Interactive Virtual Avatars. Design & Application Challenges for Future Smart Homes

Zlatogor Minchev[1,3] & Luben Boyanov[2,1]

E-mails: zlatogor@bas.bg, lb@acad.bg

Institute of ICT - Bulgarian Academy of Sciences[1]

University of National & World Economy[2]

Institute of Mathematics & Informatics - Bulgarian Academy of Sciences[3]

Under the auspices of

ifip

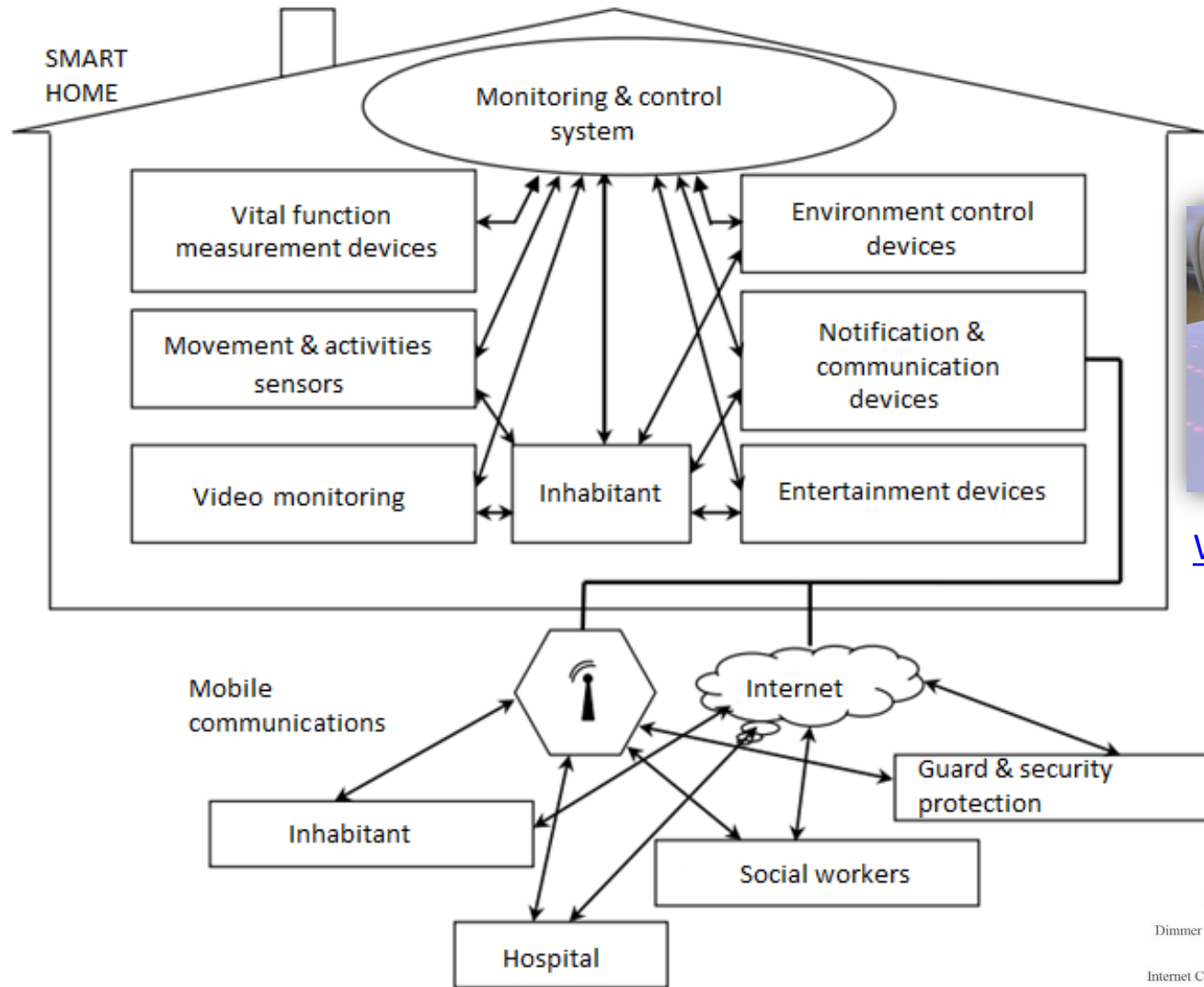Sofia, UNWE   ICAICTSEE – 2014   October 24-25, 2014

Outline

❑ Modern smart home organization

❑ Cyber threats challenges to smart homes

❑ Interactive virtual avatars in smart homes

❑ Discussion

MODERN SMART HOME ORGANIZATION

SMART HOME

Monitoring & control system

Vital function measurement devices

Environment control devices

Movement & activities sensors

Notification & communication devices

Video monitoring

Inhabitant

Entertainment devices

Mobile communications

Internet

Inhabitant

Guard & security protection

Social workers

Hospital

...?

Watch video >>
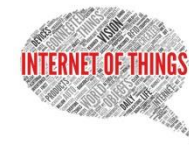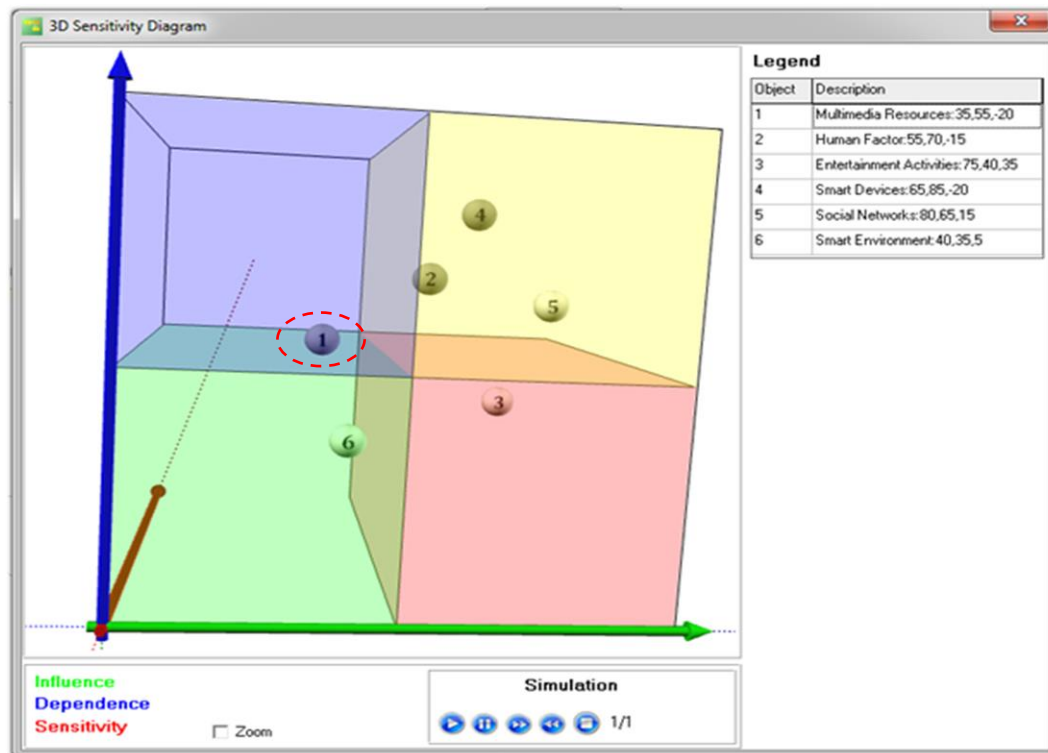
SENSORS ORIENTED

SERVICE ORIENTED

Minchev & Boyanov, 2013

Cyber threats challenges to smart homes

SMART HOMES MULTIPLE CYBER THREATS

Minchev & Kelevedjiev, 2014

Threat/Area	Human Factor	Digital Society	Governance	Economy	New Technologies	Environment of Living
Targeted Attacks						
Compromised Devices						
Malware						
Technologies Influences						
Privacy & Allianation						

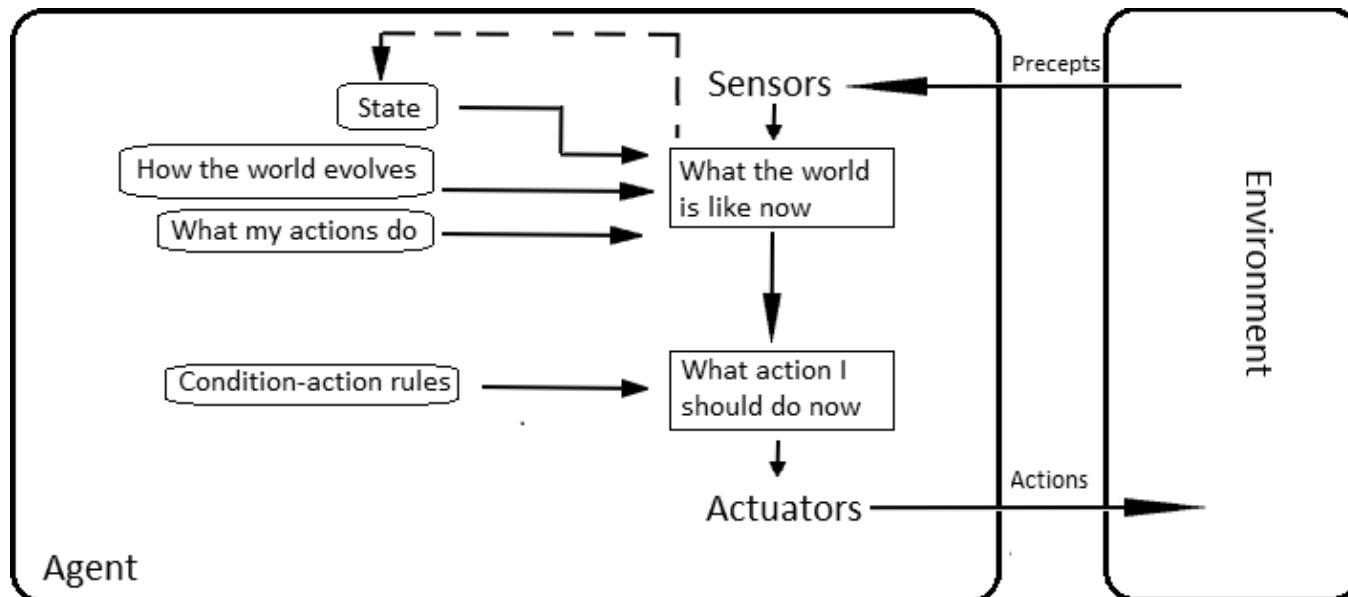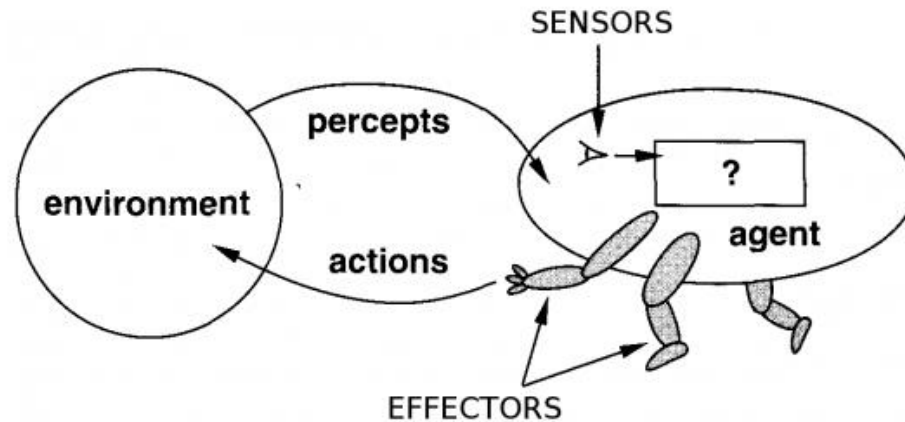Minchev, Boyanov et al, 2014

AND OUR BELIEFS FOR THE NEAR FUTURE...
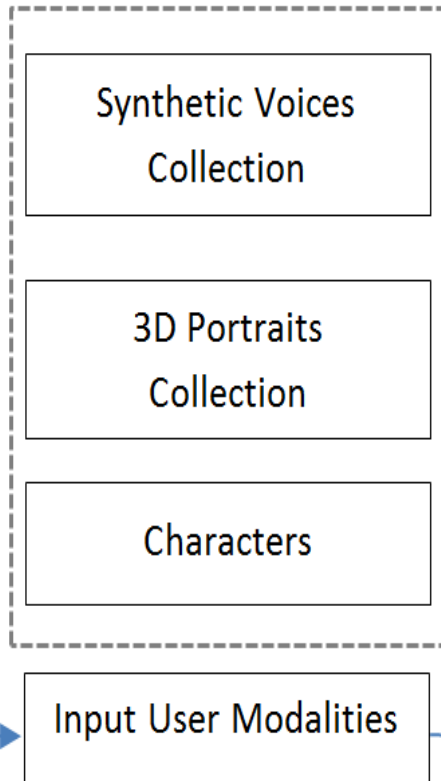
INTERACTIVE VIRTUAL AVATARS IN SMART HOMES

Watch video >>

Russell & Norvig, 2009

Avatar Live EXample

Interactive Avatar-based Interface

Synthetic Voices Collection

3D Portraits Collection

Characters

Decision Logic

Output Controlling Interface Channels

Input User Modalities

Output Home Multimedia Devices

Interface Design

I. General Design

Object1

Object 2

Object 3

Object 4

Version 4.6.2.120 Pro Edition (64-bit)

zlatogor

DAZ STUDIO

4.6

Software Development
Rob Whisenant
Chris Jones
Ammon Diether
Bruce Lamming

Quality Assurance
Bruce Hoins
Carl Fisher
Katherine Briggs
Anton Von Tonder

Product Development
Brian Howell
Josh Darling
Allen Renfeldt
Michael Lane
Heysun Oh

Customer Support
Britney Creek
Kraig Hausmann
Jared Nielson
David Sandberg
Crissie Galloway

POSER 8

USERS PREFERENCES EVALUATION*

Melody 1

Melody 2

Melody 3

Melody 4
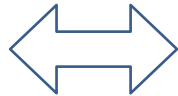
Object A

Object B

Object C

Object D

*IAPS/IADS

CSEA

Voice vs Face Matching

Voices

Voice 1

Voice 2

Voice 3

Voice 4
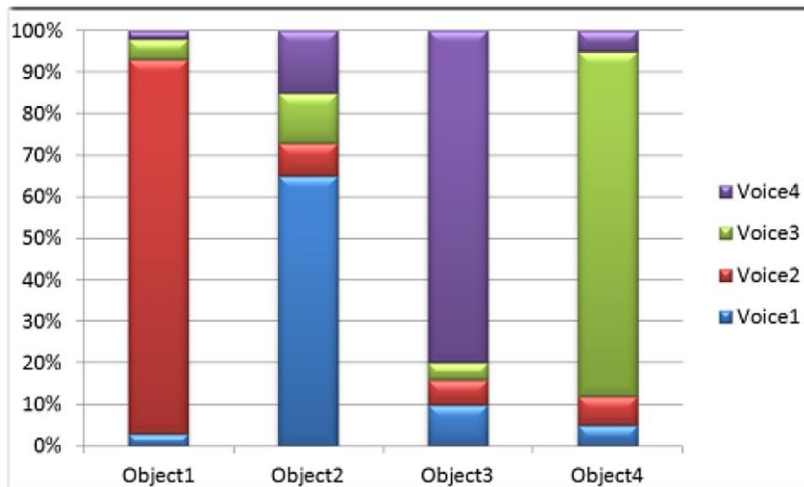

Faces

Object 1

Object 2

Object 3

Object 4

57 PEOPLE, AVG. AGE = 31.25 YEARS,
25 MALE, 27 FEMALE; VAR = 0.35

II. Detailed design…

07 Scorned Husband

08 Hip-Hop Artist

09 Soul Singer

10 Little Girl

11 Rythmic Robot

12 Dare

13 Flirting

14 Freestyle Rap

15 Singing in Shower

☐ CHARACTER
☐ BAHVIOUR
☐ DYNAMICS
☐ INTERACTION COMMANDS
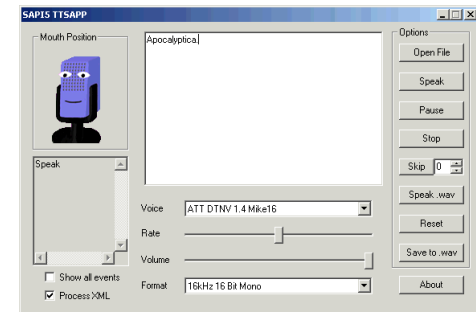☐ …

SAPI- Speech Application Programming Interface

Olivola et al, 2014

Competence

Dominance

Extroversion
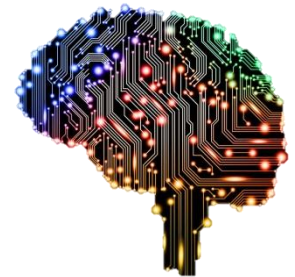
Trustworthiness

…

DECISION RULE-BASED SYSTEM

Microsoft

SAPI

USER DIALOG INTERFACE SYSTEM

DBMS

MBMS

DB

MODEL BANK

Probabilistic Reasoning

Logical Condition

?!

IF (A=true) & (B=false)

THEN ACTIVITY1

Action

....

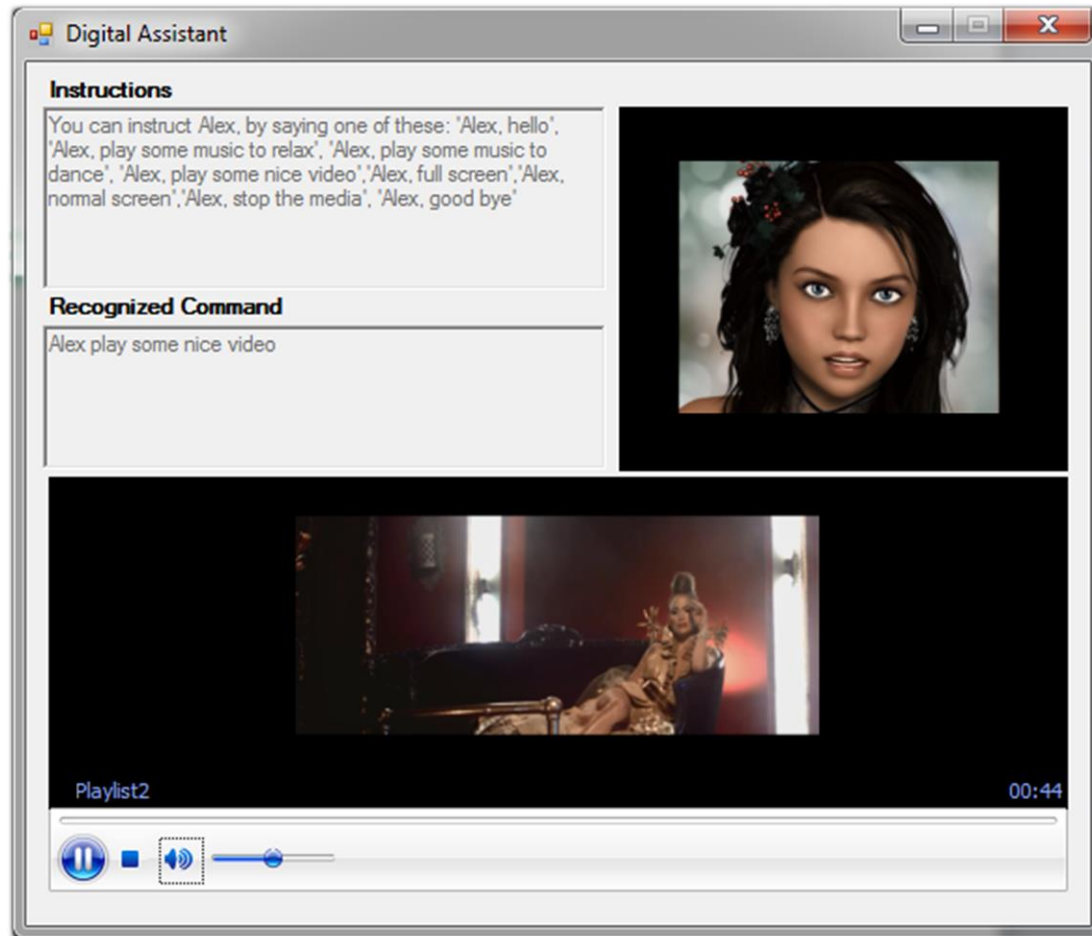IF (A7=true) & (B1=true)
THEN ACTIVITY7

DEVICES CONTROL 📱

XBee™

Bluetooth

Wifi

...

	Input	
Controller	τ_1	System

Desired behavior

Actual behavior

τ_2

Bathroom Phone

Digital Doorlock

Sub Phone

Kitchen TV Phone

Remote Control

Door Camera

Control Panel

Key tag

Monitor

Remote Controller to control over every device
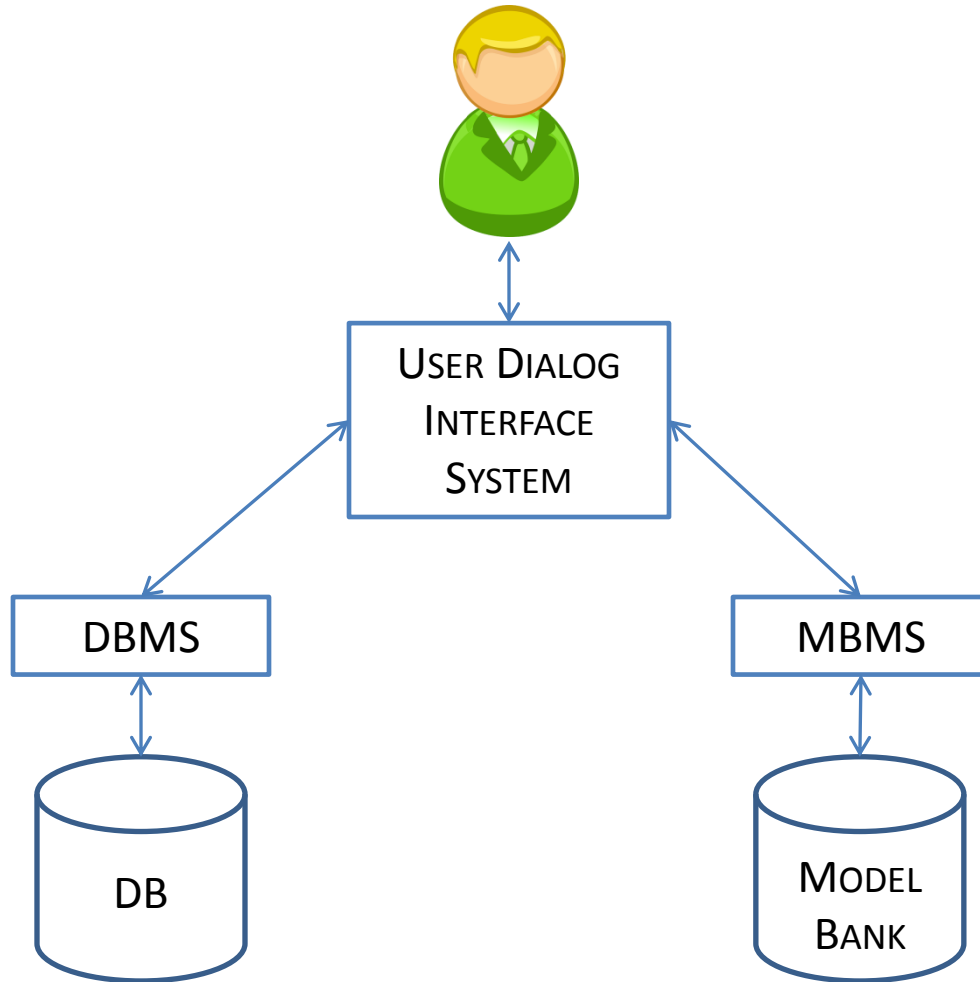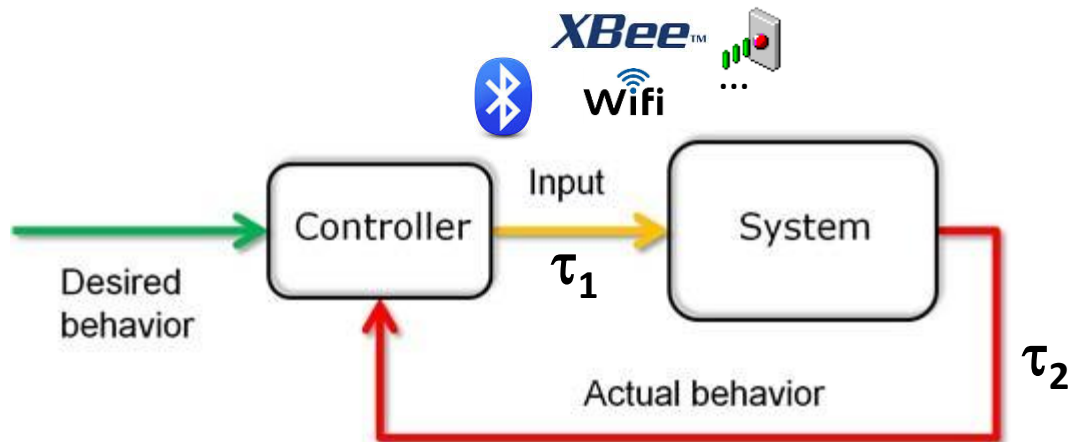
DEMONSTRATION

[Watch video >>](Watch video)

DISCUSSION

OUR CURRENT RESEARCH EFFORTS ARE SHOWING SOME PROMISING RESULTS CONCERNING "AVATAR BASED SMART HOME CONTROL SYSTEMS" AND "INTERNET OF THINGS" INTEGRATION.

THE PRACTICAL DEVELOPMENT HOWEVER REQUIRES BALANCING AMONGST: INTERFACE DESIGN, SENSORS, COMMUNICATIONS AND ARTIFICIAL INTELLIGENCE.

THE RESULTING SMART HOMES CONTROL SYSTEMS HAVE ALSO TO BE ADDRESSED AND FOR CYBER THREATS PREVENTION AS THIS NEW MULTIMEDIA PROJECTION IS CONSTANTLY EVOLVING AND IS A SOURCE OF MANY HIDDEN AND UNEXPECTED THREATS FOR THE USERS.

ACKNOWLEDGEMENT

THANK YOU FOR THE ATTENTION!