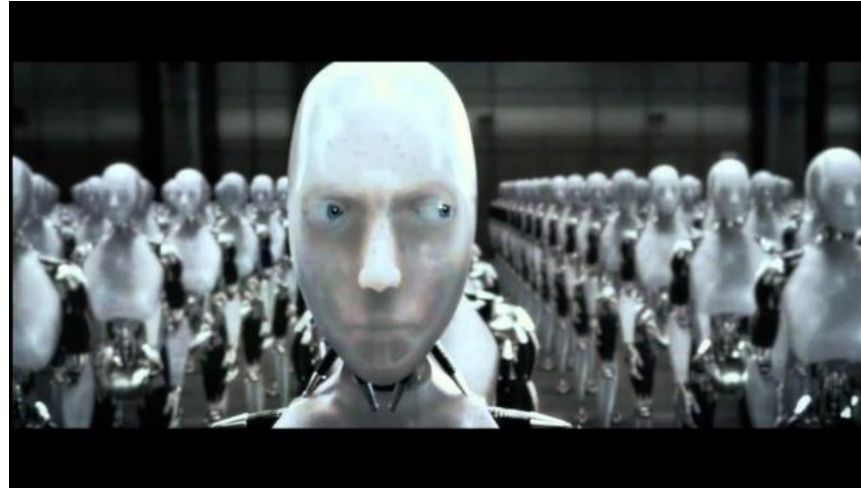


Towards Autonomous Cloud Based Robot Teleoperation with Learning Ability



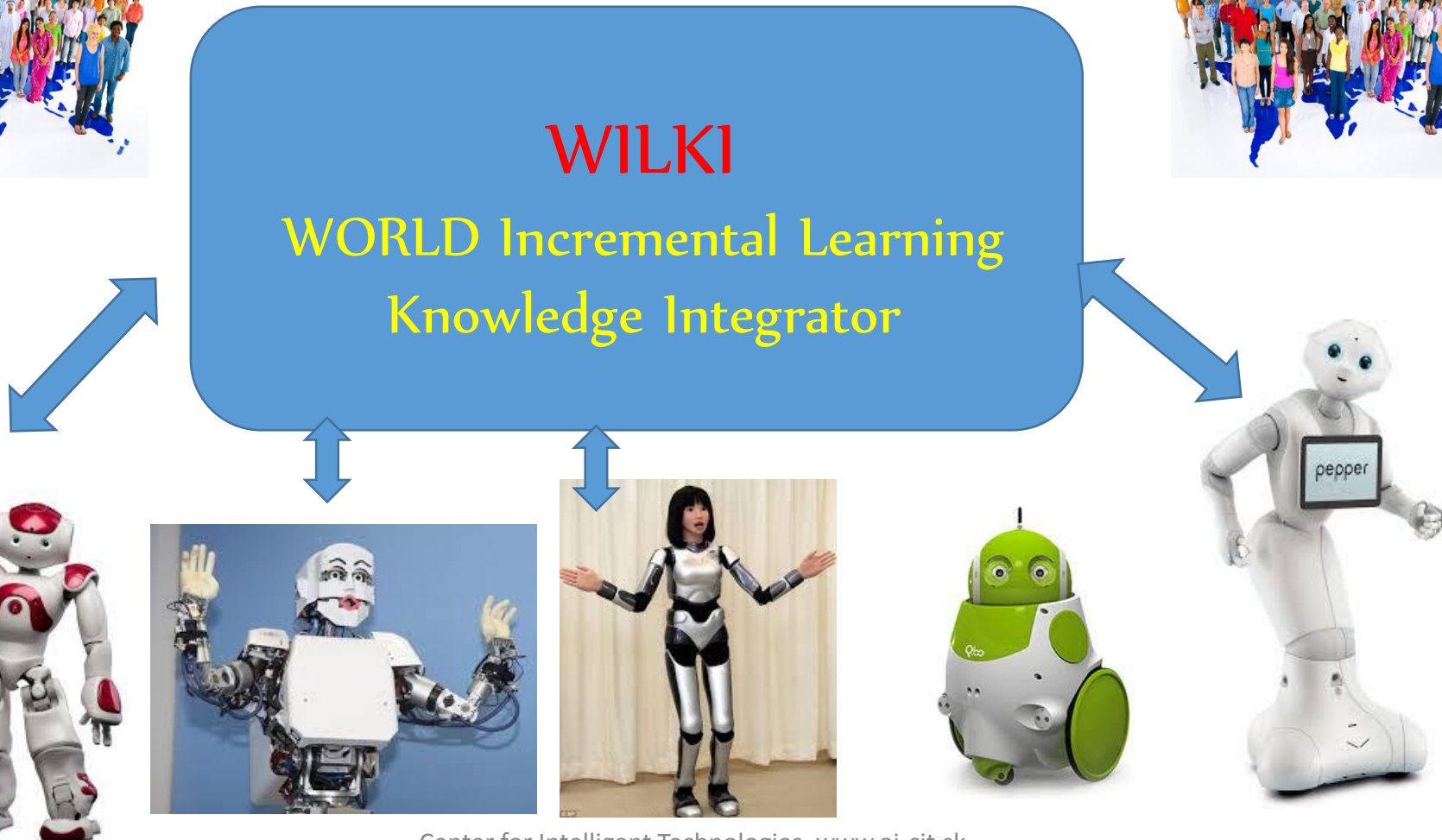
(Cloud Based Wizard of OZ for Human Robot
Interaction)

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Can we develop collective Intelligence for Robots ??



Collective Intelligence Facebook BIG DATA



Human-Robot Interaction



Social Environment



Industrial Environment

Human-Computer Interaction



Are Robot Synthetic Emotions
important in Human-Computer interaction ?

Definition of Identity of the ROBOT ????



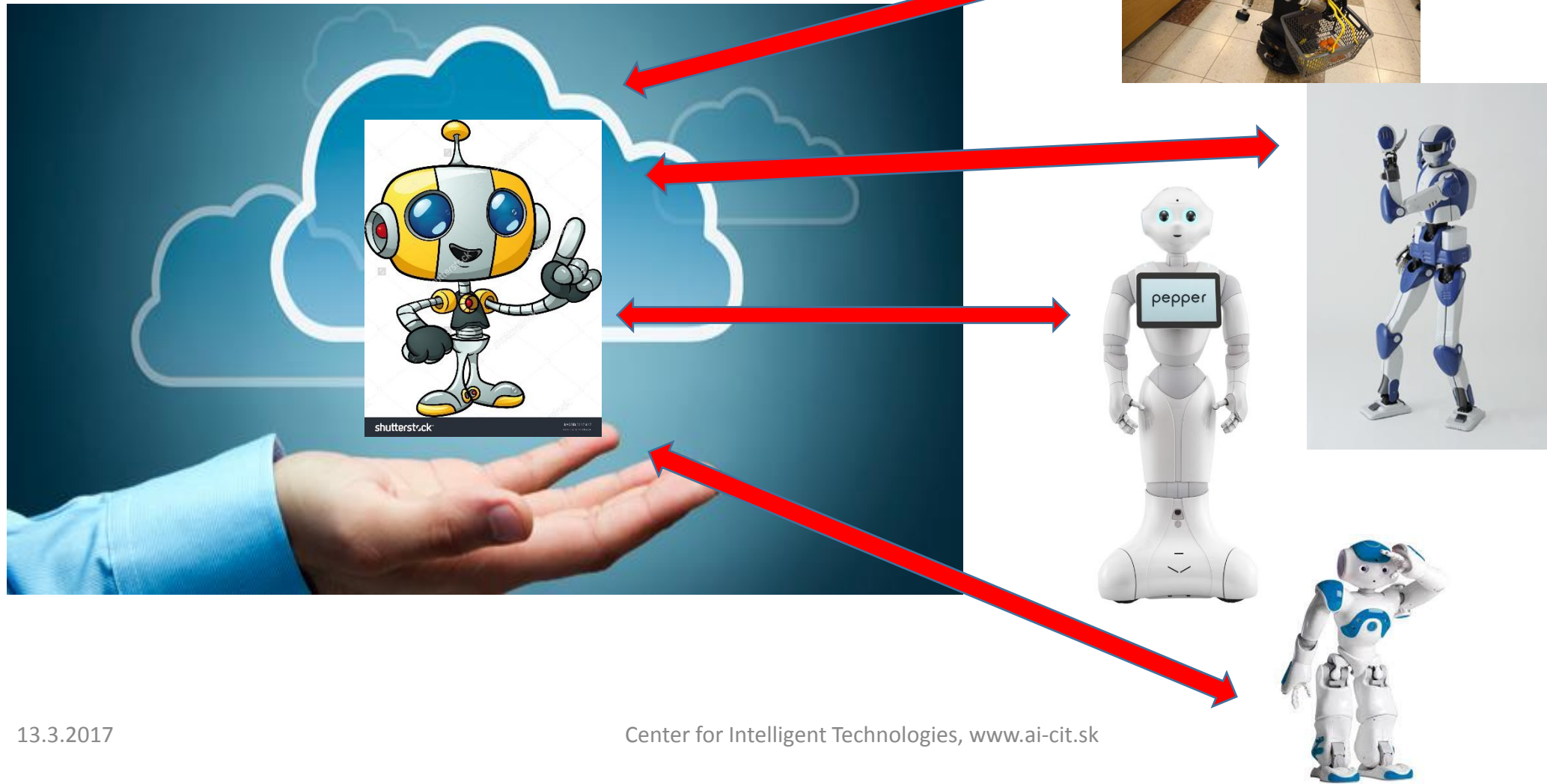
Classical Robot Concept

This is a Robot !!!!



Virtual Robot Concept ???

This is a Robot



Ubiquitous Robot Concept URC???

ubiquitous "turning up everywhere," 1837, from ubiquity + -ous. The earlier word was ubiquitary (1580s), from Mod.L. ubiquitarius, from ubique.

Synonym - **Omni present**
Virtual or Real Robot



Feature to network with VR or CR any sensor, any information from Internet , Any of Human

Wizard of Oz (Kelley, 1984)
subjects interact with a
system that subjects believe
to be autonomous, but
which is actually being
operated or partially
operated by an
unseen human

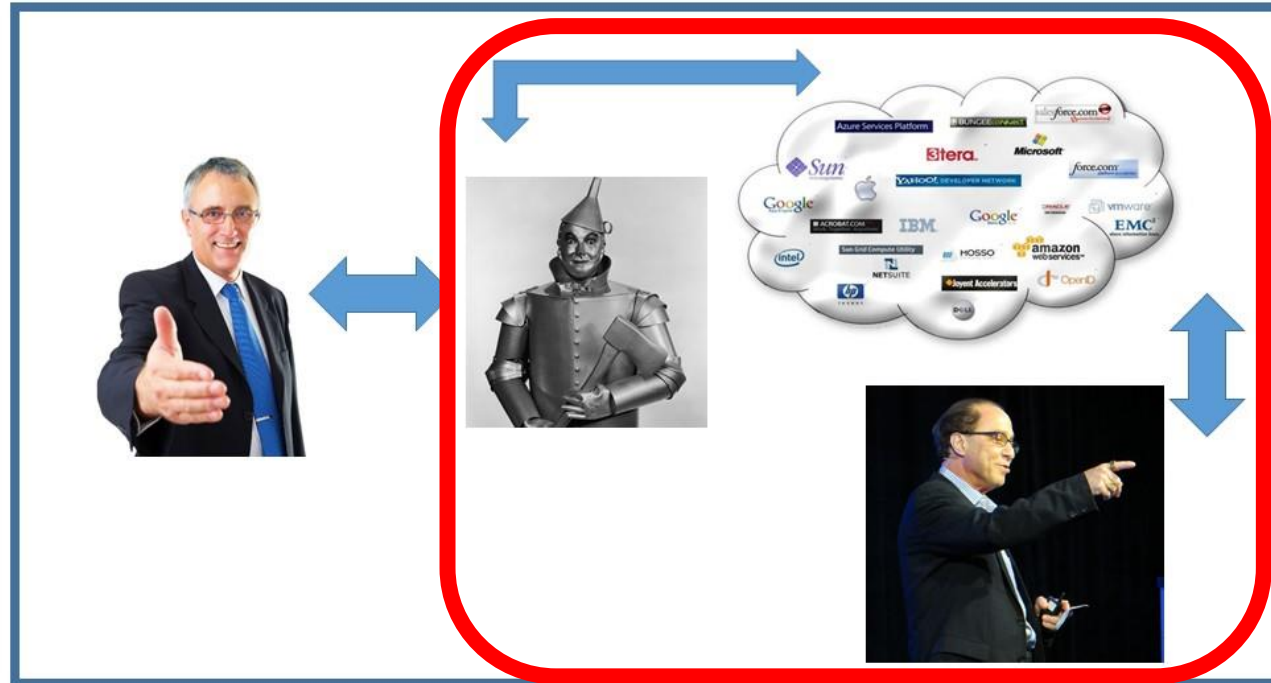
autonomous robots
but preprogrammed, limited set
of behaviors,
in long-term interaction -> boring
not able of personalization

**How people want
social robots to
behave?**

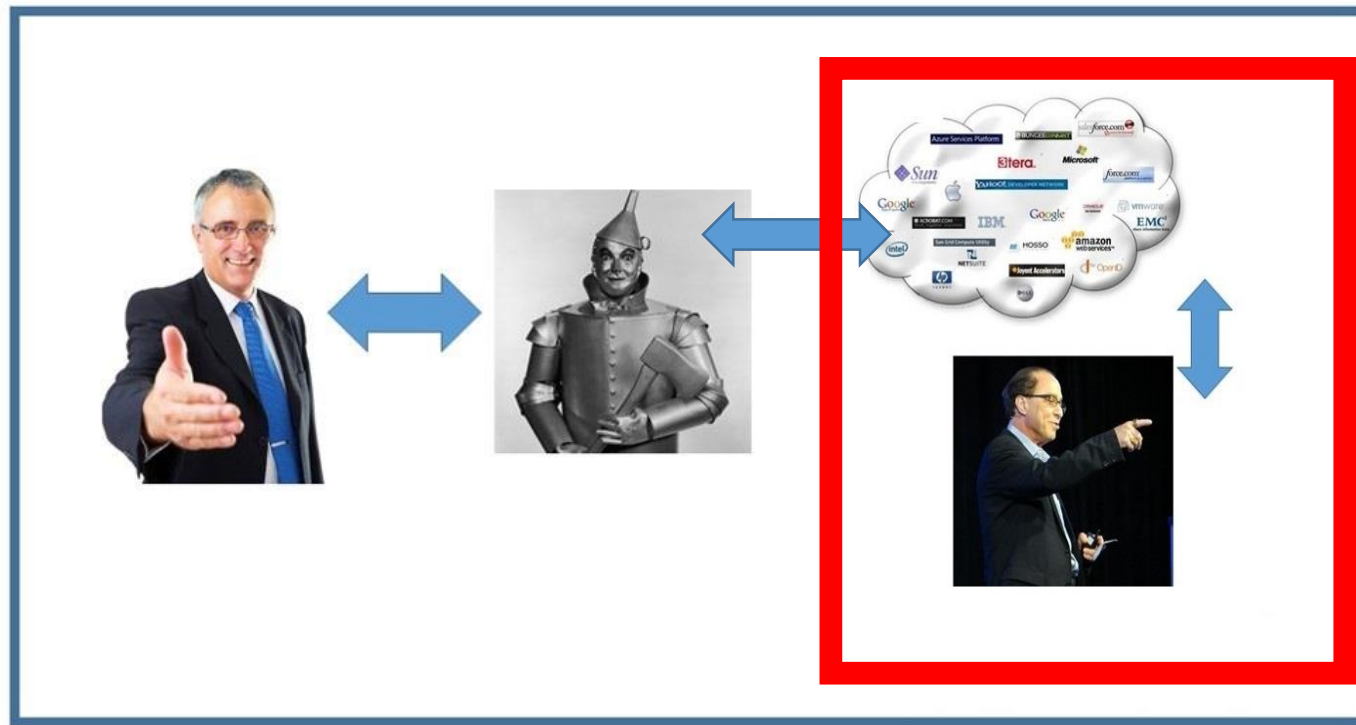
a large personality difference
in people's expectations &
preferences



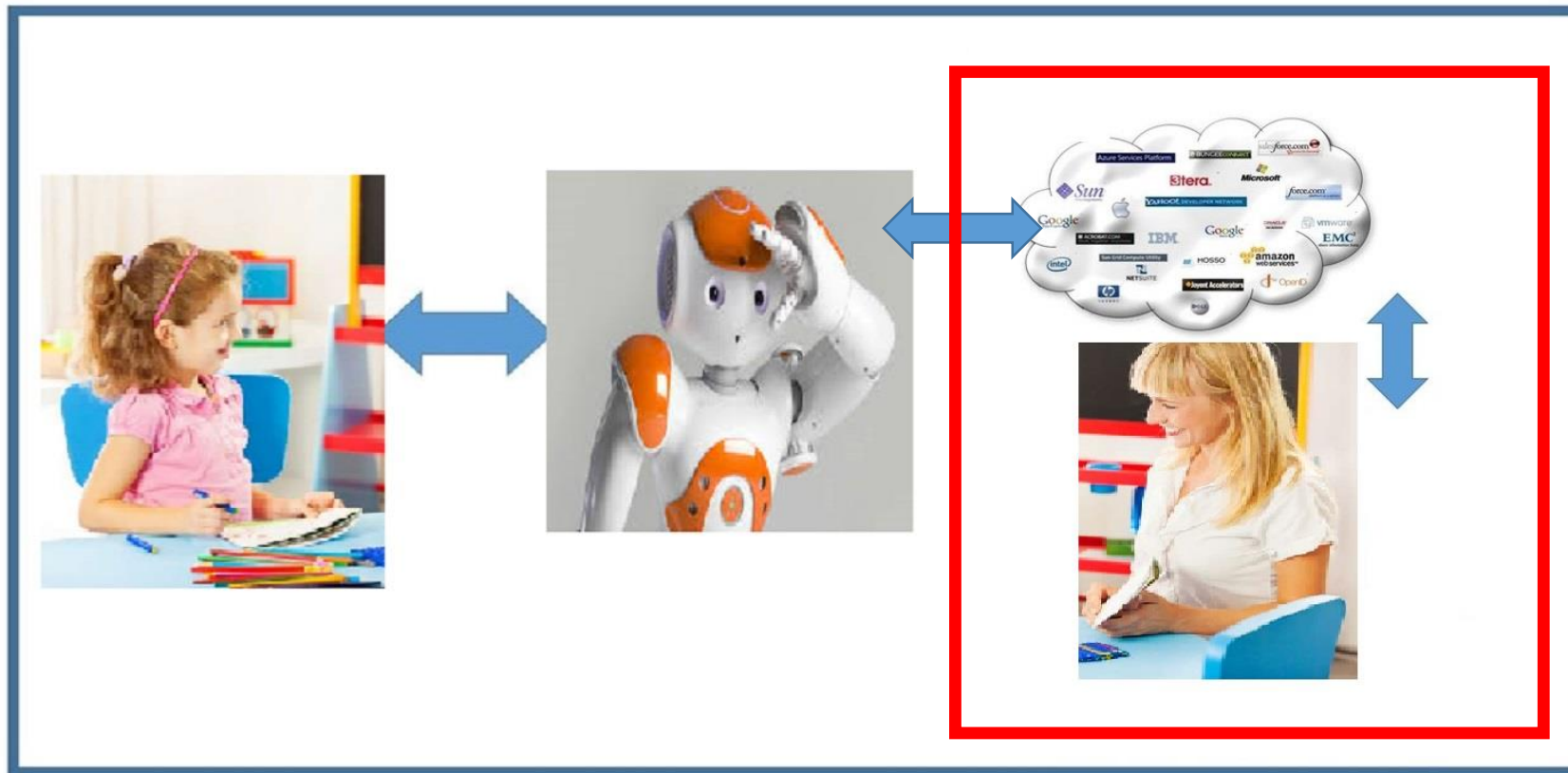
Wizard of Oz



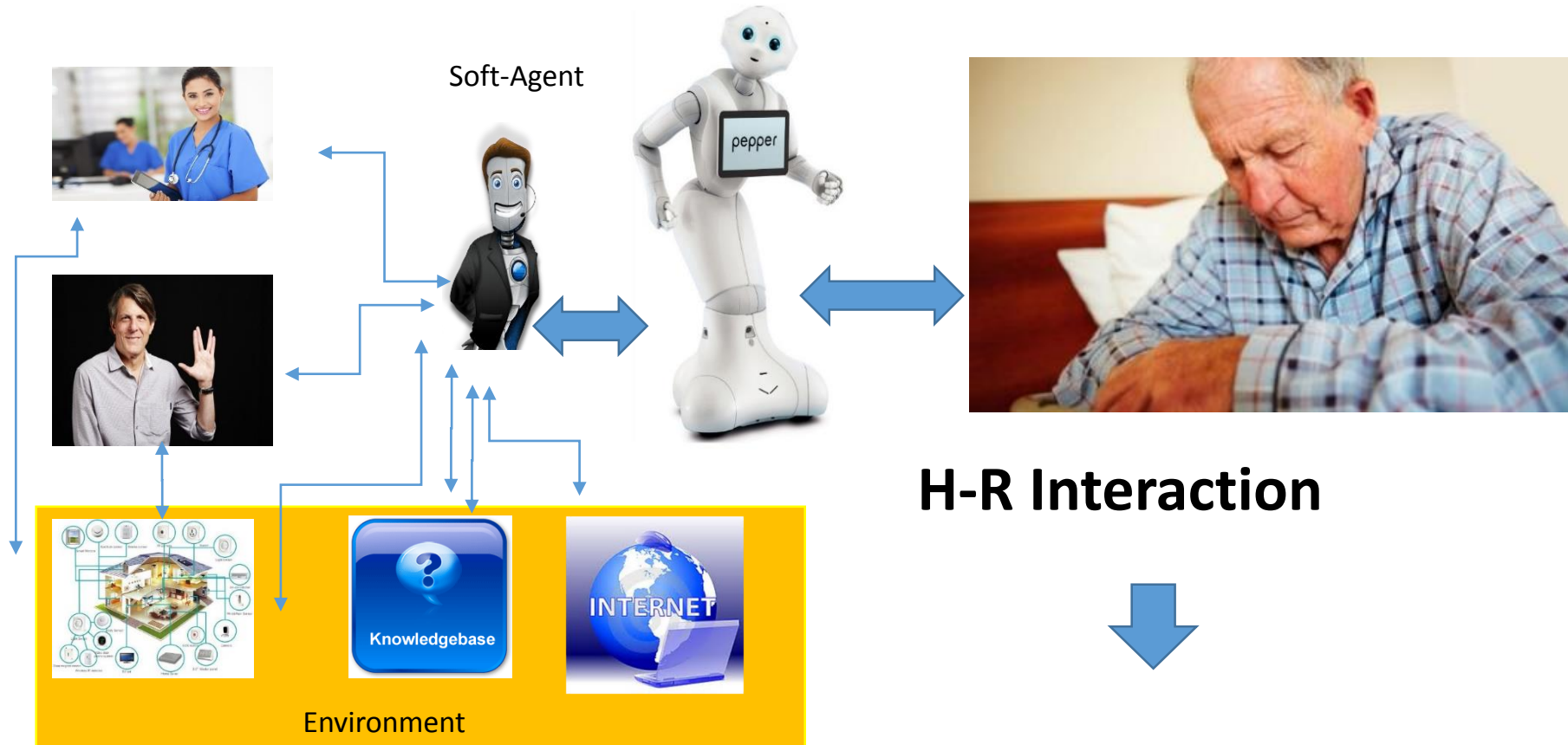
Wizard of Oz Teleoperation in Human-Robot Interaction



Application of WoOz ... Social Robotics



Human-Robot Interaction – new paradigm - What is Wizard of Oz ?

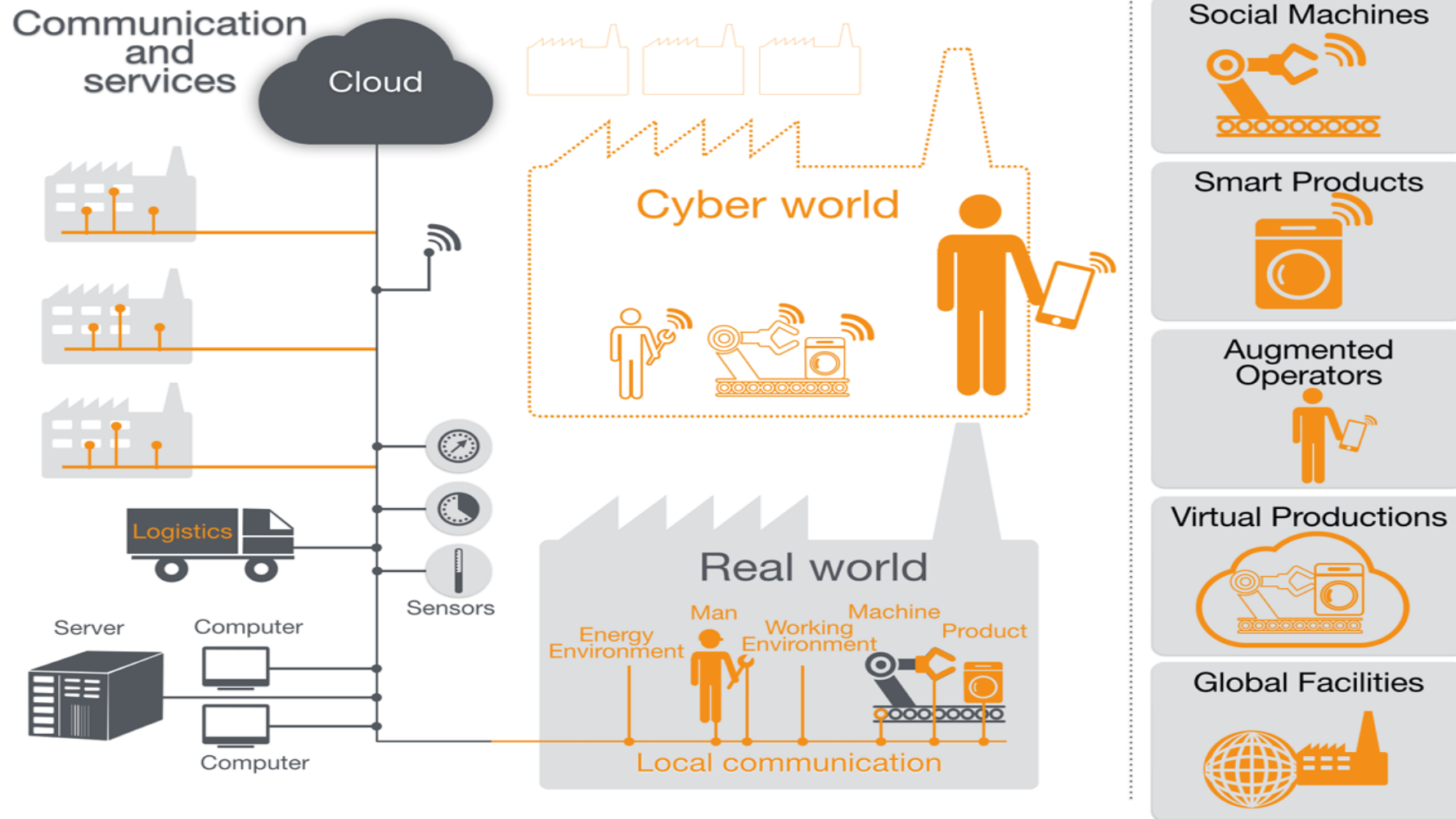


Human Emotional models from psychological domain

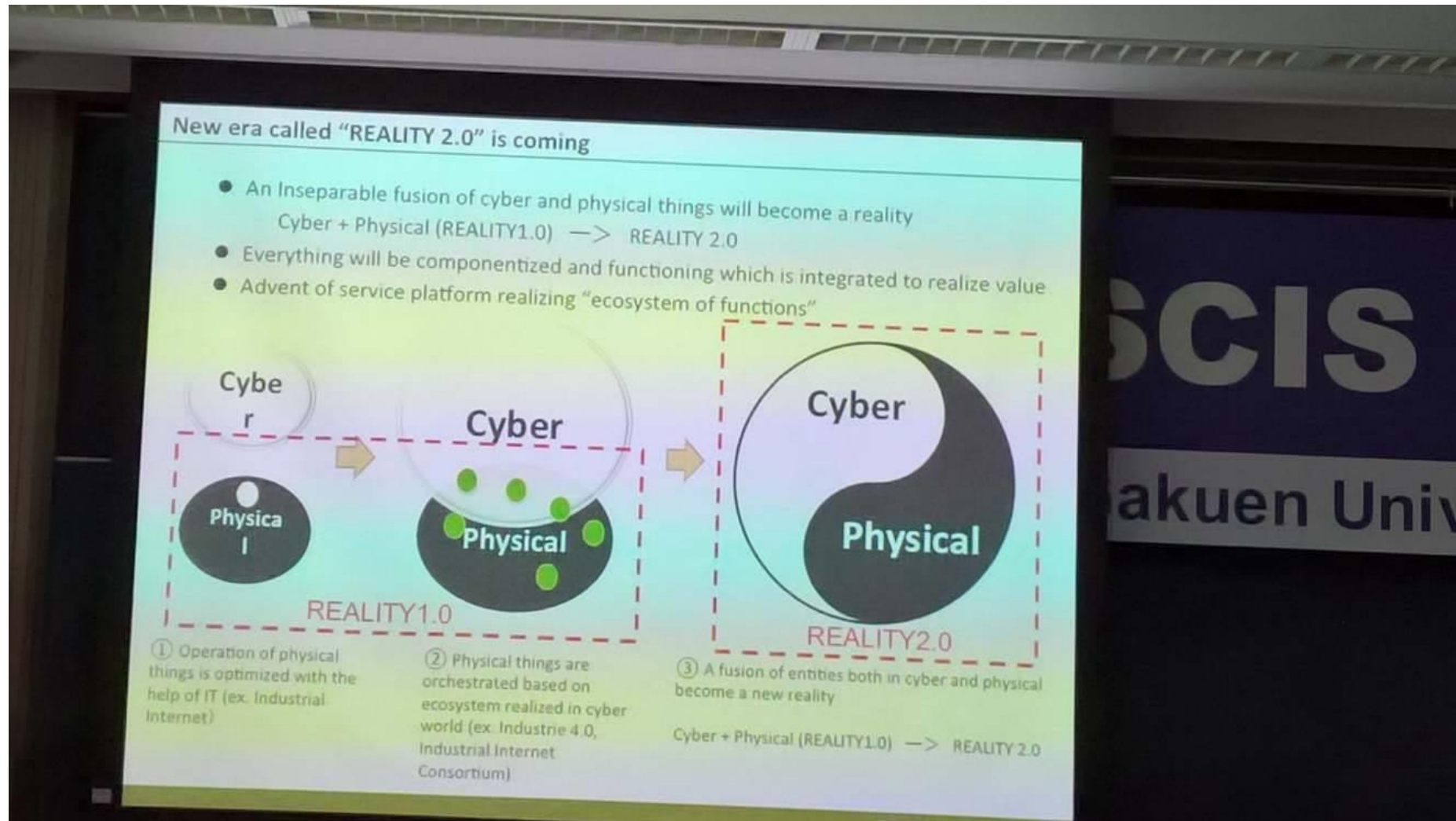
Number of psychological models :

1. Ekman Emotional Model (1973)
2. Izard Emotional Model (1977)
3. Plutchik Emotional Model (1980)
4. PAD Emotional Model (Pleasure, Arousal, Dominance) designed by Mehrabian (1980,95,97)
5. others / Model less Emotional models (common sense emotional models)

Industry 4.0 – impact to factories of future



In Japan - Dr. Iwano from JST



Can Be this concept used in Social Robotics ????



Cloud Robotics



- Cloud Computing – around 1950 – mainframes – thin clients

John McCarthy - in the 1960s that "computation may someday be organized as a public utility."



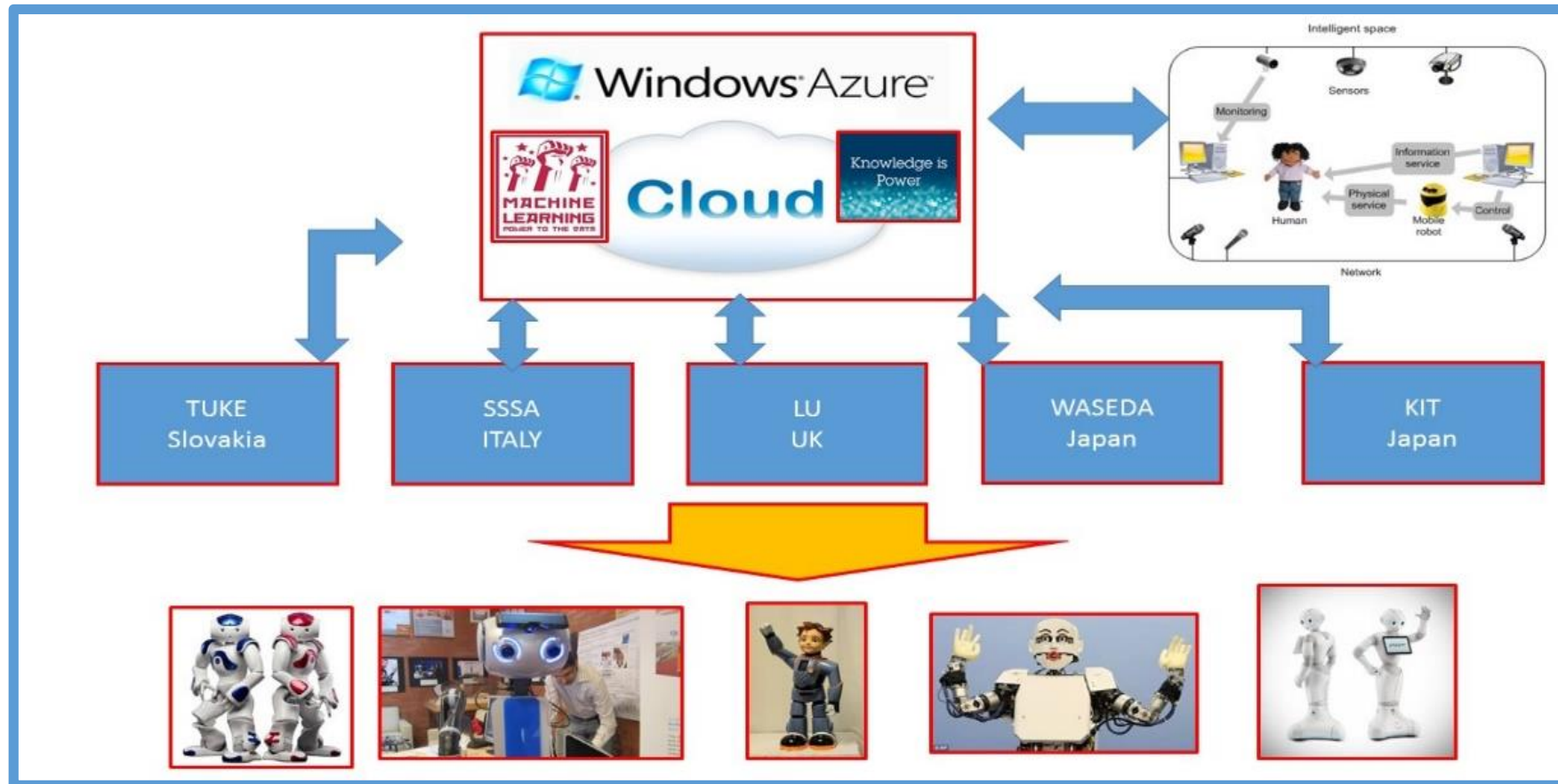
- Cloud Robotics – James Kuffner from CMU
(What if robots and automation systems were not limited by onboard computation, memory, or programming? This is now possible with wireless networking and rapidly expanding Internet resources.)



Cloud Based Wizard of Oz



Microsoft Azure Machine Learning Grant for AAL – 2016



Our priority :
**Cloud Based Emotional Affective
Loop as a behavior model concept
of interaction (sensing + action)**

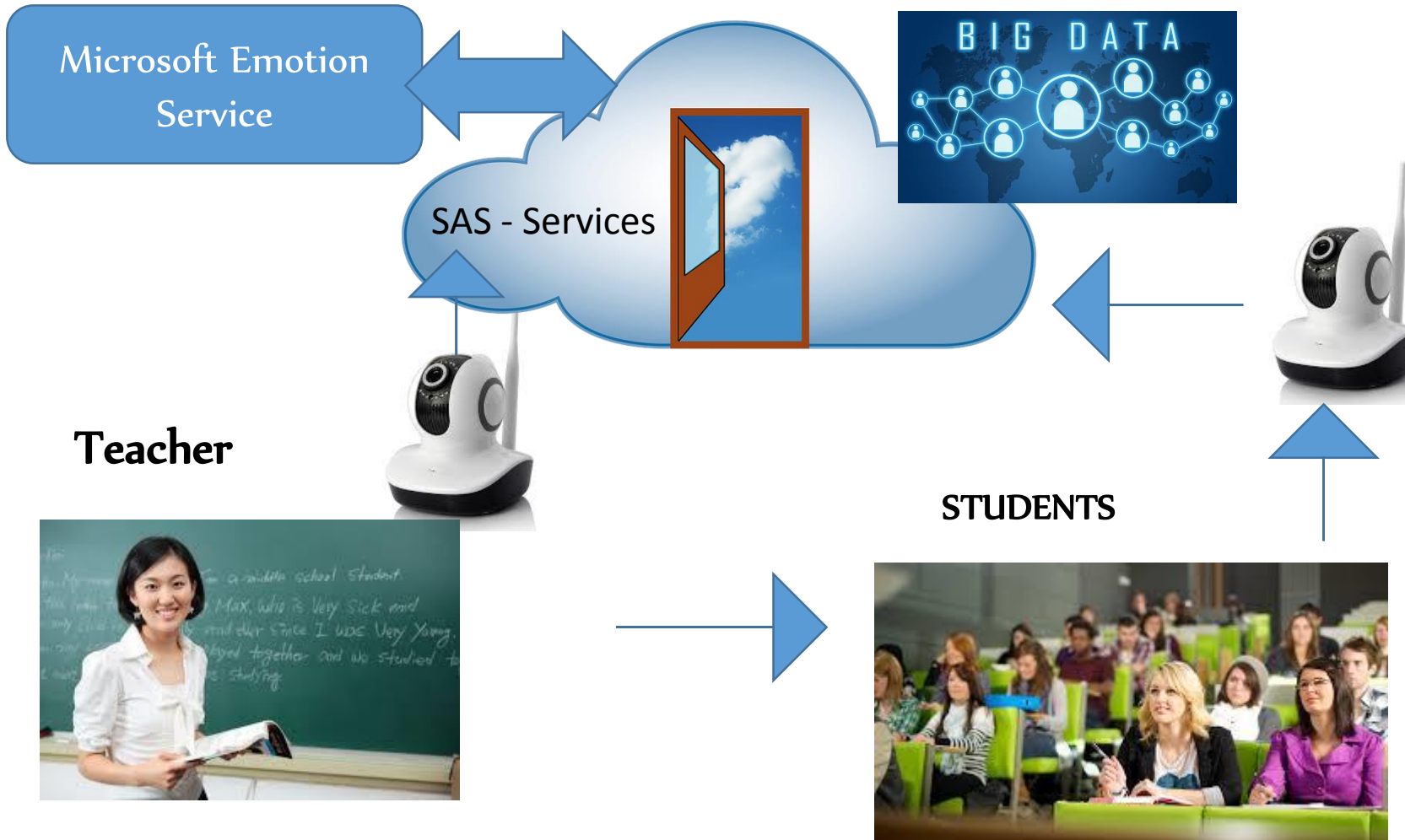
A) How to estimate an emotional state of the human for ANY purposes **(sensing)**

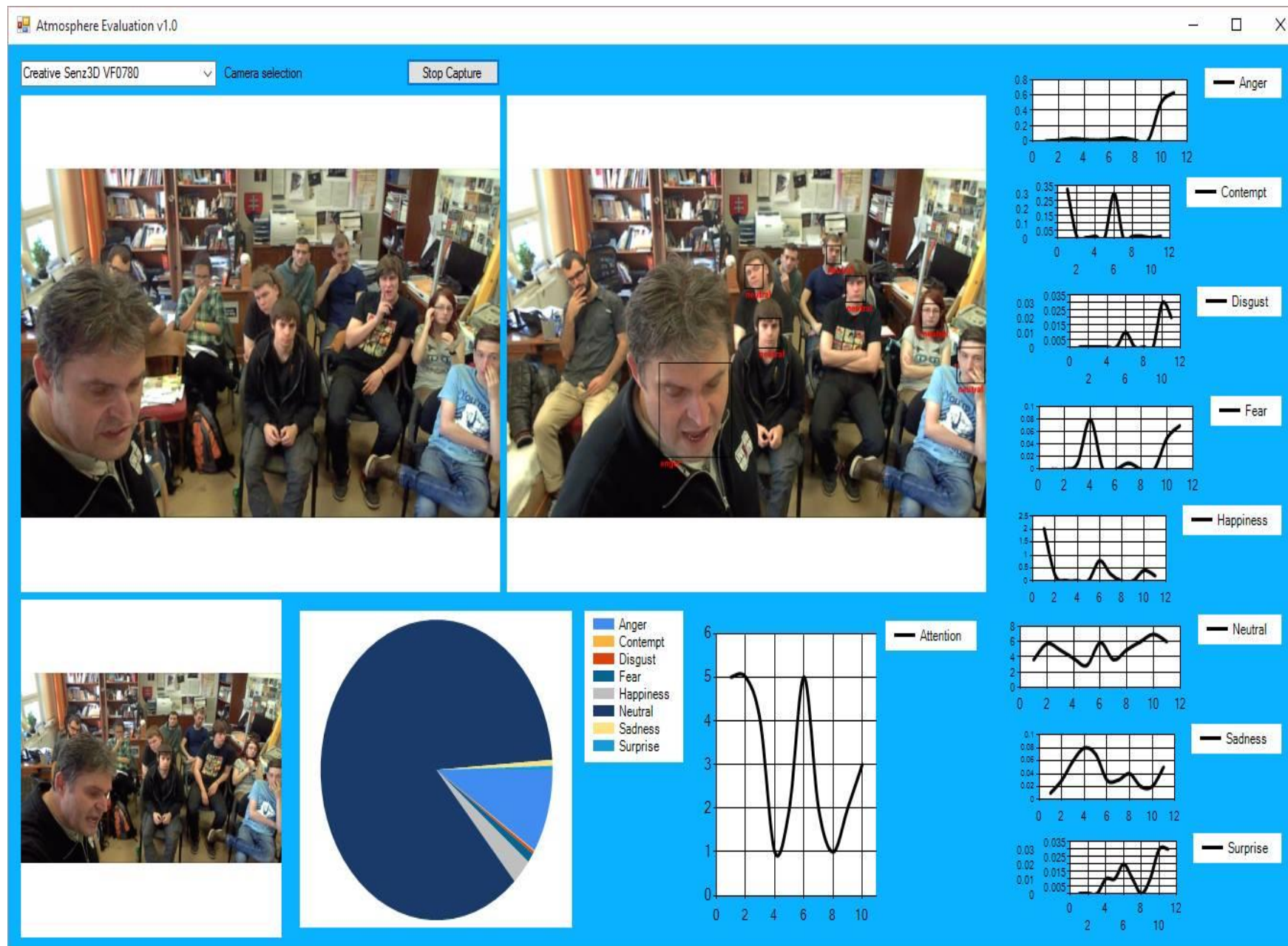
B) Teleoperation with Learning **(action)** – Wizard of Oz with learning – towards non-human wizard ...

Sensing



Improve Teaching analyze students response



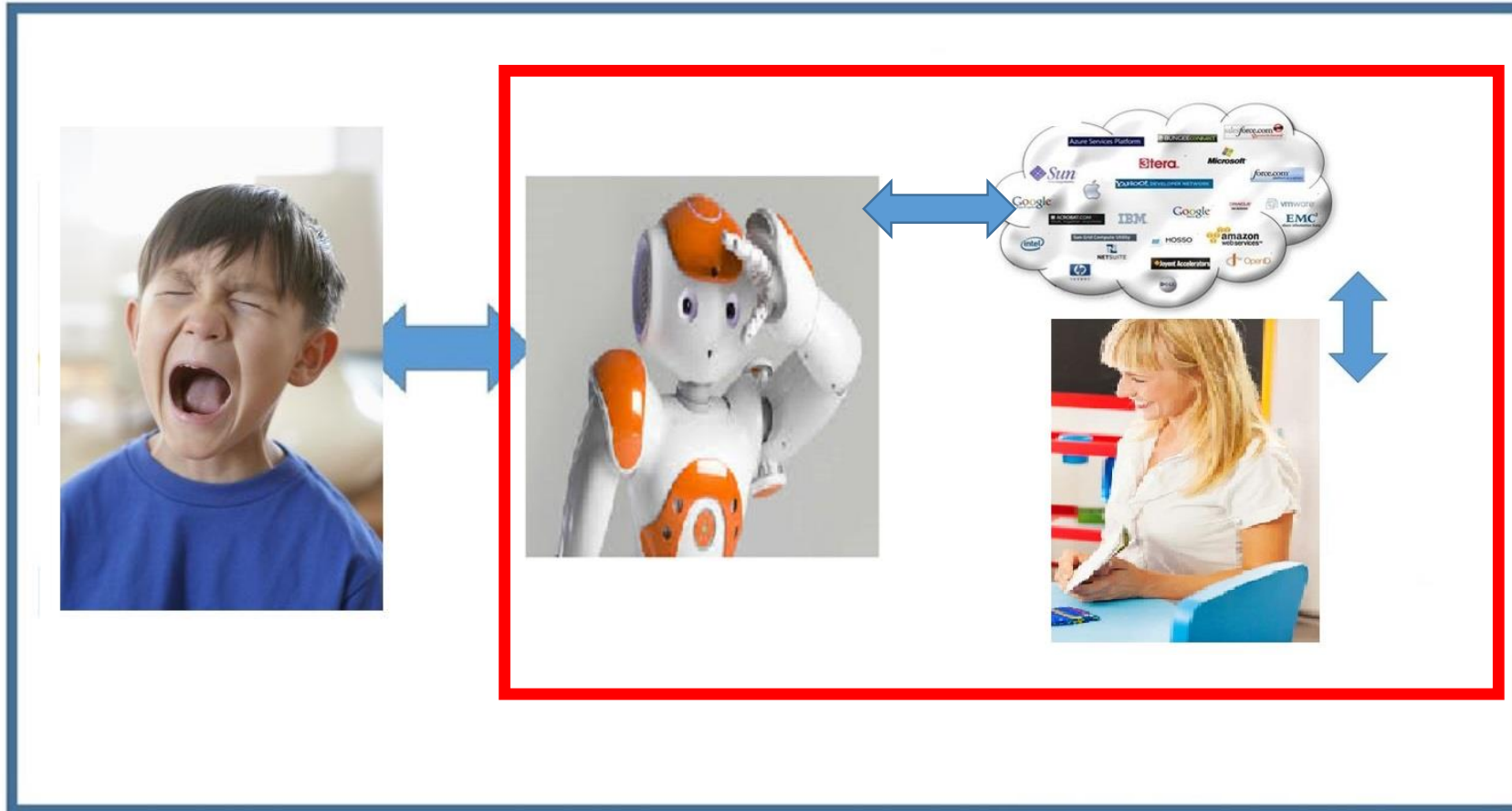


Action in Interaction



Application of WoOz ...

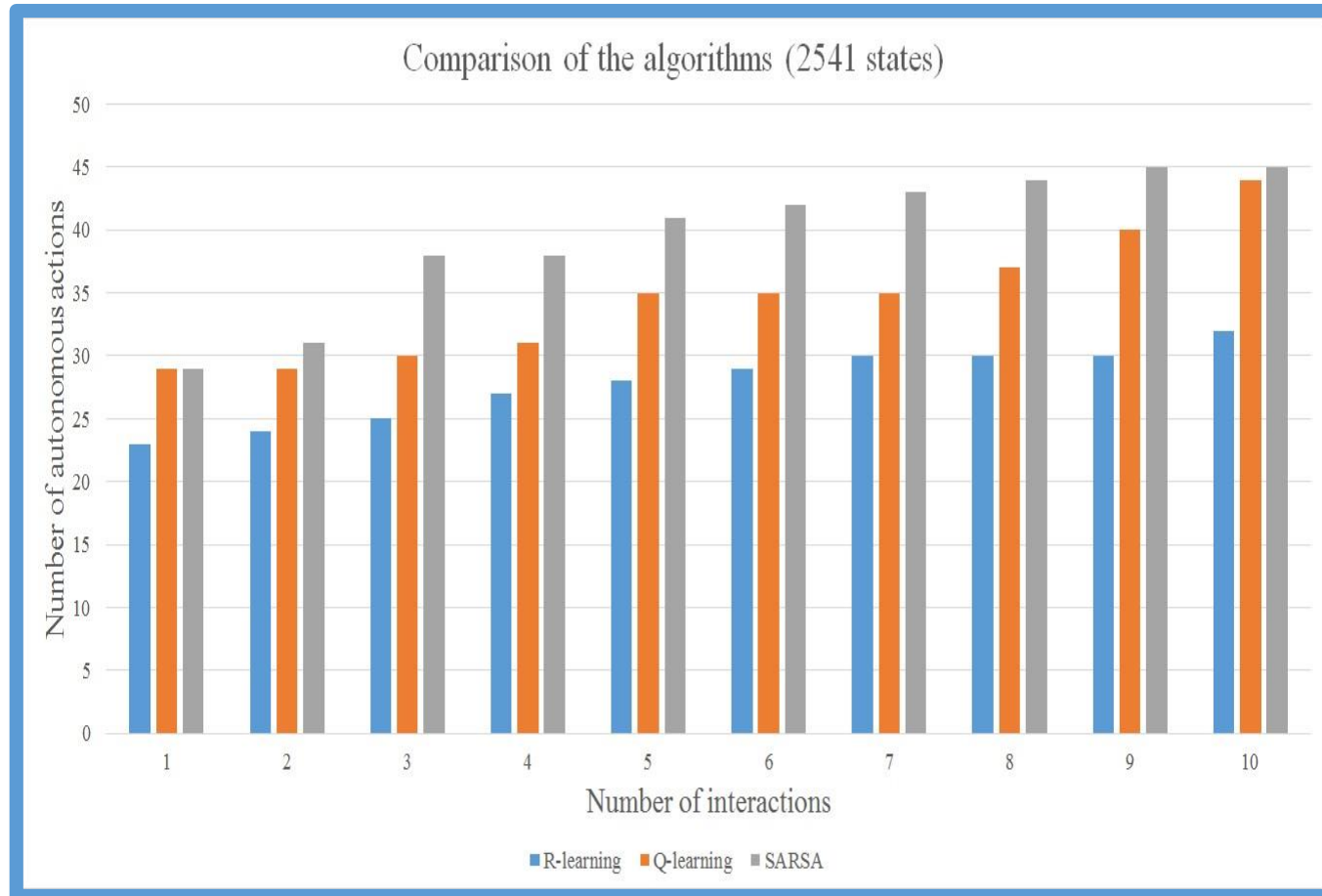
Social Robotics – autistic kid (based on simulation data)



Learning social behavior from the Wizard

- In HRI experiments the robots are teleoperated by an expert (Wizard of Oz technique)
- How to prepare robots for long-term HRI?
- How to learn a personalized social behavior during the interaction?
- Socially guided machine learning – human in the loop (A. Thomaz)
- Learning from the Wizard

Preliminary results – interactive reinforcement learning



Almost Autonomous Wizard

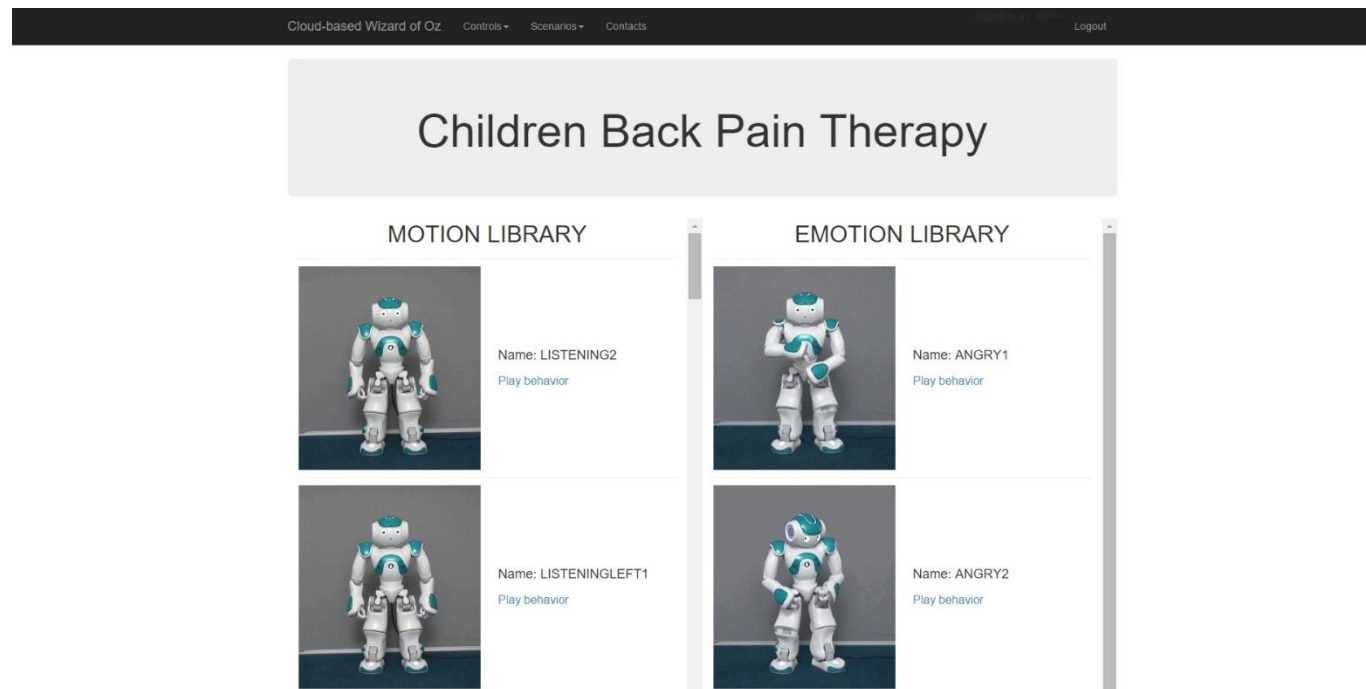
Only

**5 involments of Wizard (50-45)
45 autonomous actions**

Preliminary results – cloud-based teleoperation interface

- Developed on top of Microsoft's Azure cloud platform
- Currently supports NAO (Aldebaran Robotics), Q.bo (Thecorpora) and Milo R-25 (Hanson Robotics)
- Database of behaviors for each robot
- Animated gifs for every behavior
- User's can add their own behaviors
- User's can create their own scenarios

Cloud-based teleoperation User interface



Conclusion

Cloud Based Affective loop with Cloud Based sensing and Cloud Based Wizard of Oz is a way to Autonomous Human Robot Interaction

Commercial Applications with Emotions are expected including emotional sensing of humans and also syntetic Emotions of Robots Towards Humans

Future - undergoing work

**Integration of
Cloud based Emotion recognition
&**

**Wizard of Oz with learning
Into integrated**

Cloud Based system for Social Robotics for Public Use

Conclusion

We see enormous potential in Cloud Based Robotics and we focus on Cloud Based Robotics and building AI for Social Robots using Cloud Infrastructure for HUMANS

Our Global Challenge

Our Dream

Evolving Learnable Distributed Framework

(Ecosystem of Cloud Services)

for Interactive Companion Robotic Systems

Thank you for your time ...

We would be excited to collaborate,
to Exchange research experience , networking
meetings, Innovation Seminars ...

Create a Network of International seminars using
tele-conferencing

We are open for video-connections and Remote
lecturing and discussions

