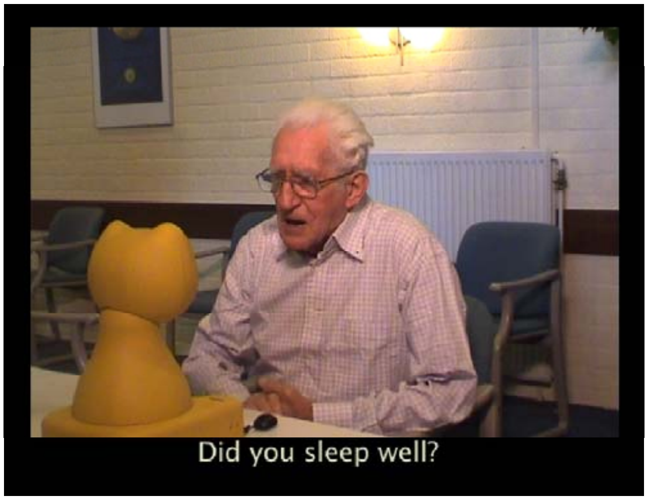

This video shows clips from experiments in which we introduced a personal robot to elderly people. We used the robot in a Wizard of Oz setting, where a hidden operator controls the robot. The participants received simple tasks and we anticipated the dialogues by developing scenario's. The video shows that, although our instructions were strict, simple and clear, the participants often had a conversation with the robot that was not only beyond the given tasks but also far beyond the presented possible functionalities of the robot. This was either because the they found it difficult to understand the limitations of the iCat's possibilities or because (perhaps due to the excitement about being observed in an experiment) they felt like making a joke to make the researchers laugh or the robot confused. *(Duration: 2:06)*

Incremental Learning of Gestures by Imitation in a Humanoid Robot

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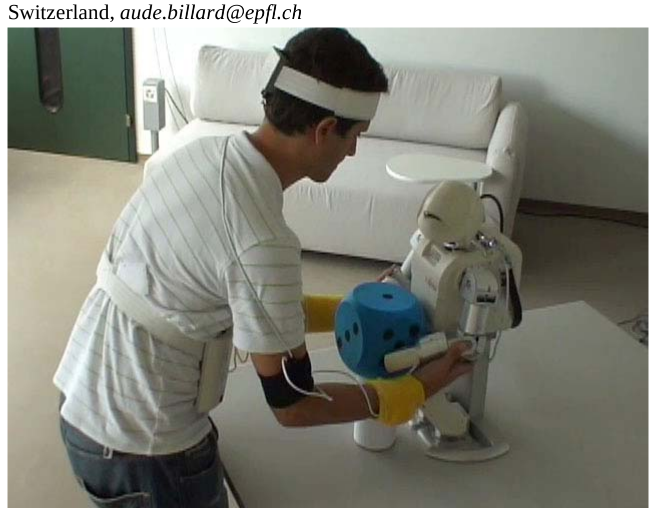

This video shows how a humanoid robot can learn incrementally new skills by interacting with a human instructor. By using active teaching methods that puts the human teacher "in the loop" of the robot's learning, this video shows that a skill can be efficiently transferred by interacting socially with the robot. In a first phase, the robot observes the user demonstrating how to lift a foam dice while wearing motion sensors. The motion of his/her two arms and head are recorded by the robot and encoded probabilistically in a Gaussian Mixture Model. The robot then tries to reproduce the skill while the user observes the imitation attempt. Due to the different embodiment between the robot and the user, the robot first fails at reproducing correctly the task. In a second phase, the user helps the robot refine its skill by kinesthetic teaching, i.e. by grabbing and moving its arms throughout the task to provide the appropriate scaffolds. The model of the skill is then updated by an incremental Expectation-Maximization learning algorithm. After three demonstrations, the robot finally reproduces perfectly the skill on its own. *(Duration: 3:41)*

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Longitudinal HRI Trials Video Clips

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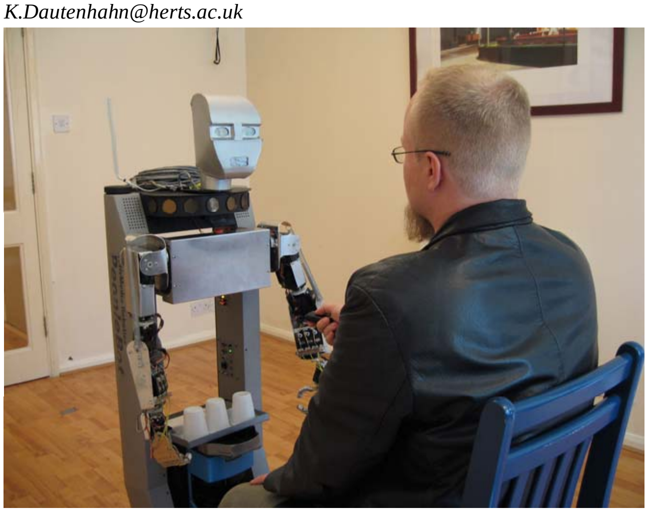

This video shows clips from Human-Robot Interaction (HRI) trials run at the University of Hertfordshire as part of their work for the COGNIRON Project (www.cogniron.org). The aims of these HRI trials were to investigate issues of human-robot social spaces, robot behaviour, robot appearance and robot intention and how the humans' views and perceptions of the robot changed over a period of 5 weeks in the University of Hertfordshire Robot House. Participants were exposed to two HRI sessions each week which included various experimental conditions including a range of possible domestic scenarios. The video illustrates some of the methods used to gain data from the trials and also shows details of the main pre and post longitudinal HRI trial procedure. (Duration: 2:36)

Look and Listen

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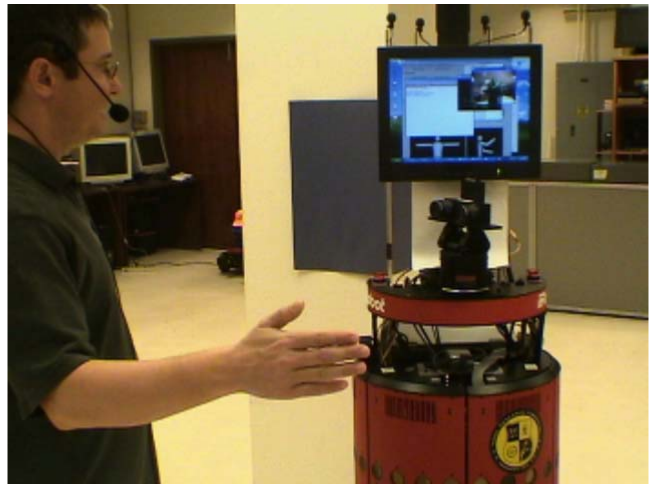

In this video, we demonstrate the integration of speech recognition, speaker localization, 3-D hand and face tracking, and gesture recognition. Upon hearing the command “Face me,” the robot initializes visual tracking of the speaker by means of sound localization. The robot rotates to face the speaker and initializes active tracking with the pan/tilt stereo tracking system. Deictic gestures are then used to direct the tracking to accept gestures from an alternate speaker. To direct the camera system, users point with their right hand and state “Look over there.” The users direct the camera to track one another several times to demonstrate the combination of deictic gestures and voice commands. Lastly, iconic gesture recognition is shown for dynamic gestures. Gestures representing “Go,” “Hello,” “Any,” “Report,” and “Halt” are demonstrated. All interaction in this video is performed in real time. Tracking and gesture recognition are performed at approximately 15 frames per second. Speech recognition is performed continuously and speaker localization occurs upon the utterance of key phrases. *(Duration: 2:16)*

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Pearl, The Nursebot Robot, Gives A Health Interview

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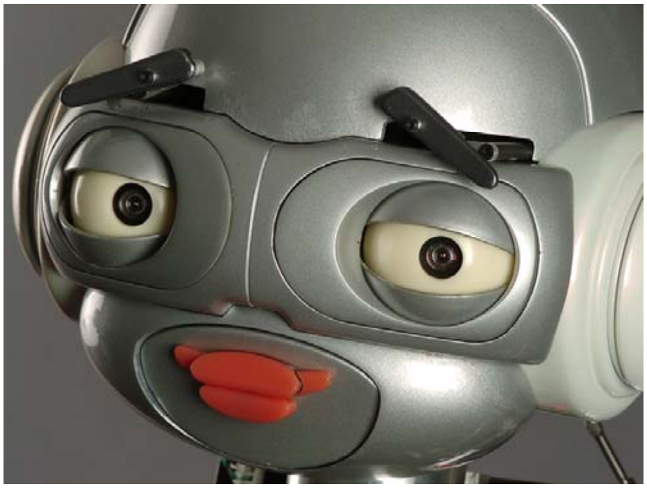

In the People and Robots lab, during an experiment (see "Comparing a Computer Agent with a Humanoid Robot"), Pearl was asking the participant about his health, exercise habits, eating habits, and so forth. Suddenly, a servo in Pearl's head broke and Pearl started smoking. The participant, instead of finding the experimenter to report this fire hazard, typed a message to Pearl, "Your head is smoking." Pearl cocked her head and went on with the interview. *(Duration: 0:41)*

Robot Cues and Appearances Video Trials

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This video shows clips from Human-Robot Interaction (HRI) trials run at the University of Hertfordshire as part of their work for the COGNIRON Project (www.cogniron.org). The aims of these HRI trials were to investigate issues of human perception and preferences of robot appearance and behaviour. The video is actually edited from that used to perform a video-based HRI trial which investigated how humans perceived robots. The video was recorded in the University of Hertfordshire Robot House. The main hypothesis under investigation was that robot appearance should be perceived by humans as consistent with its behaviour and capabilities. Although the main findings were not conclusive, they did show some evidence that supported the main hypothesis and suggested a methodology to relate the relative contribution of each aspect of robot appearance and behaviour with regard to the overall impression of a robot's appearance and associated behaviour. *(Duration: 3:0)*

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Taking Control of UAVs: Concepts for the Future

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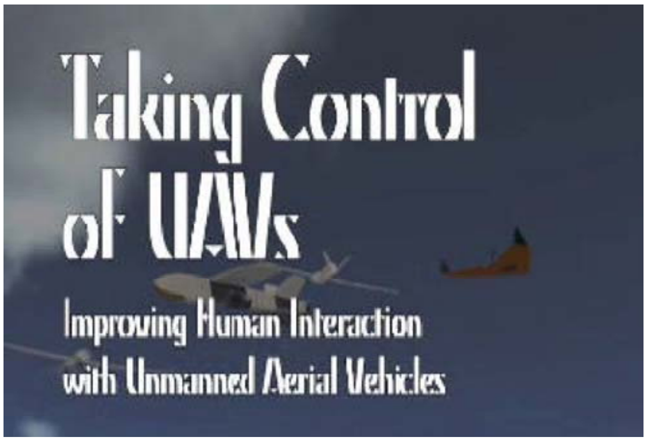

This video shows a hypothetical scenario that illustrates some of our UAV interaction design work. The work was done to address an urgent need to support efficient and flexible UAV operations. UAV operations are currently manpower intensive and confined to a single location. Moreover, they are often non-intuitive and plagued by "mishaps." Our research aims to determine ways to provide better situation awareness (SA) of both UAV team members' activities and the environment and identify opportunities for generalizing our understanding of improved SA to other command and control domains. We have been working to provide guidance for how UAV teams could be distributed, and developed and evaluated interaction designs that support small teams operating multiple UAVs simultaneously. Our technical approach combines observation, interviews, analysis, prototyping, and experimental techniques. We have studied both live and simulated UAV operations with both large and small UAV platforms. Our analysis results informed new interaction designs that were validated via experimentation. Partners in this work have been Holly Yanco of UMass Lowell, Michael Goodrich of Brigham Young, and Missy Cummings of MIT. *(Duration: 2:45)*

Waiter Application

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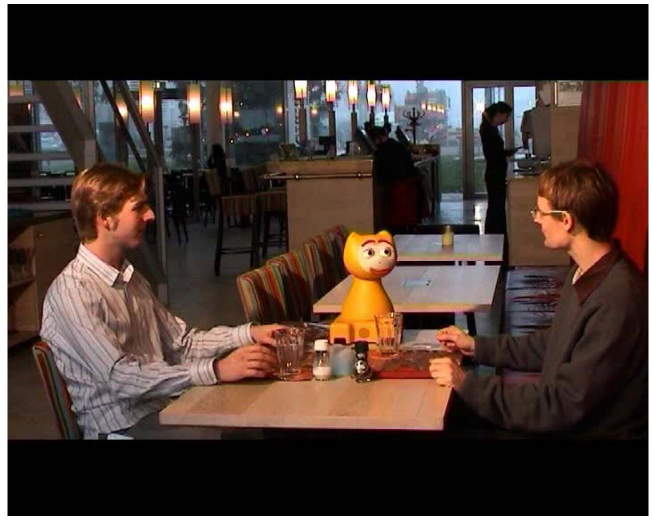

Robotic technology provides means for future user interfaces. It enables creating artificial characters that are able to give social cues and therefore can be utilized for a natural and intuitive interface. In our video prototype we demonstrate that by blending chatterbot techniques with parameterized matching animations a social communication channel can be maintained. We used the Philips Research Platform iCat and applied it in a restaurant scenario serving as a waiter. First she welcomes the customers and attracts them to her table. Then iCat takes their orders and entertains them while waiting by telling jokes and engaging chitchat. Furthermore she suggests drinks when glasses are empty or announces incoming dishes. Throughout the whole conversation iCat uses animated facial expressions to convey emotional messages. Emotional answers are as crucial as verbal ones in order to achieve the illusion of being a believable character. The application of iCat in a restaurant provides a real world testing environment along with a controlled setting. The short interaction time helps to maintain the social line and remain exciting enough to make people come back with other friends. The relevance of this application derives from the benefit of the restaurant to save time for the personal and from the convenience for the customer of getting immediate attention. *(Duration: 2:59)*