https://www.youtube.com/watch?v=_IaZ5kgv8GU

Zápočtovka - 5 otázok

Conclusion part #1

Artificial Intelligence

The only solution for Intelligent Robots

Integration of Scientific Comunities

RITA

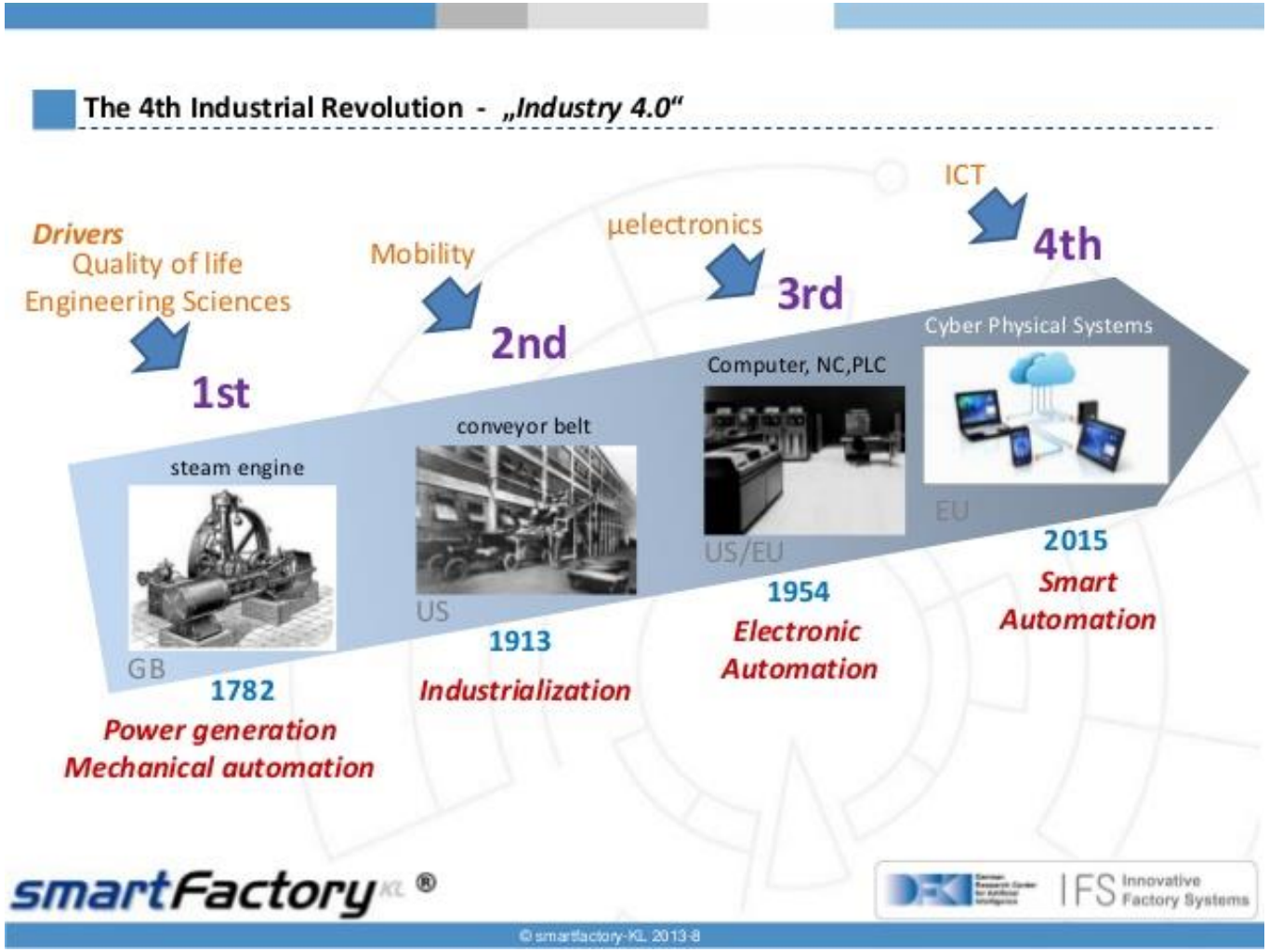
Integration of Robotics and AI

Motivation

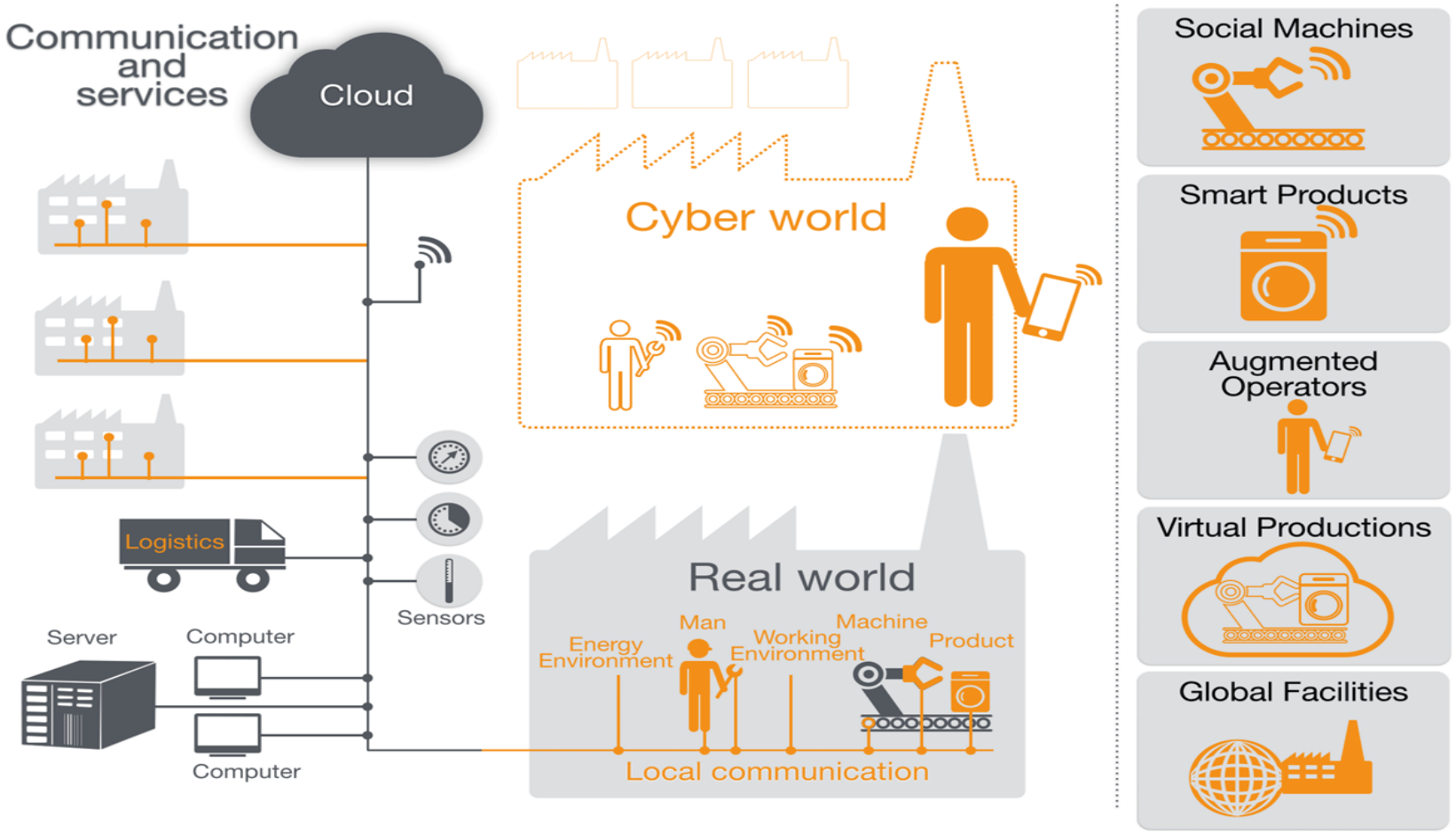
http://www.youtube.com/watch?v=6AOpomu9V6Q

How to know what to download .. ?? A problem ..

Industry 4.0


The 4th Industrial Revolution - „Industry 4.0“
Drivers
Quality of life
Engineering Sciences
1st
Mobility
2nd
µelectronics
3rd
ICT
4th
steam engine
GB
1782
Power generation
Mechanical automation
conveyor belt
US
1913
Industrialization
Computer, NC,PLC
US/EU
1954
Electronic
Automation
Cyber Physical Systems
EU
2015
Smart
Automation
smartFactory KL ®
IFS Innovative Factory Systems
© smartfactory-KL 2013-8

Industry 4.0 – impact to factories of future



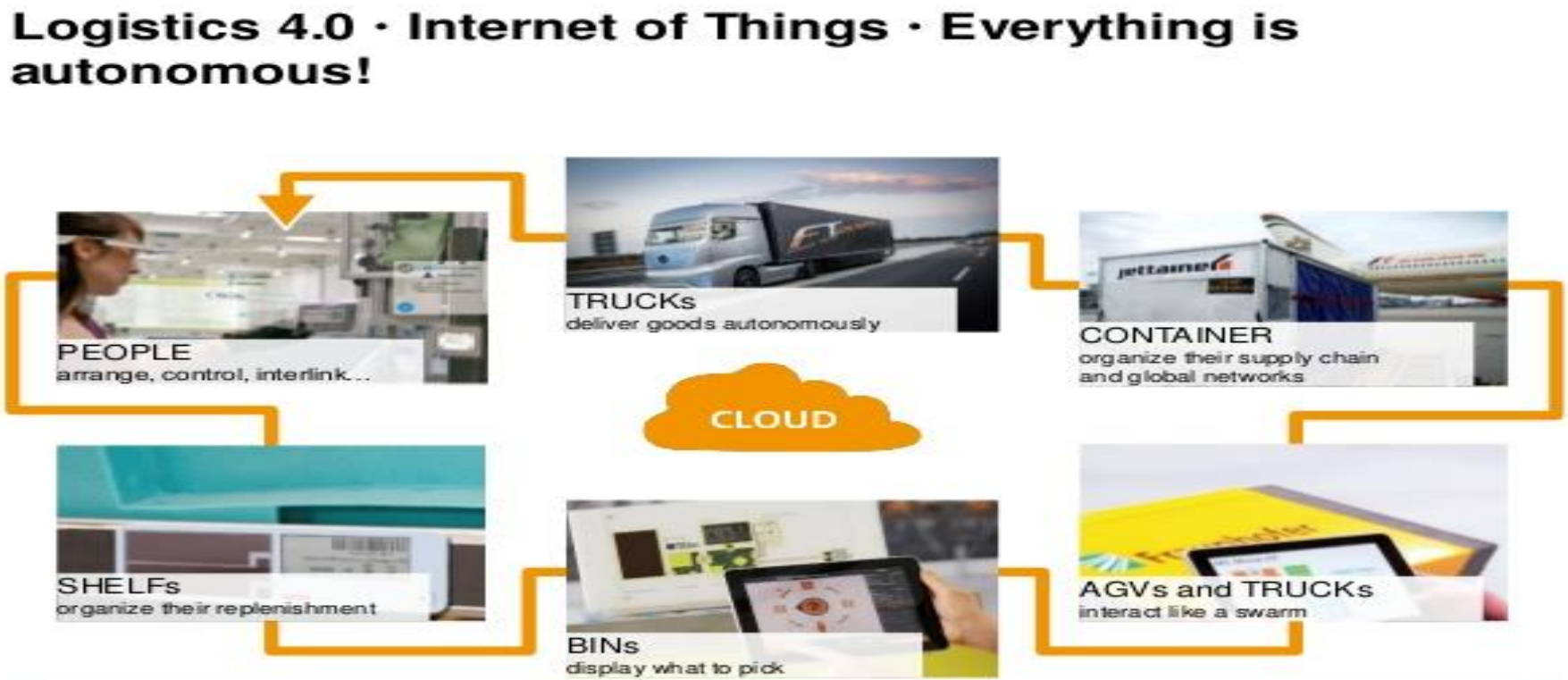
What can be 4.0 ????

https://www.slideshare.net/WilliamBuchanan1/health-40

https://emea.nttdata.com/uploads/tx_datamintsnodes/Whitepaper_Automotive_Tier1_final_single.pdf

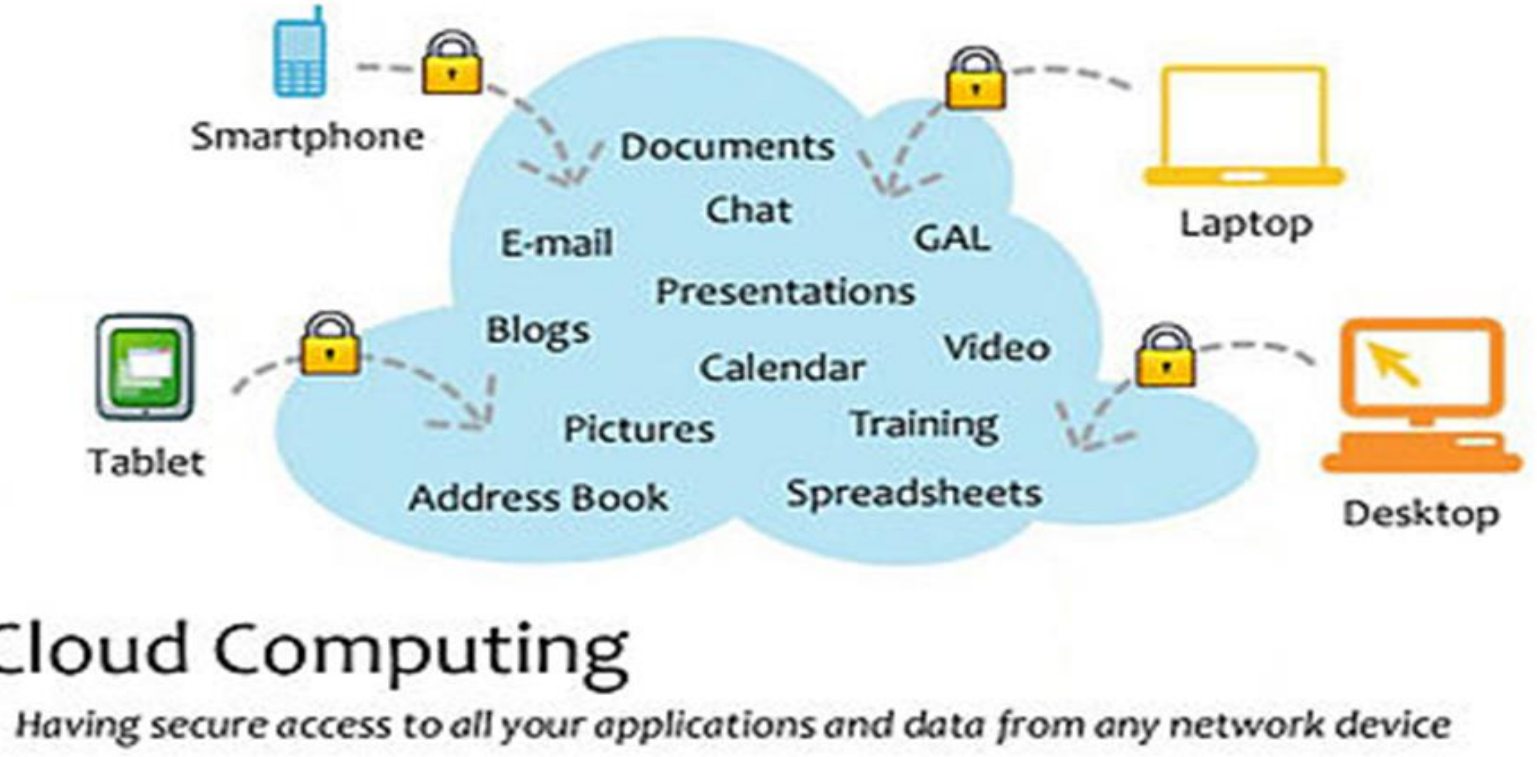
https://www.baslerweb.com/en/vision-campus/markets-and-applications/image-processing-industry-4-0/?gclid=CKD_9e6fv9MCFUeVGwodrAMN5w

Logistics 4.0



Fraunhofer IML

What is Cloud … ???



Example …. Office 365 …. From Microsoft

Cloud Robotics has potential to improve performance in at least five ways:

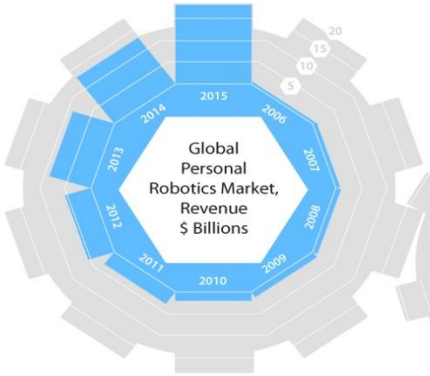
1) Big Data: indexing a global library of images, maps, and object data,
2) Cloud Computing: parallel grid computing on demand for statistical analysis, learning, and motion planning,
3) Open-Source / Open-Access: humans sharing code, data, algorithms, and hardware designs
4) **Collective Robot Learning: robots sharing trajectories, control policies, and outcomes, object identification – creating a common knowledge base – remote collective brain**
5) Crowdsourcing and call centers: offline and on-demand human guidance for evaluation, **learning, and error recovery.**

Simple approach …Grishin Robotics

Future of Cloud Robotics

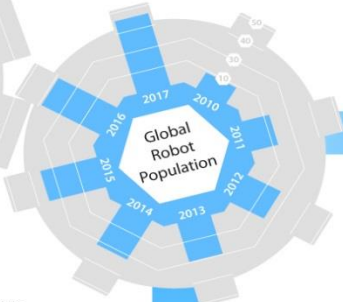
The Growth in Robotics

Consumer Robotics is booming



Personal robots market will grow to more than $19 billion in 5 years.

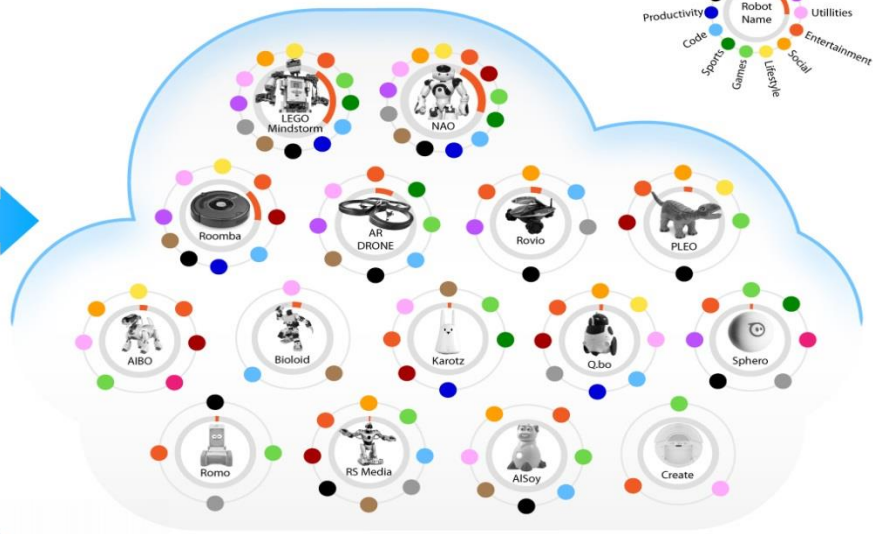
Global personal and service robots population grew tenfold in the last 4 years and are expected to keep growing at the same exponential pace, reaching more than 100 million robots in service in 5 years.

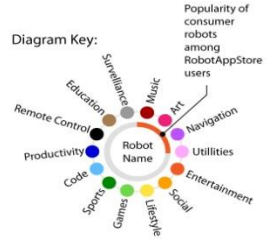


The fast growth of consumer robotics will be fuelled by the **Cloud**, which the application store will play an important role in. How is all of this related?

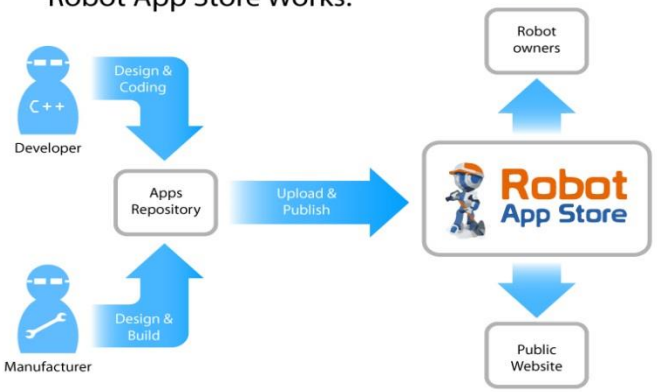
The Robot App™ Cloud

Robots can be taught to handle many different tasks through the installation of robotic apps. Very soon, these robots will be upgradable real-time by connecting to the cloud and downloading apps from there.





How the Robot App Store Works:



Robots Apps are used around the World:

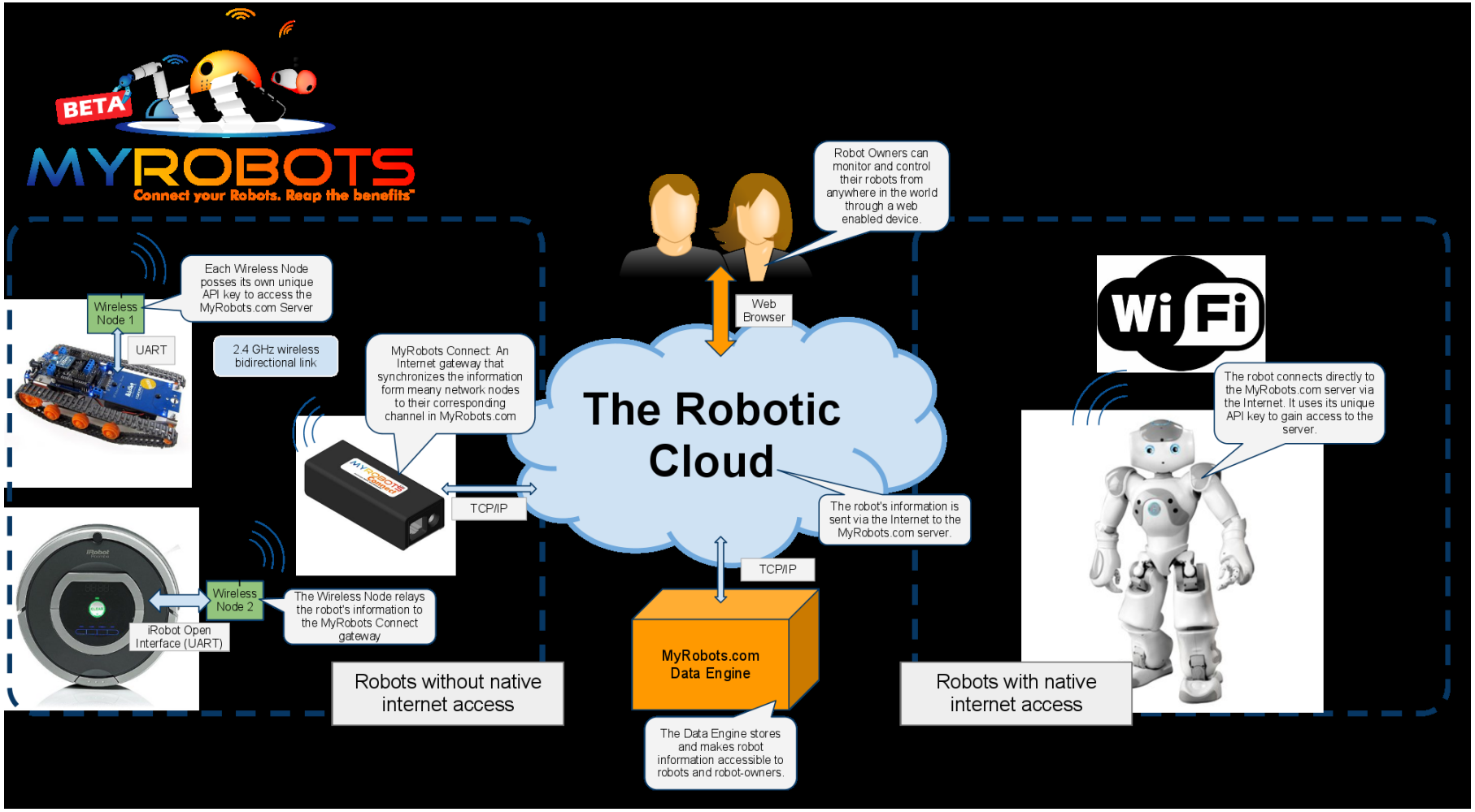
@GrishinRobotics @RobotAppStore /GrishinRobotics /RobotAppStore

GRISHIN ROBOTICS http://grishinrobotics.com/

Robot App Store http://www.RobotAppStore.com

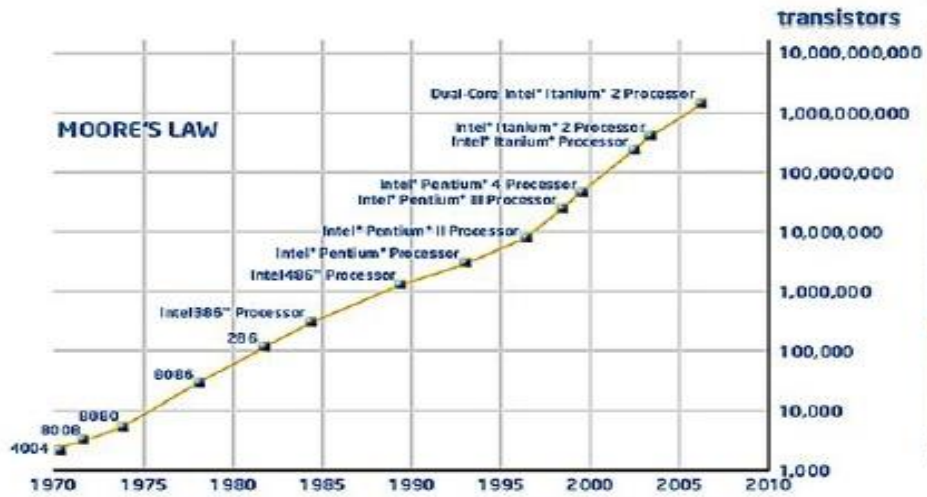
Infogr8

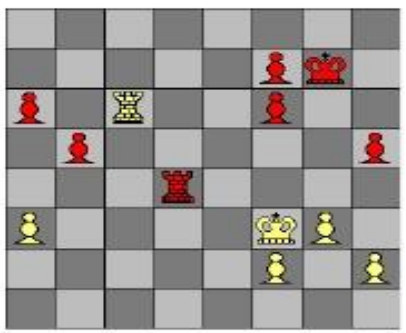
Only networking and telework (where is AI…?)



Influence to AI concept ???????

Search-based Artificial Intelligence

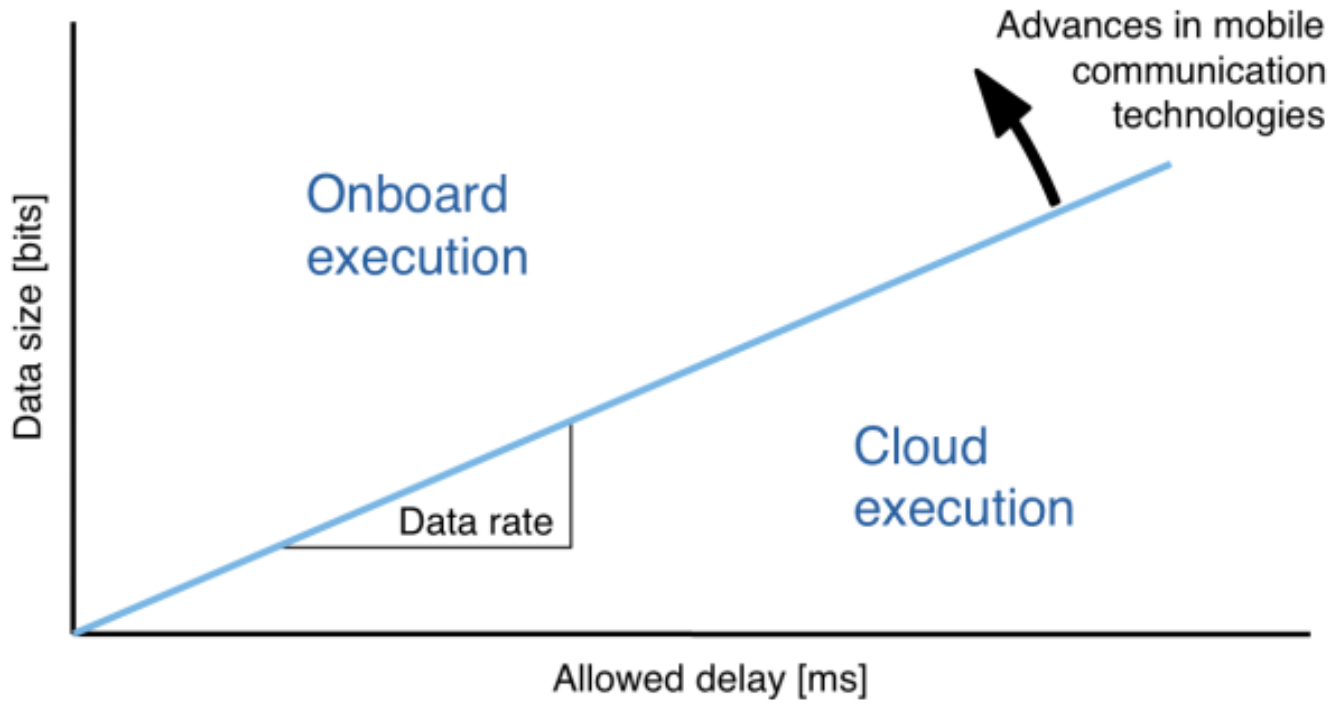




More complex problems challenges

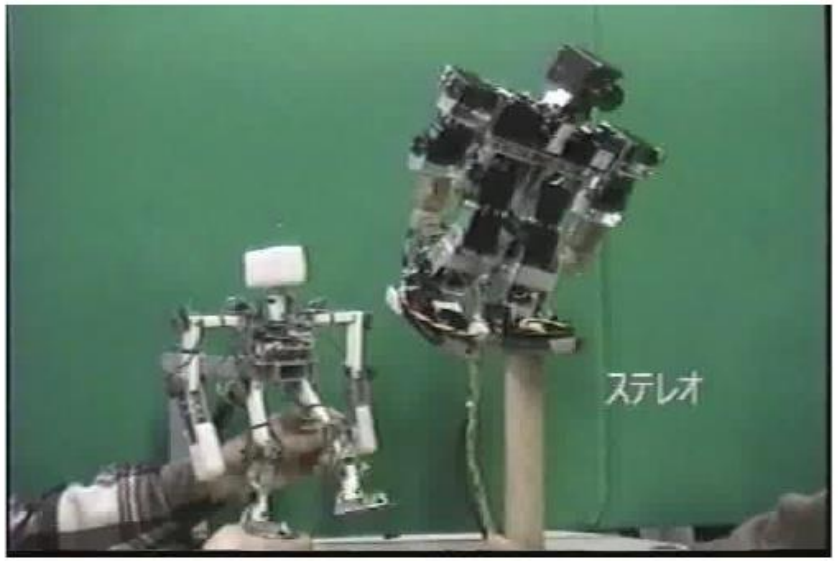
- The same task for different type of robots, units
- knowledge acquisition from different platforms
- Experience and **incremental learning** from user around the Globe
- Creation of central knowledge based from so called AI parts in distributed manner (world incremental knowledge Integrator – WILKI)
- Enrichment of WILKI from other sources in cyberspace which already used
- Fast access to cloud in any part of the globe and **disconnected mode** policy for units connected to cloud

On-board via off-board paradox (where is a future ?)



More complex approach – since 1990 from University of Tokyom Japan

“Remote-Brain” Robots



Prof. Inaba from University of Tokyo , 1997

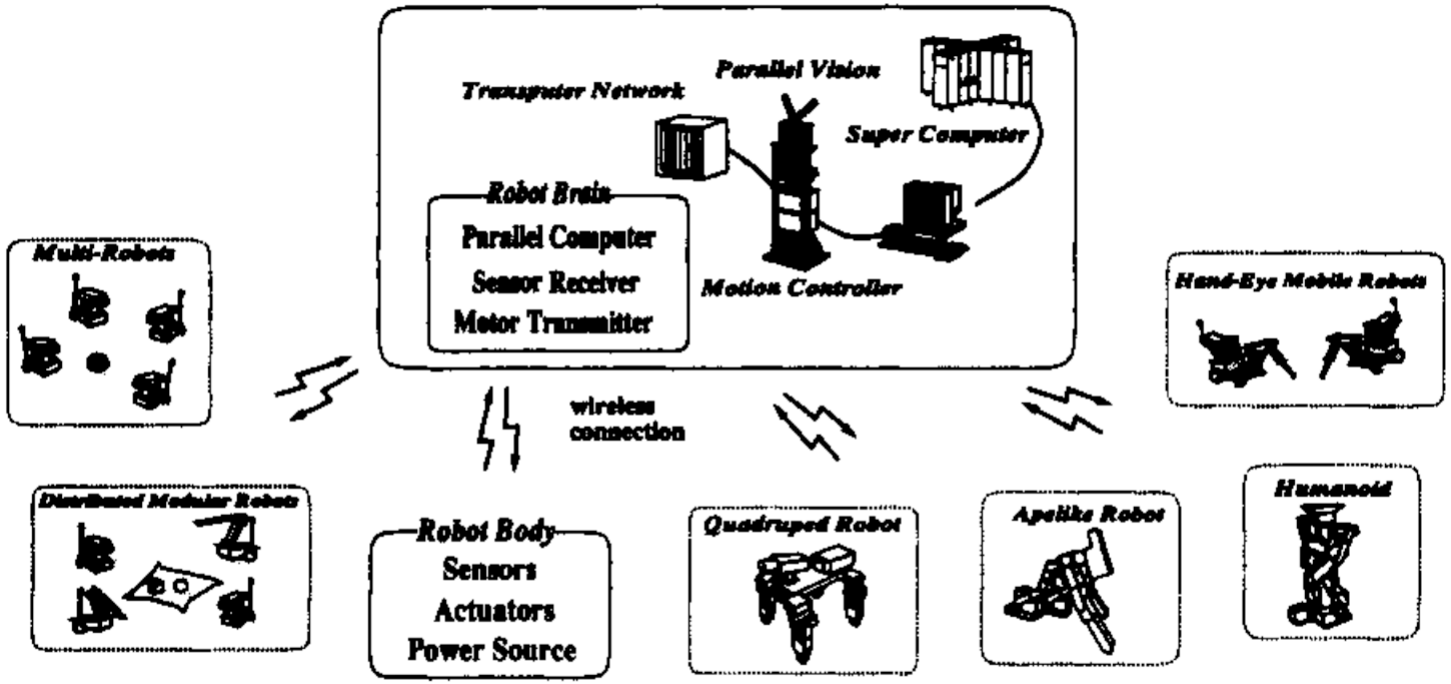
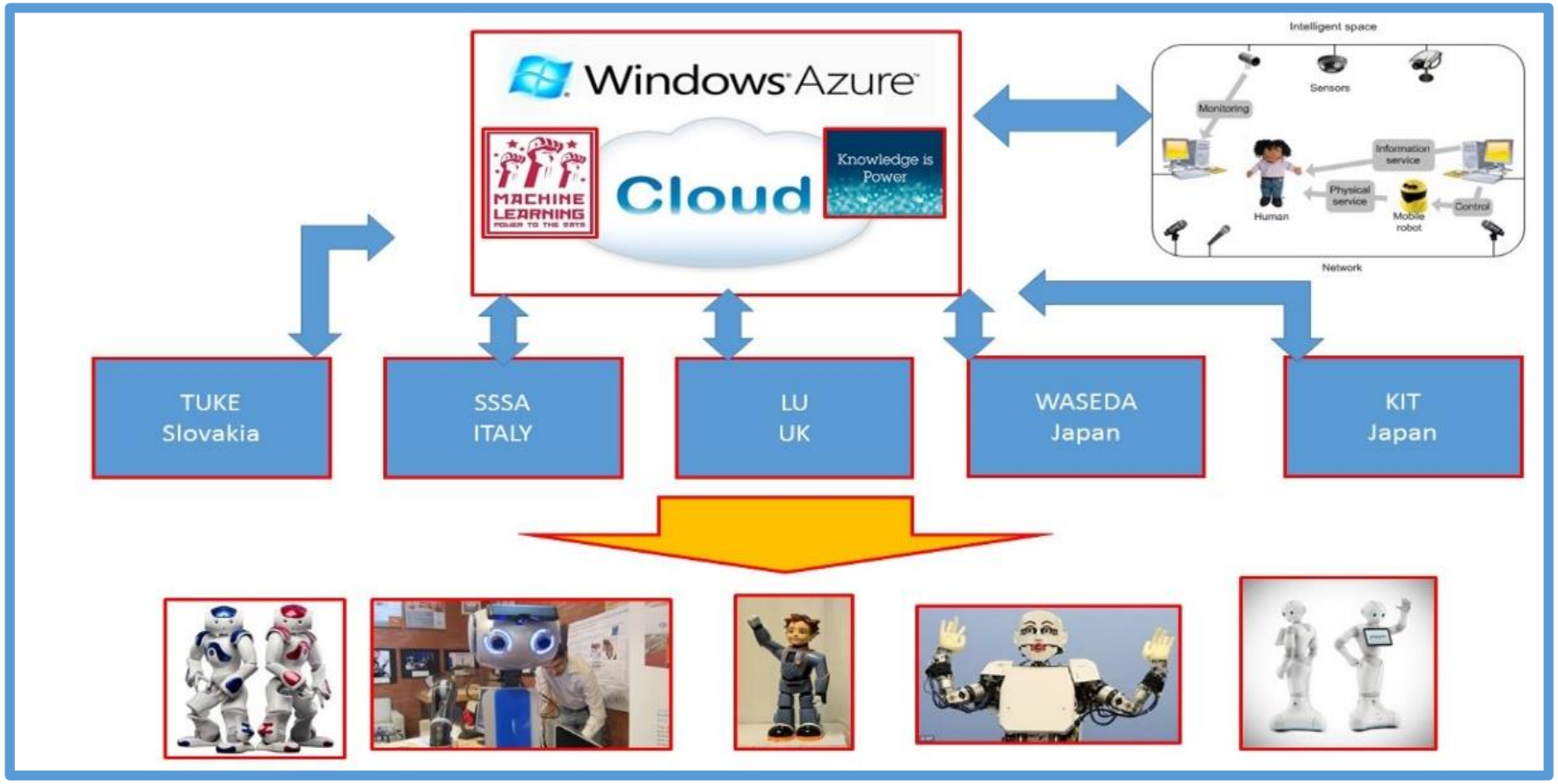
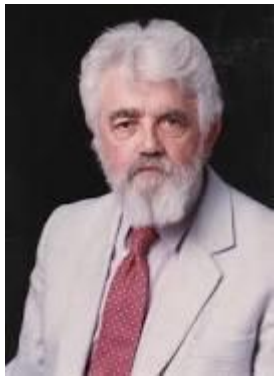


Figure 1: The idea of remote-brained robot

Microsoft Azure Machine Learning Grant for AAL – 2016



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.)

Definition of Cloud robotics..

A strong and general intelligence as human or beyond human is already possible using a critical high number of specialized “silly” AI tools or “AI bricks” to integrate interdisciplinary on cloud computing, and using mobile smartphones technology.

What are AI bricks ?

Examples of thousands (milions?) of "*AI bricks*" very intelligent in their specialization and very silly in all other tasks:

- RTS (Robot Tools Server) for redirecting each cloud-robot (machine in real live) to the optimal specialized tool (like DNS in WWW) for complete a mission.**(*AI Bricks* registered in RTS will survive by natural selection** on depending of **feedback** from all worldwide millions of cloud-robots or it's human owners, scoring successes or fails of robot ordered missions and tasks, scoring each *AI Brick* for deciding which cloud-tool better scored ***AI Brick*** use next time in similar circumstances.**)**
- Expert tools: chess (Deep Blue machine won the human world champion Kasparov on 1997), psychology, emotional intelligence, lawyer, languages, empathy, medical, history, mycology, weather, philosophy, feelings, etc…
- Simulation tools – prediction tools consider as modeling tool for simulation like processing

REFLECTIONS

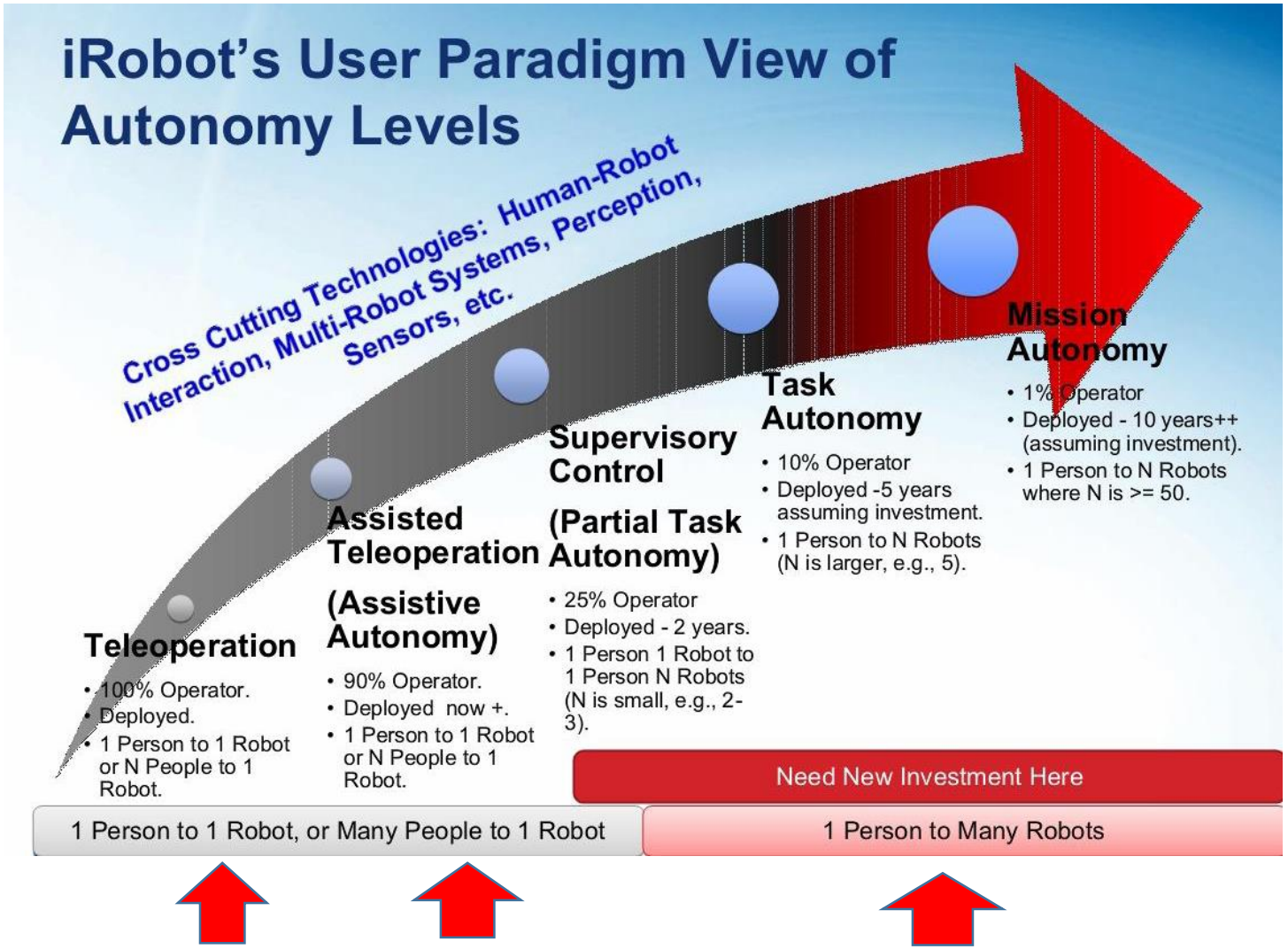
- **James Kuffner**, a professor at Carnegie Mellon University, currently working at Google,

“knowledge database,” (WILKI) where they’ll share their interactions with the world and learn about new objects, places, and behaviors.

Will Cloud Robotics change a AI ??

- Will it change AI ? Machine Learning ???
- Will computer speed, storage and fast wifi change AI ??
- Do we need thinking machine ?????
- to ask – means to think or find an answer ???
- AI bricks – granularity of AI problem solving

Qua Vadis Intelligent Robotics ???



Very important for Robot applications

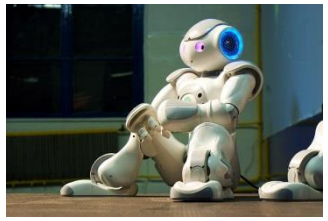
…….

many Technological challenges

Our approach to the problem

TELEOPERATION
MONITORING

INTERFACE – middleware on CLOUD



Azure from AAL perspective

THINK BIG – START SMALL !!!!

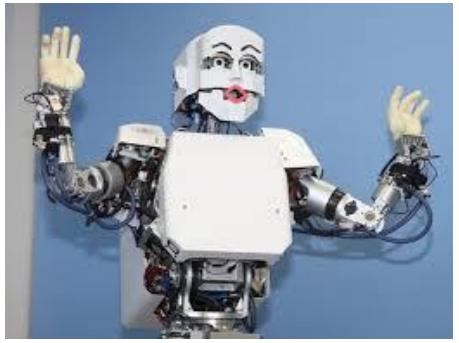
QUESTION :

“IF we make Cloud Robotics can we save energy for Robot movements ??? “

Can we develop collective Intelligence for Robots ??

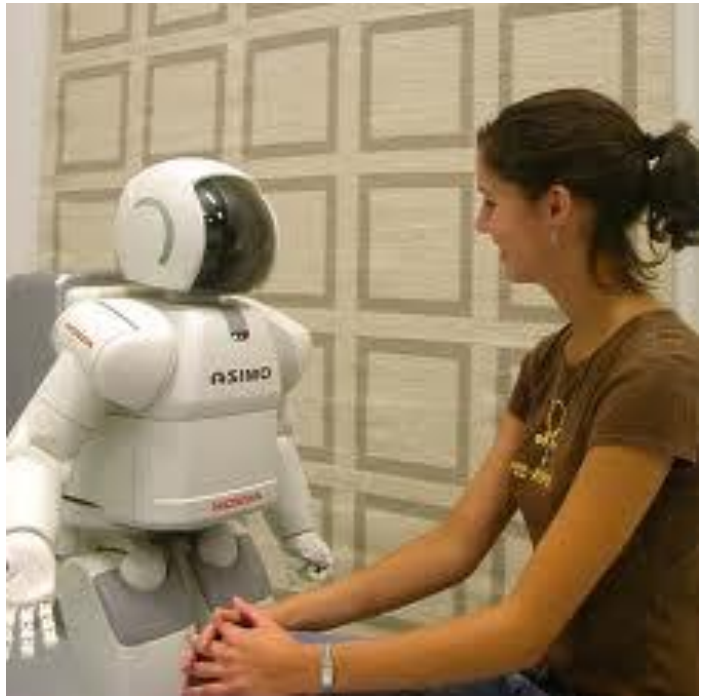
WILKI

WORLD Incremental Learning Knowledge Integrator



Collective Intelligence
Facebook BIG DATA

Human-Robot Interaction



Social Environment

Industrial Environment

Human-Computer Interaction

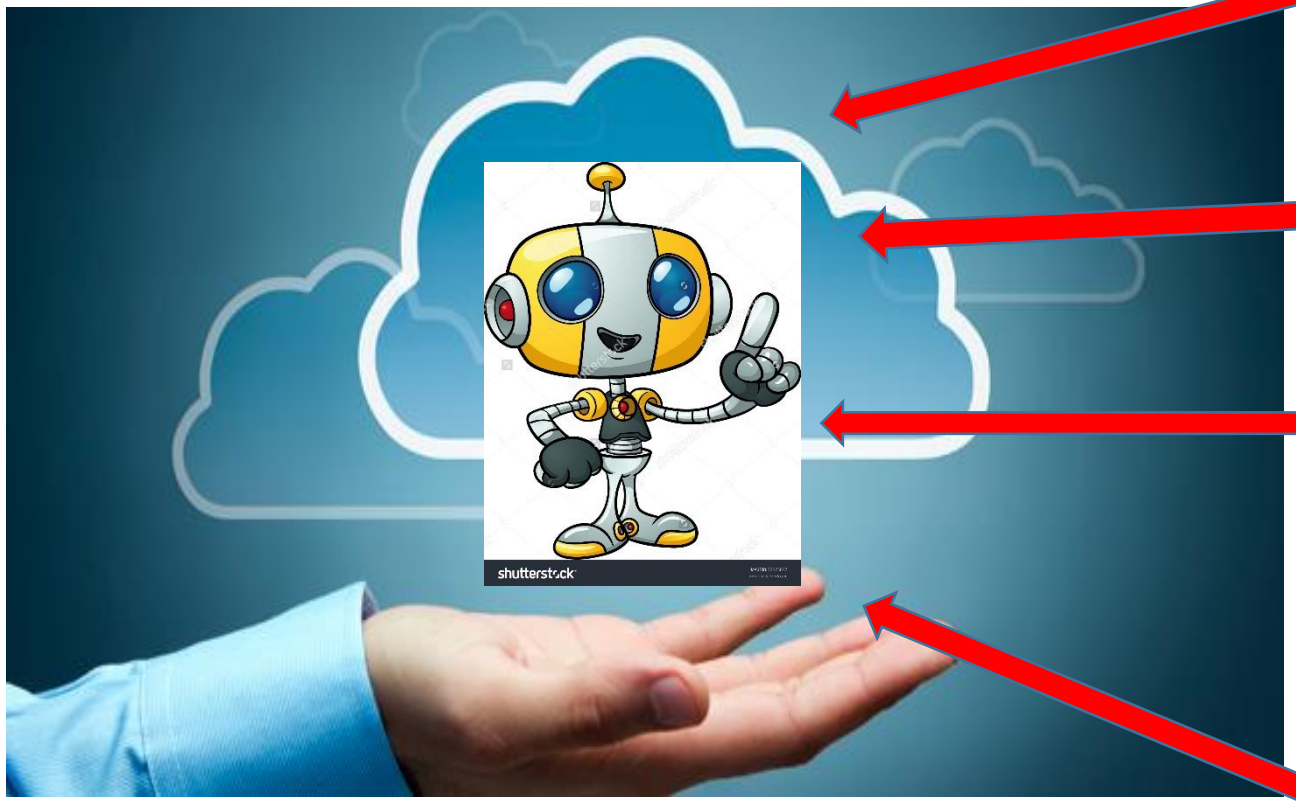
Are Robot Synthetic Emotions I
mportant in Human-Computer interaction ?

Definition of Identity of the ROBOT ????

Classical Robot Concept

This is a Robot !!!!

Virtual Robot Concept ???
This is a Robot



Ubiquitous Robot Concept URC???

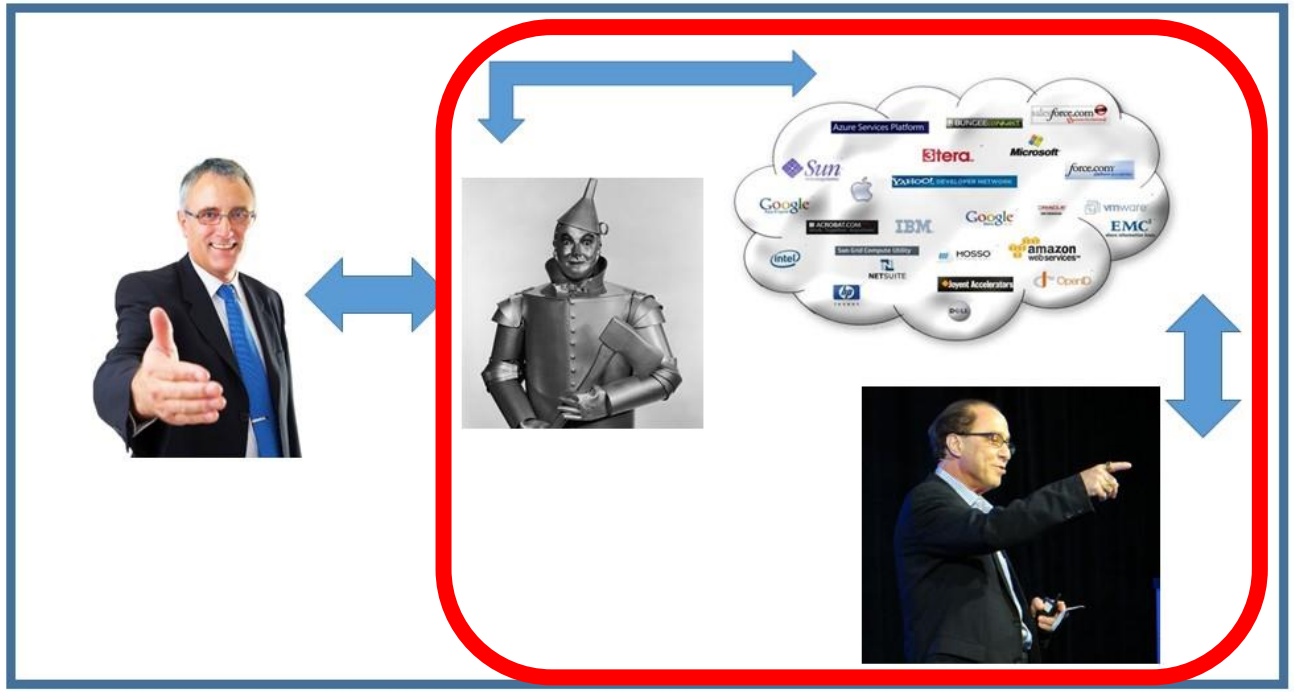
ubiquitous "turning up everywhere," 1837, from ubiquity + -ous. The earlier word was ubiquitary (1580s), from Mod.L. ubiquitarius, from ubique.

Synonym - **Omni present**

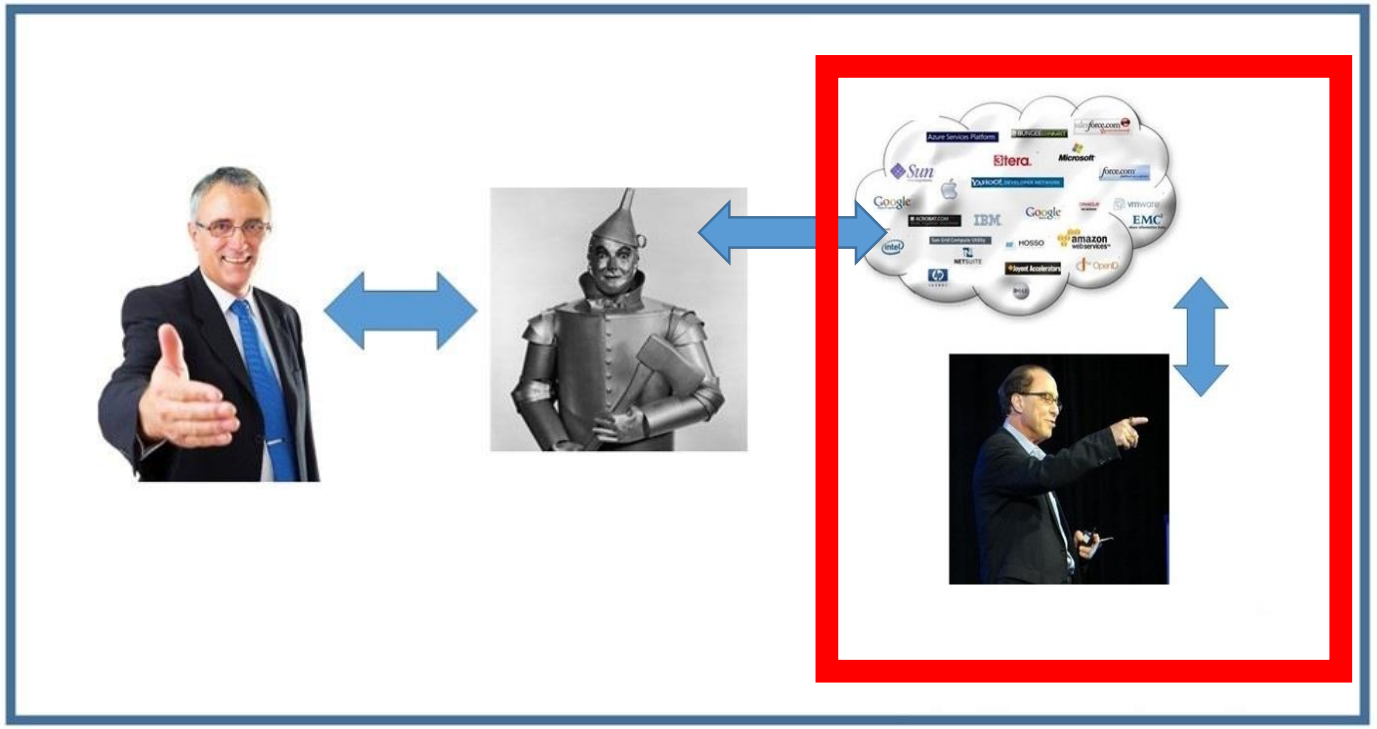
Virtual or Real Robot

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

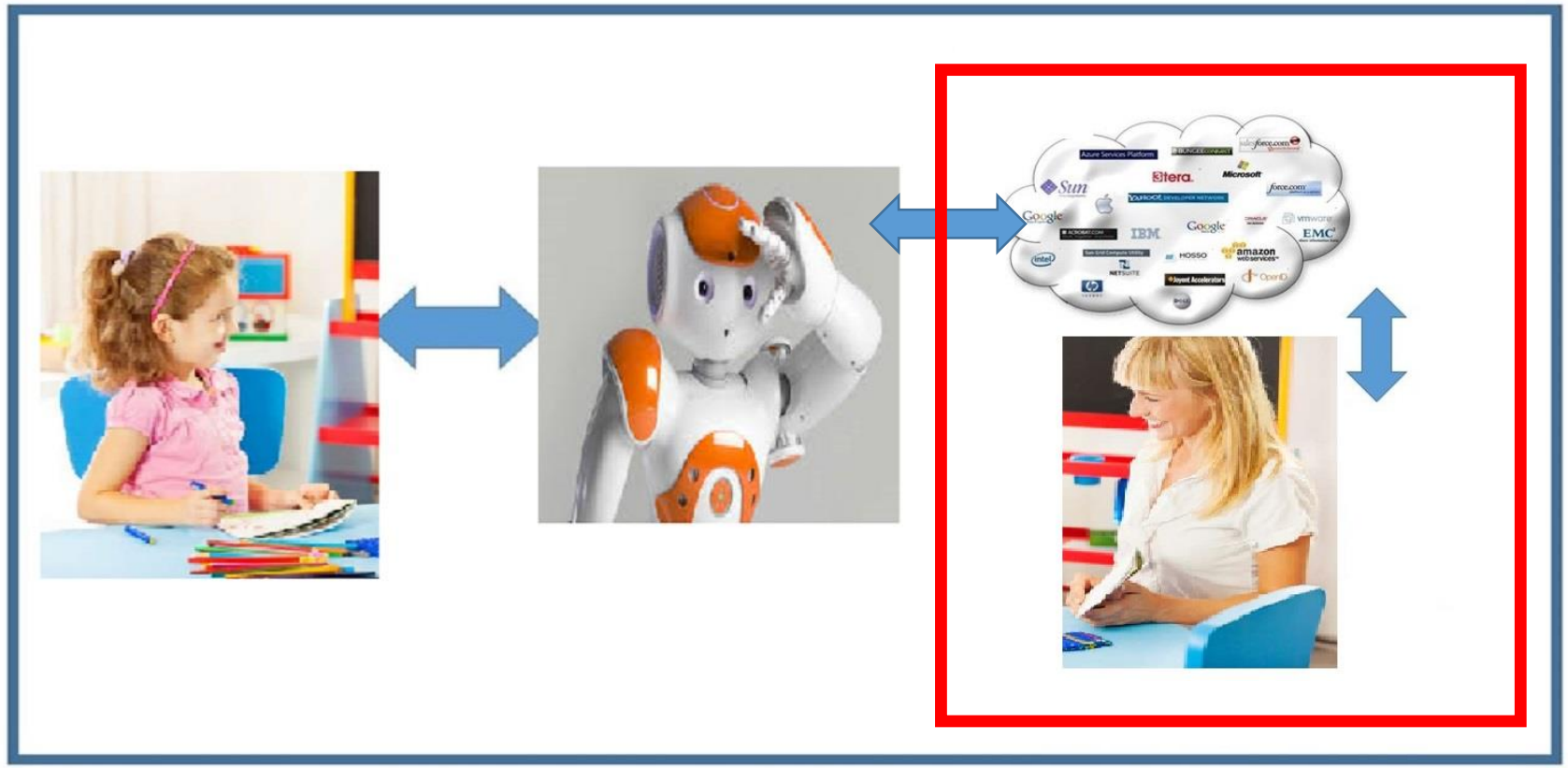
Wizard of Oz


Azure Services Platform
Sun
tera
Microsoft
Google
IBM
Google
EMC
amazon
web services
MOSSO
NETSUITE
Joyent Accelerators

Wizard of Oz Teleoperation in Human-Robot Interaction



Application of WoOz … Social Robotics

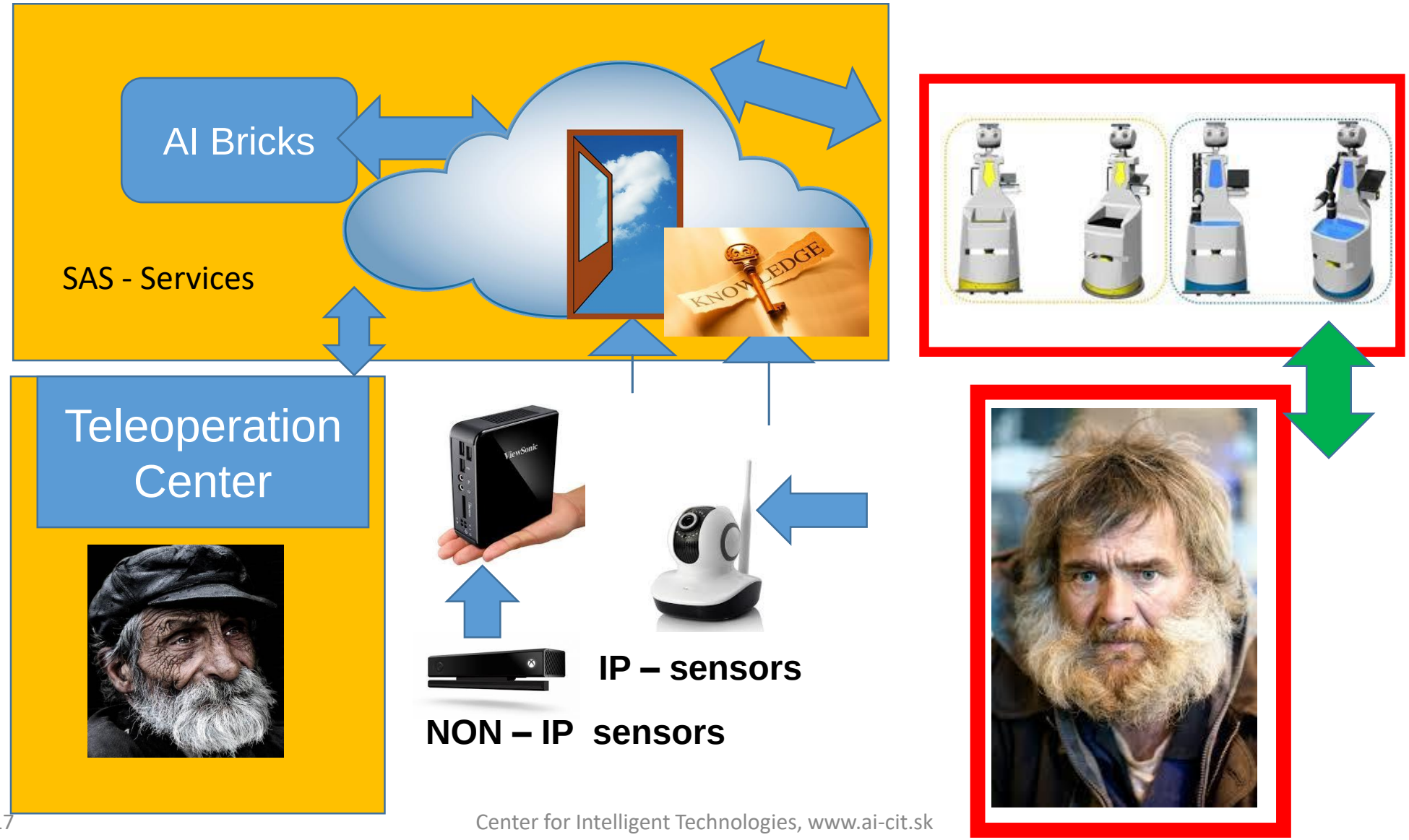


Human-Robot Interaction – new paradigm - What is Wizard of Oz ?

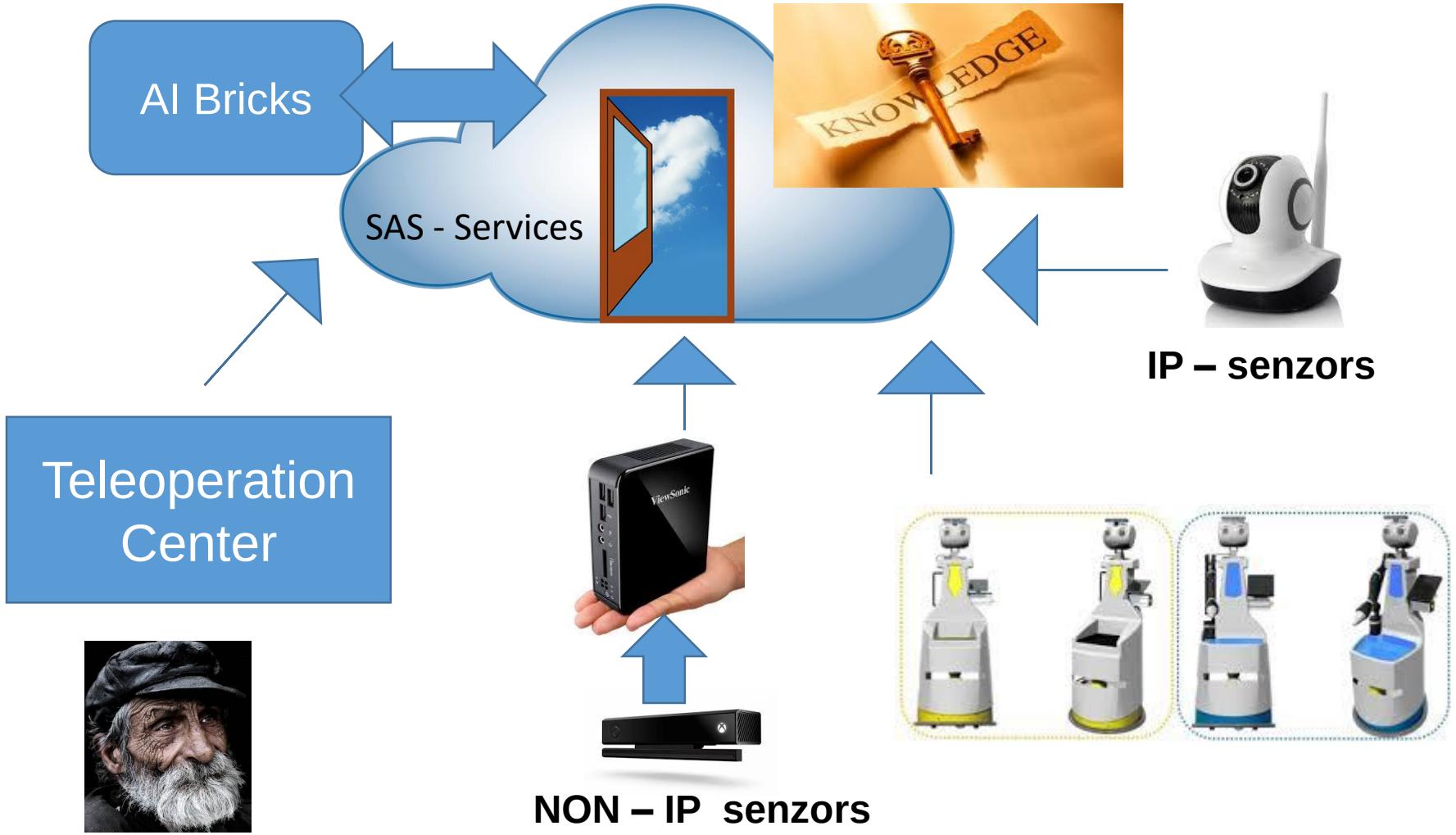
H-R Interaction

H-R-E Interaction

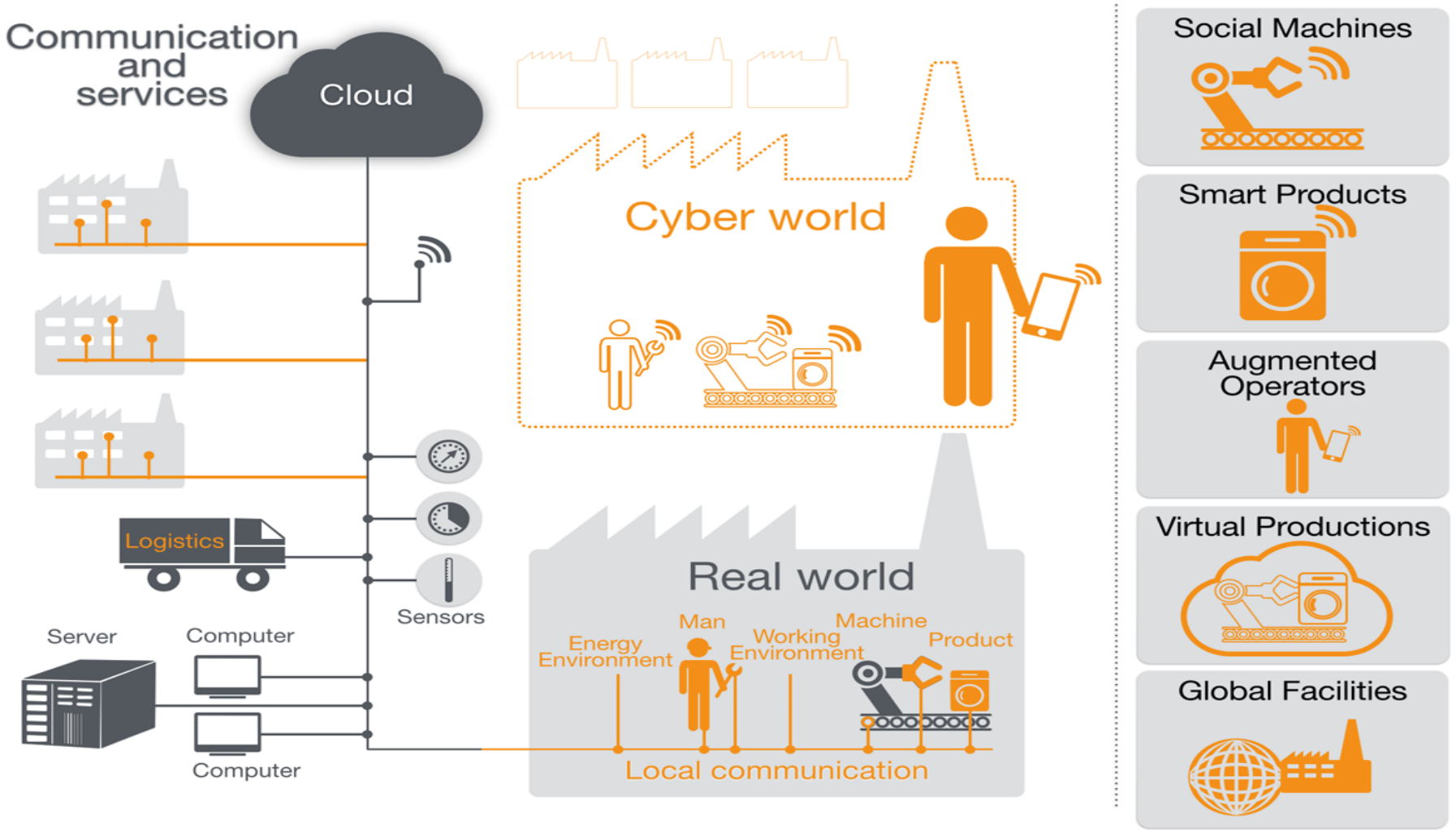
Cloud Based Wizard of Oz



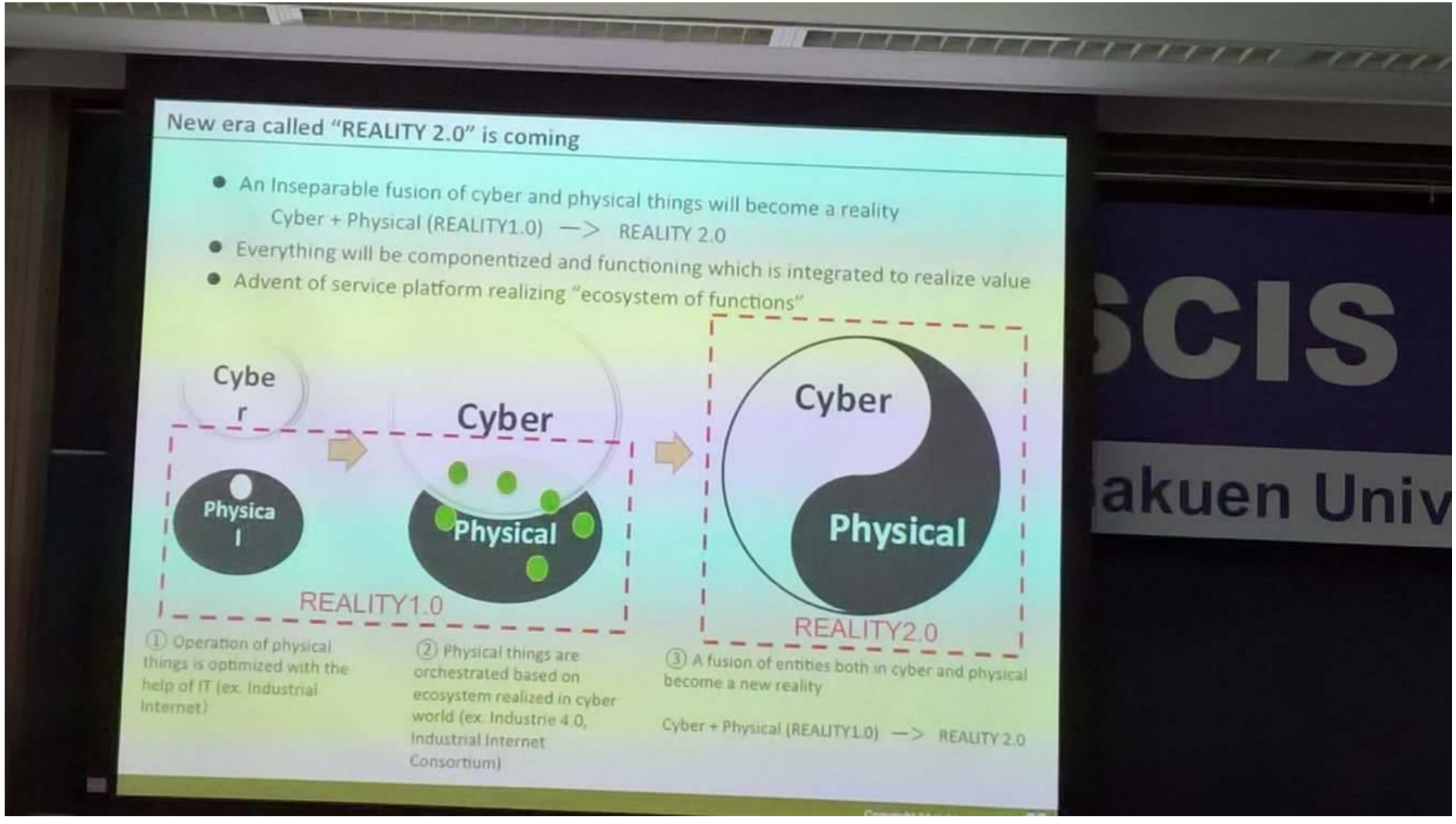
Cloud Based Wizard of Ozz



Industry 4.0 – impact to factories of future

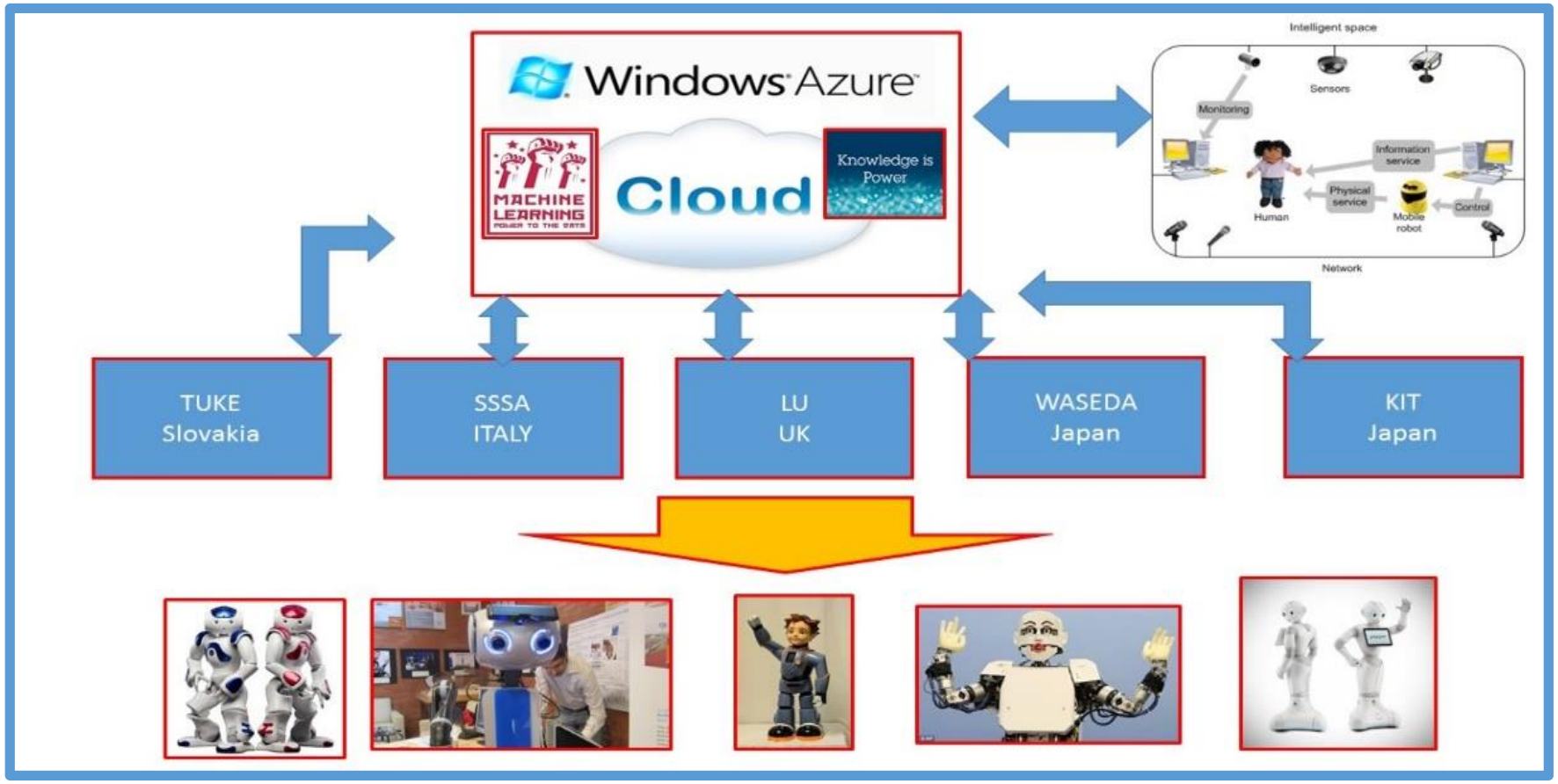


In Japan - Dr. Iwano from JST



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

Microsoft Azure Machine Learning Grant for AAL – 2016



Our priority :

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

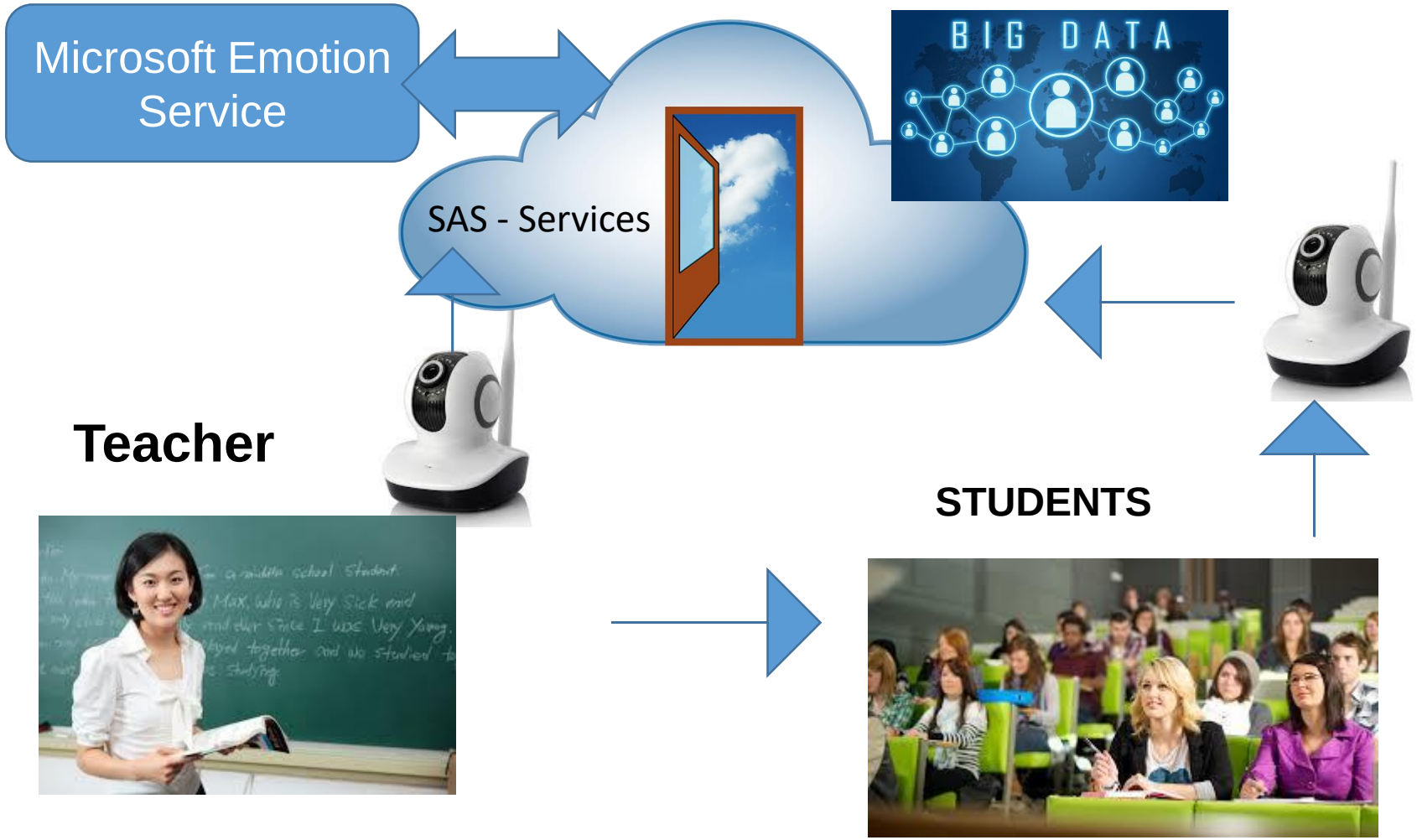
A) How to estimate an emotional state of the human for ANY purposes **(sensing)**

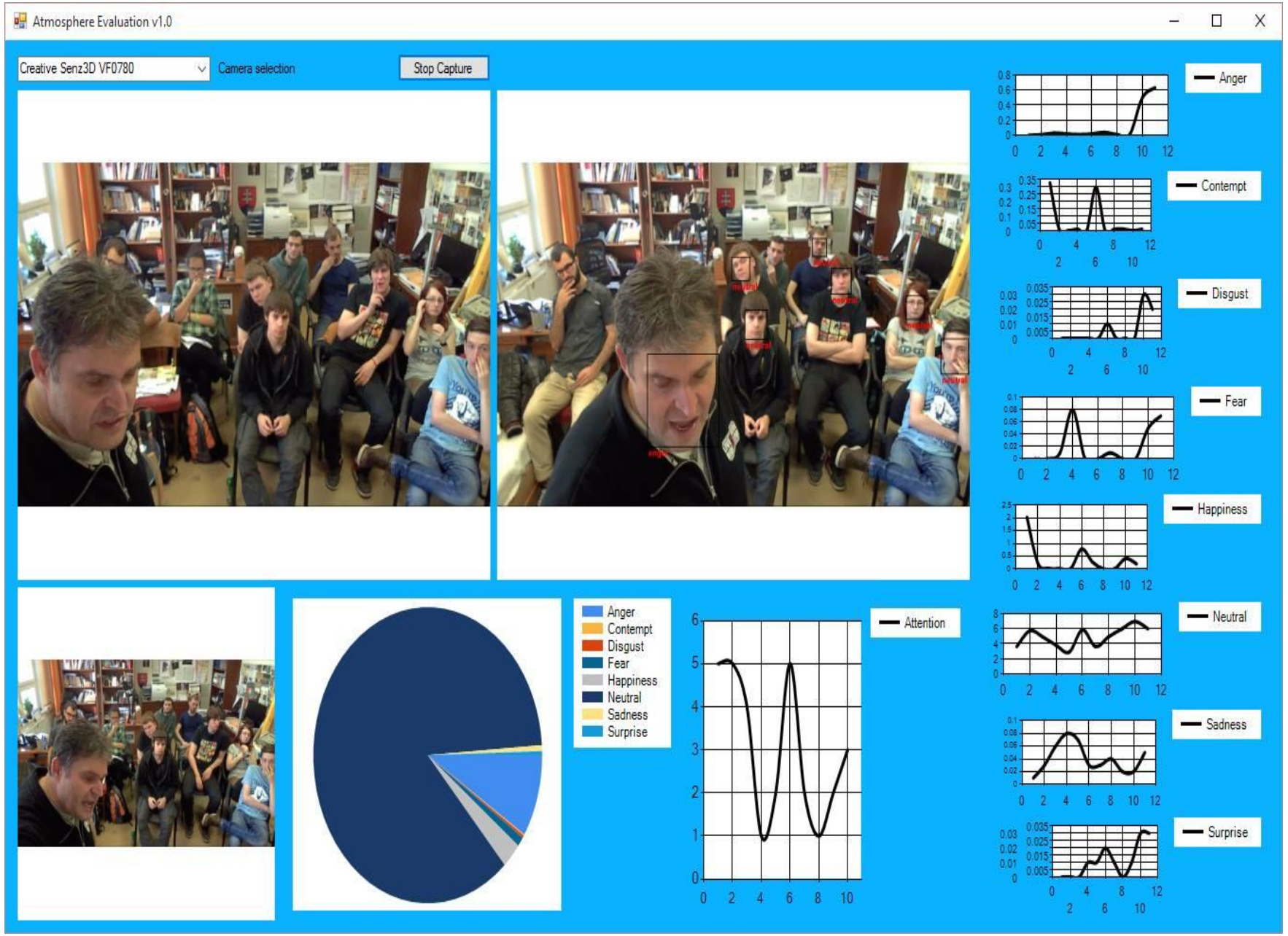
B) Teleoperation with Learning **(action)** – Wizard of Oz with learning – towards non-human wizard …

Our Basic project in Cloud Robotics

- Cloud Based Wizard of Oz Teleoperation of Robots with learning abilities
- Distributed ROS on the Cloud – one ROS for more robots for easier maintaince
- Cloud Based Emotional Affective Loop as an behavior model concept of interaction

Improve Teaching
analyze students response




Atmosphere Evaluation v1.0
Creative Senz3D VF0780
Camera selection
Stop Capture
Anger
Contempt
Disgust
Fear
Happiness
Neutral
Sadness
Surprise
Attention

Major Challenges in synergy of Robotics and AI (personal View)

1. Importance of software in Robotics increase
2. Shared Knowledge will be essential
3. Evolving Cloud Based Robotics Platform for Robotics will be business based standart
4. I do believe in Industry 4.0 concept FofF
5. Strong connection between Robotics and AI is needed – to prevent reinvention of systems

Our Global Challenge Our Dream

Evolving Learnable Distributed Framework for Interactive Companion Robotic Systems


THANK YOU FOR
YOUR ATTENTION
KINOPOISK.RU
risovach.ru

Cvičenia ---- výzva na bonusové body ...


BURNING
QUESTION
WHAT ARE YOU THOUGHTS ON THE MATTER?