Inspire Create Transform

UNIVERSIDAD EAFIT®

Why Some Control Technologies are Adopted in Industry and Others Are Not

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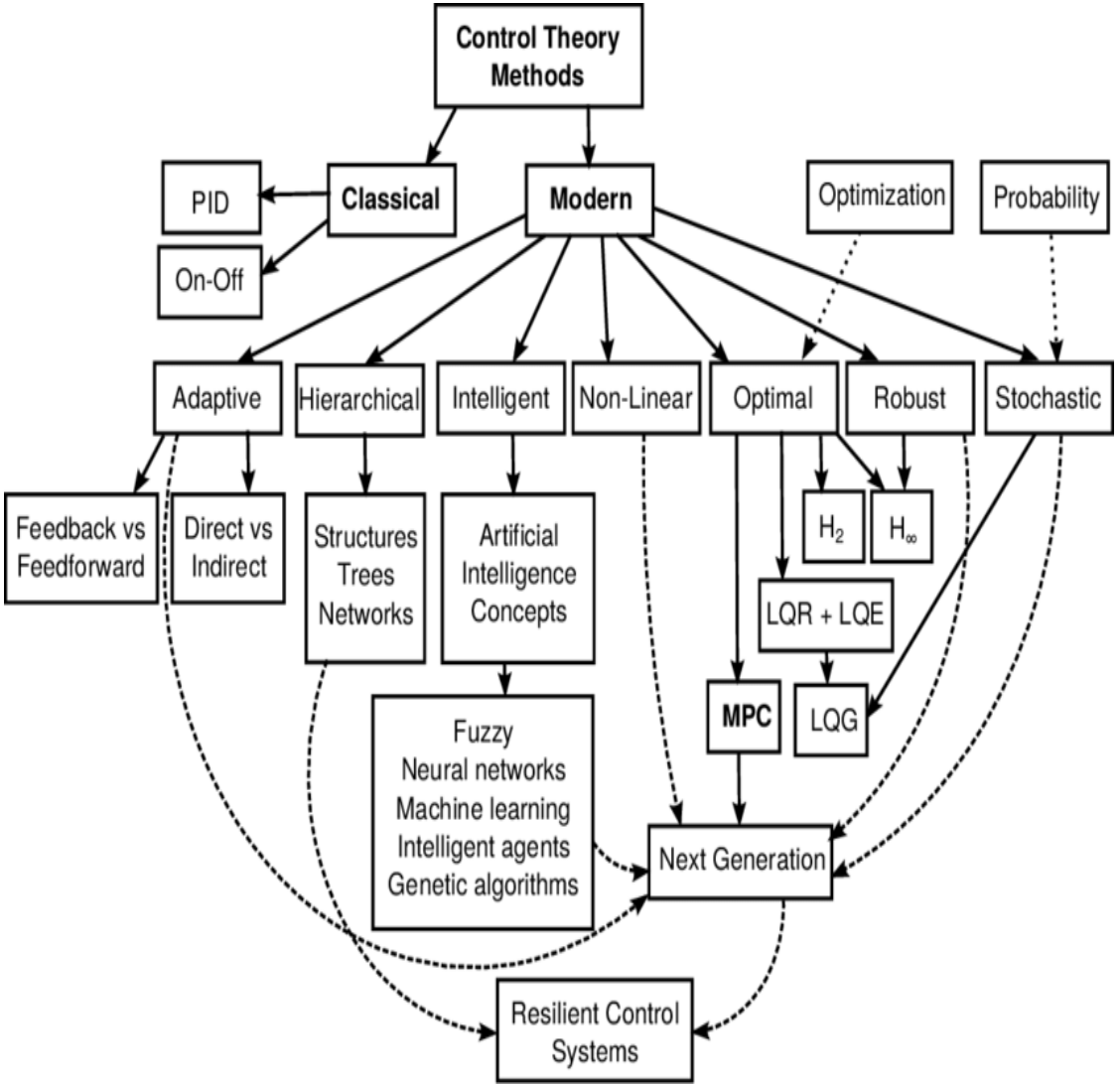
Outline

- Introduction
- Control theory
- Innovation & technology
- Probability of failure
- Why Advanced control
- Survey results
- Human in the loop
- Social and cyber-physical systems

Introduction

Control Theory

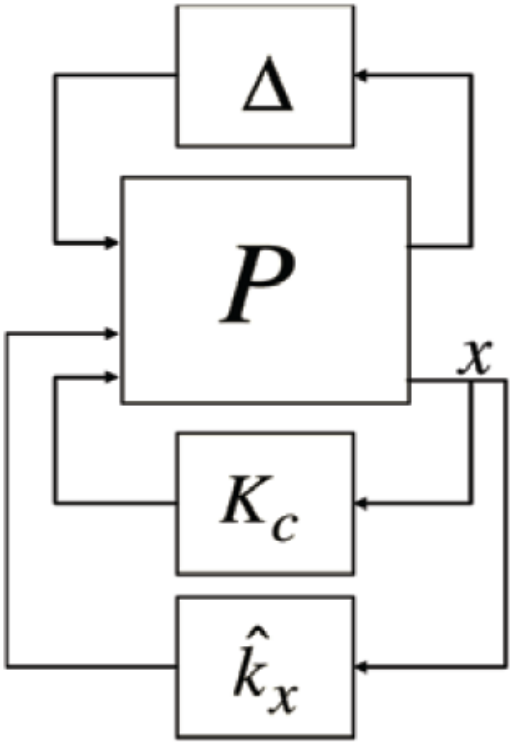


Drgoňa J, 2017

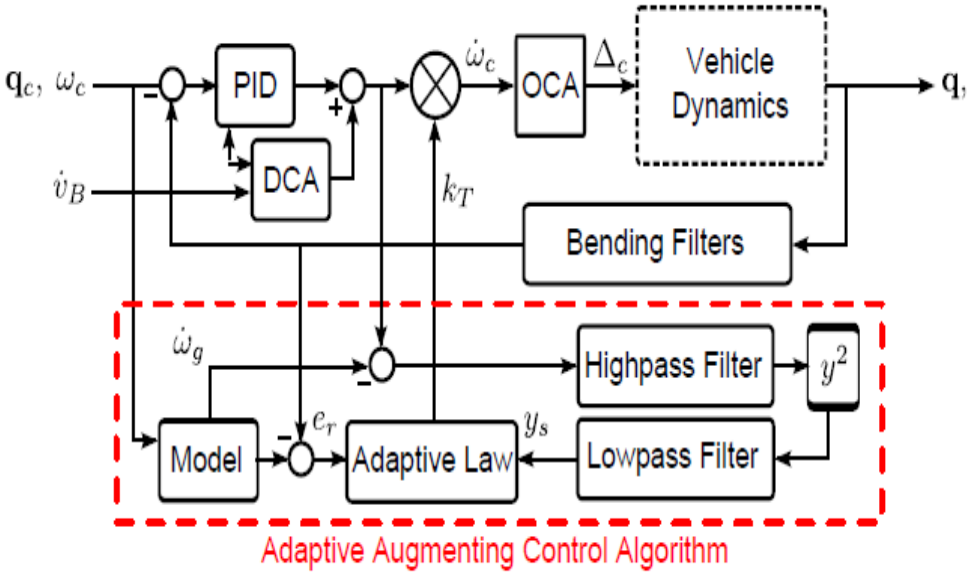
Control Theory

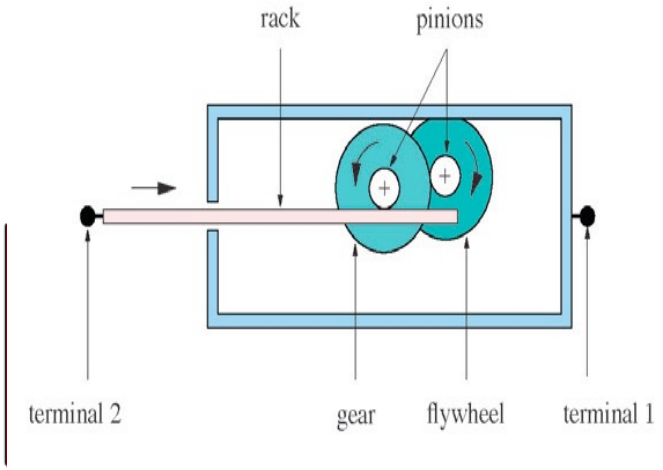
Shown at right is a control engineer's block-diagram representation of robust adaptive control. The nominal plant model P of the system under control (such as a missile) is subject to uncertainties Δ. The baseline flight controller K_c, designed using robust control techniques, is augmented with an adaptive controller. The state vector x is the input to both the baseline and adaptive controllers. The combination provides robust stability and performance over a substantially enhanced space of modeling uncertainties and can accommodate changes in the system under control.

JDAM

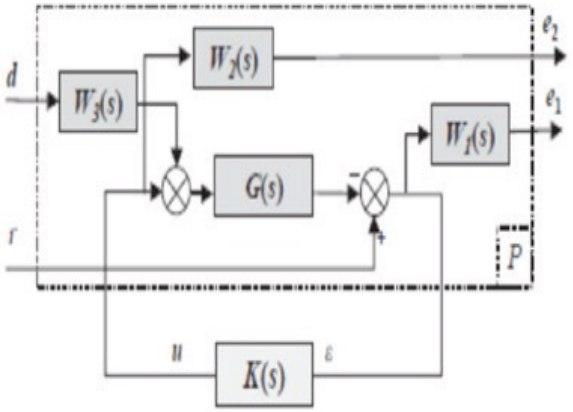


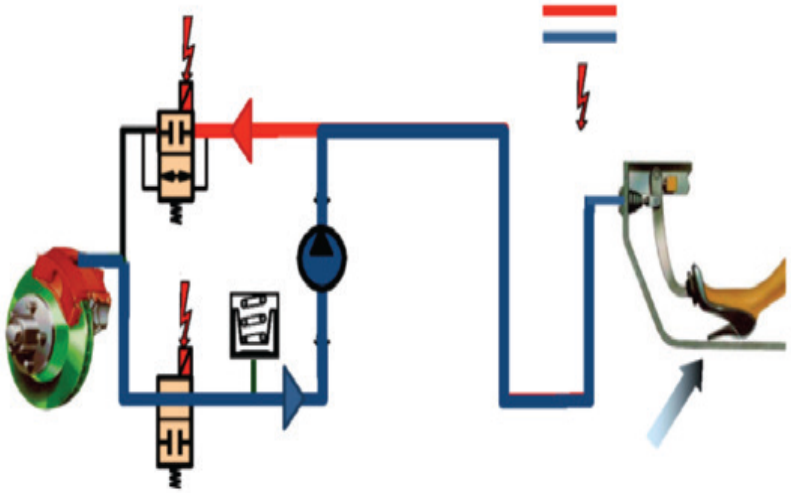
Control Theory





Control Theory





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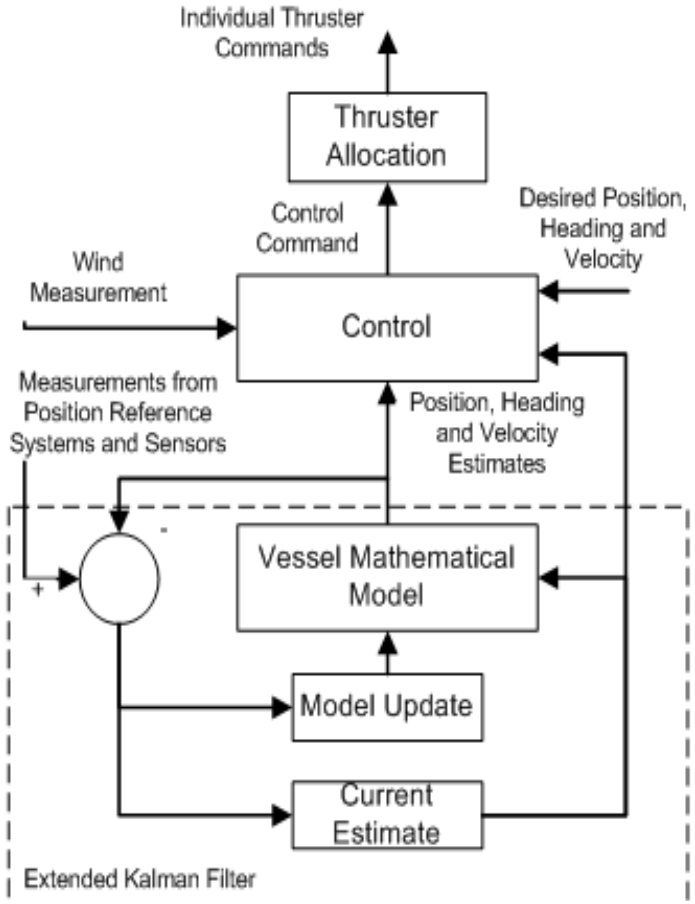
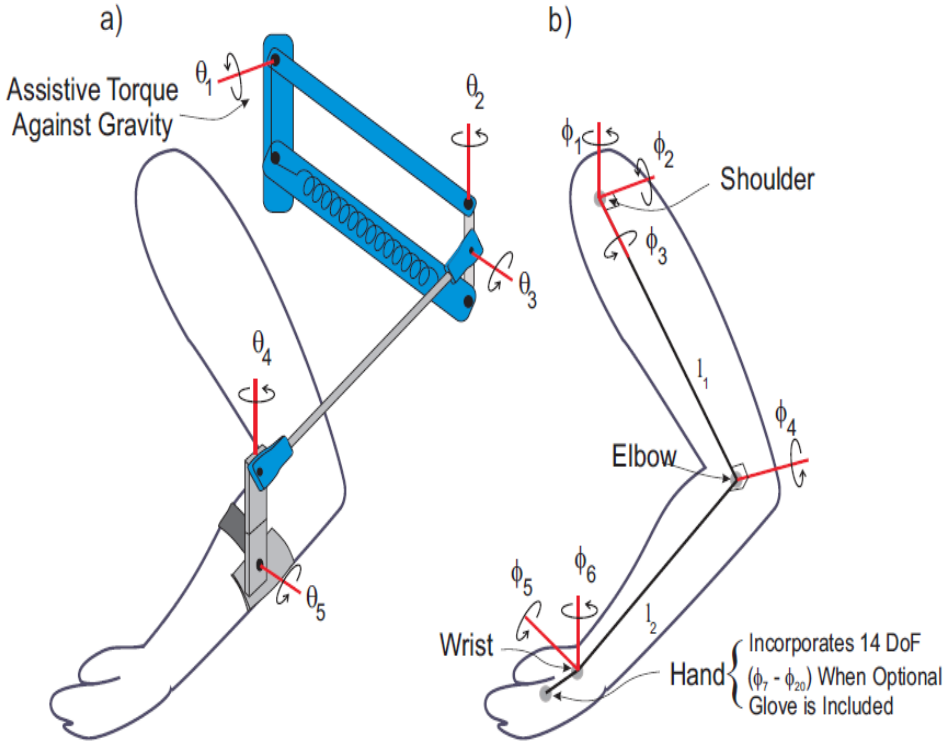
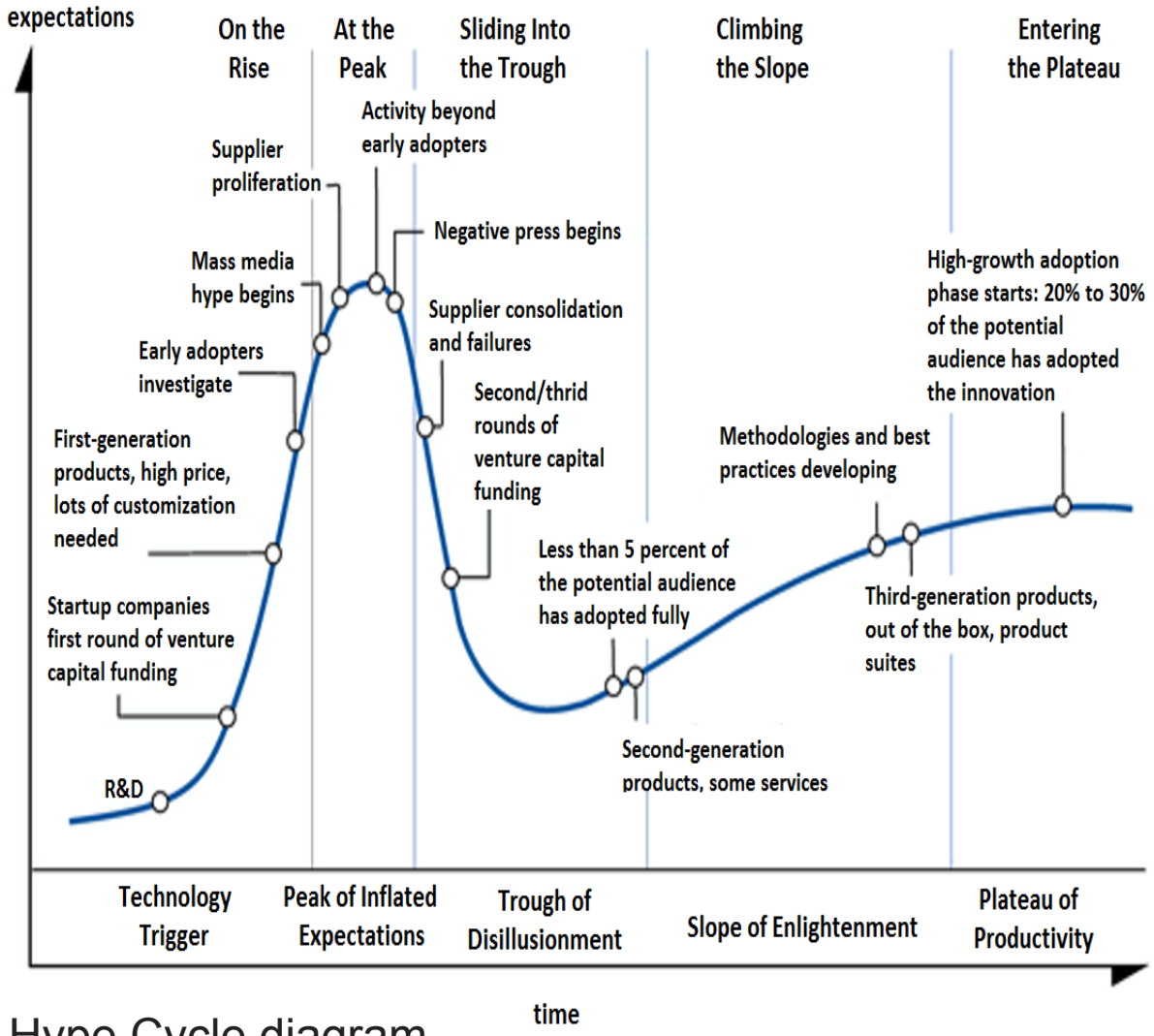


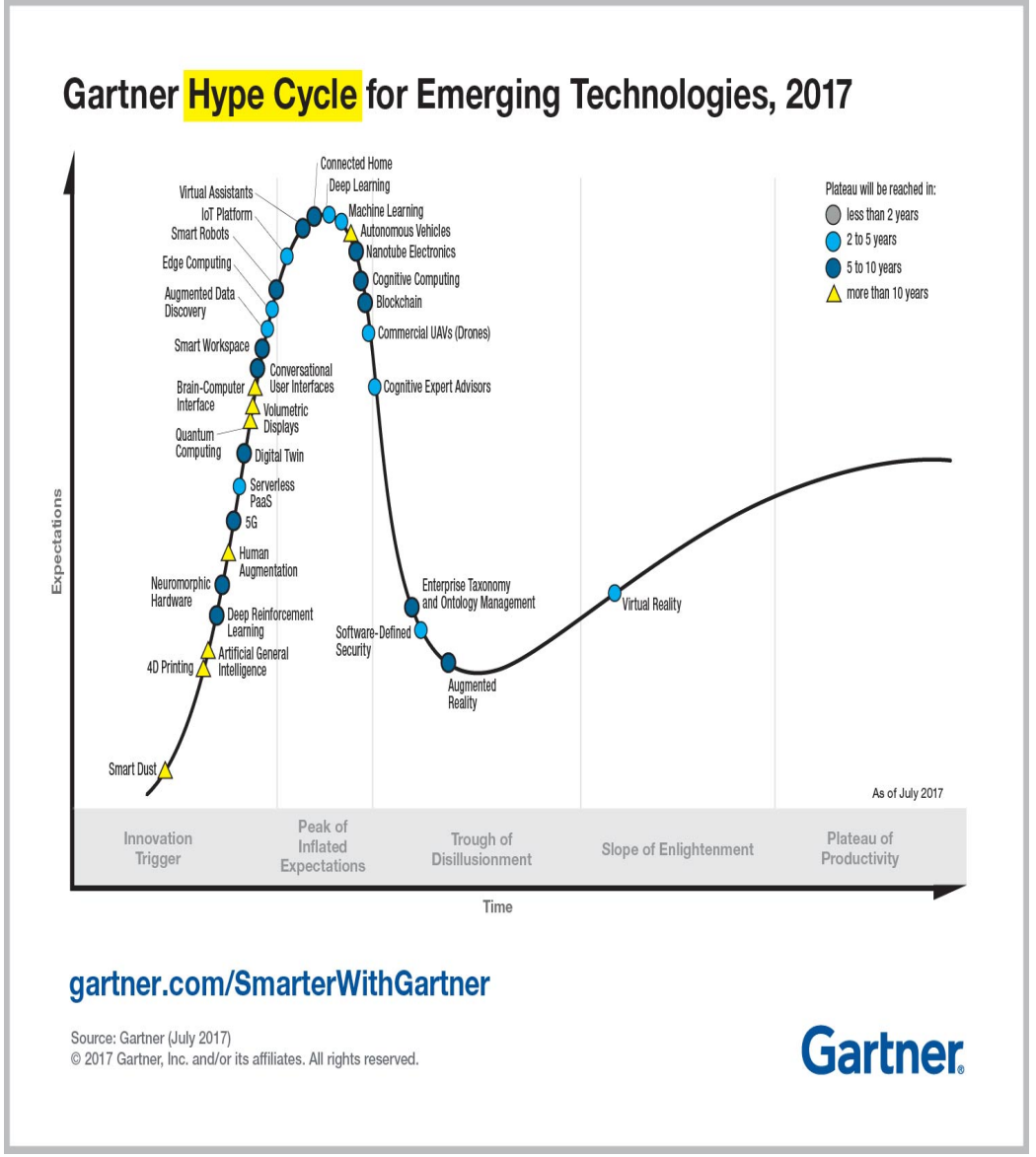


Innovation/ Technology



General Gartner Research's Hype Cycle diagram

Emerging technologies



Probability of Failure

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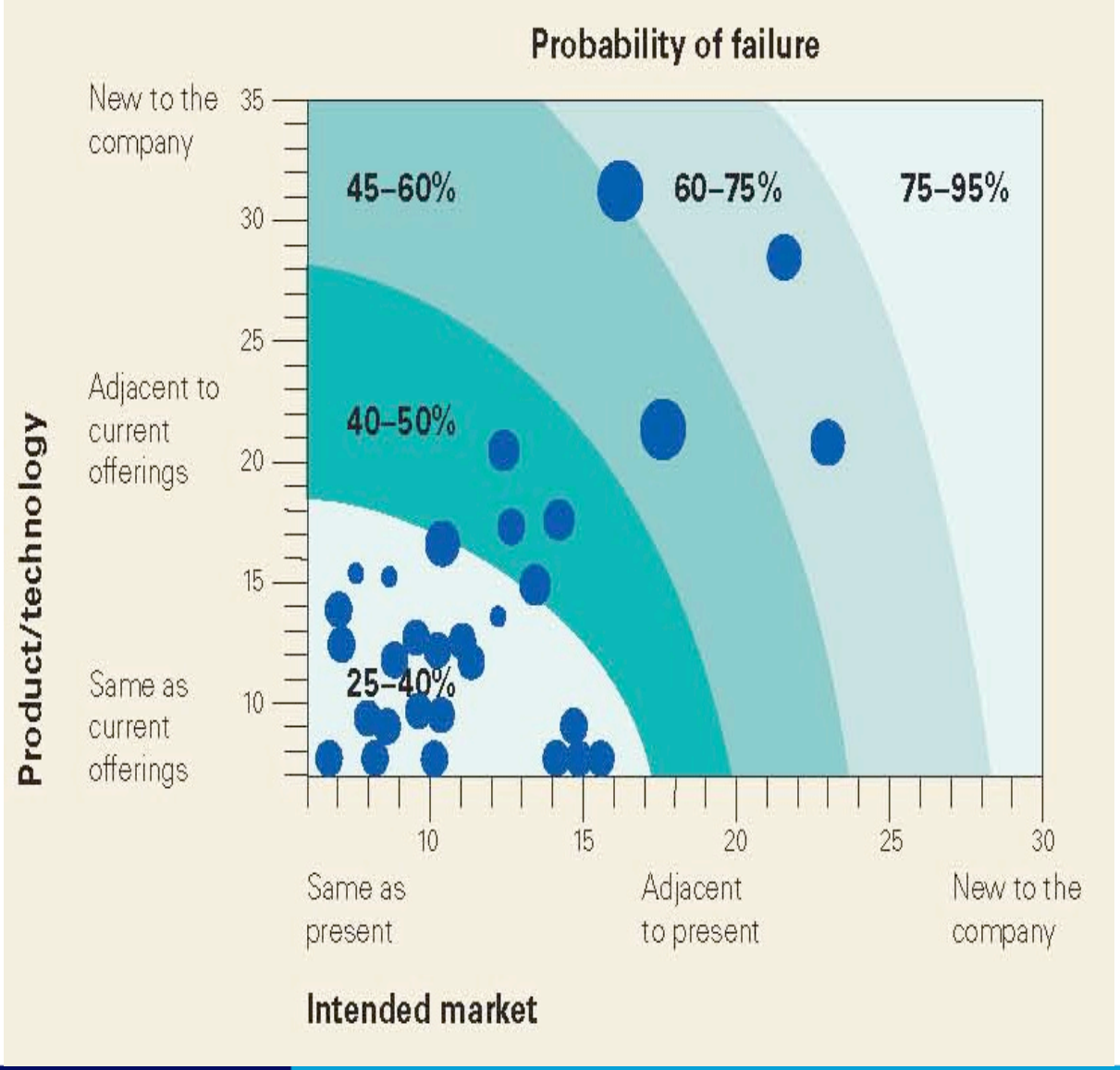
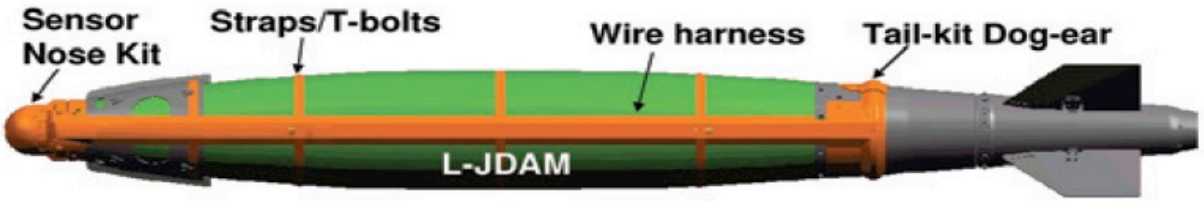


Why Advanced control

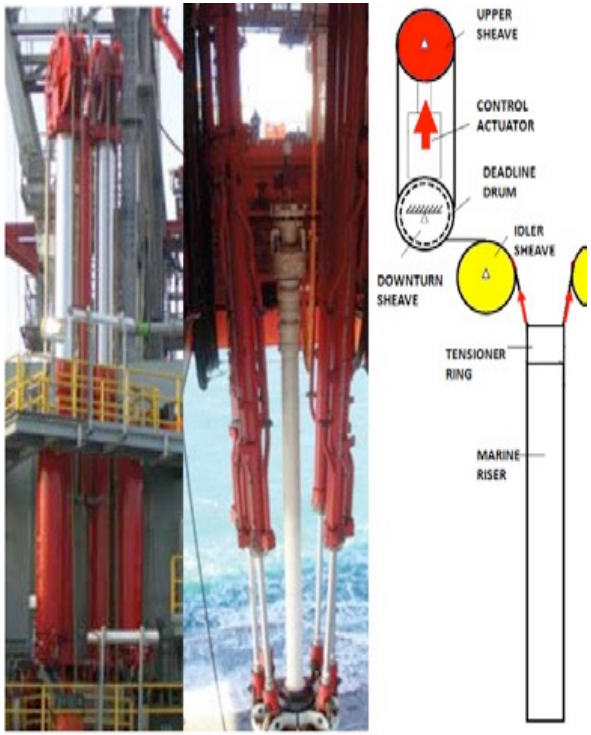


Laser-guided MK-82 scores direct hit against a moving target during tests at Eglin AFB.

Affordable hit-to-kill accuracy minimizes collateral damage; the photograph shows the hole made in the target by a (nonexplosive) weapon.

Why Advanced control

Why Advanced control



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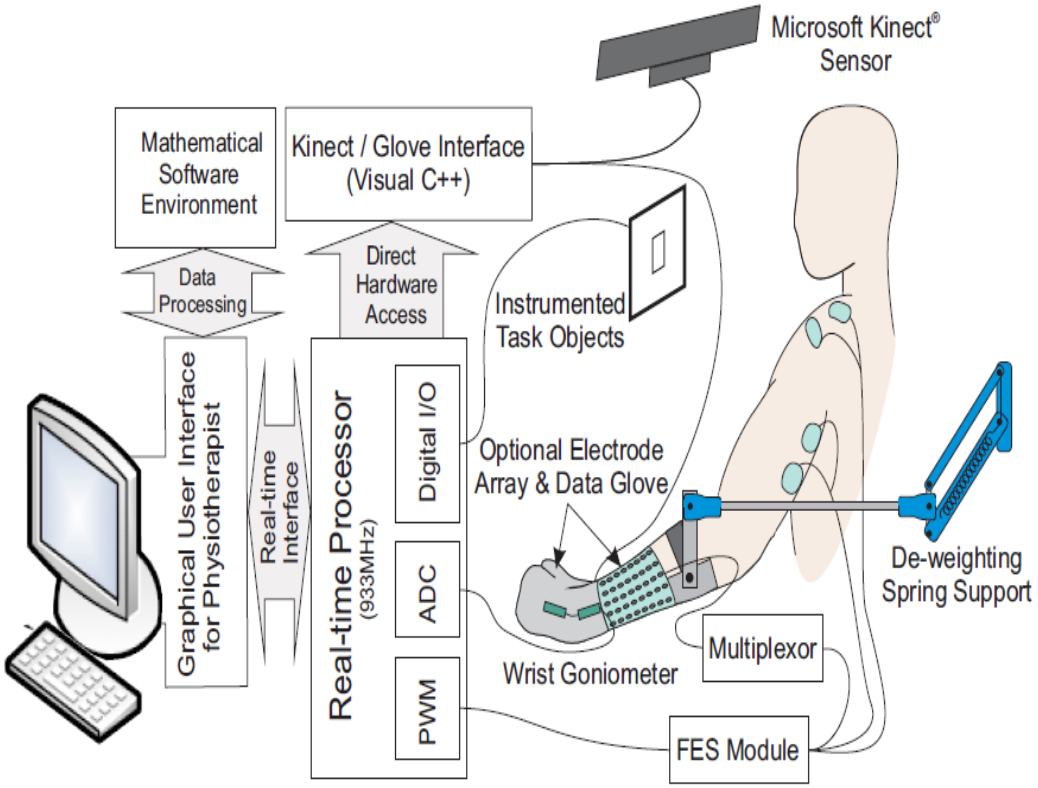
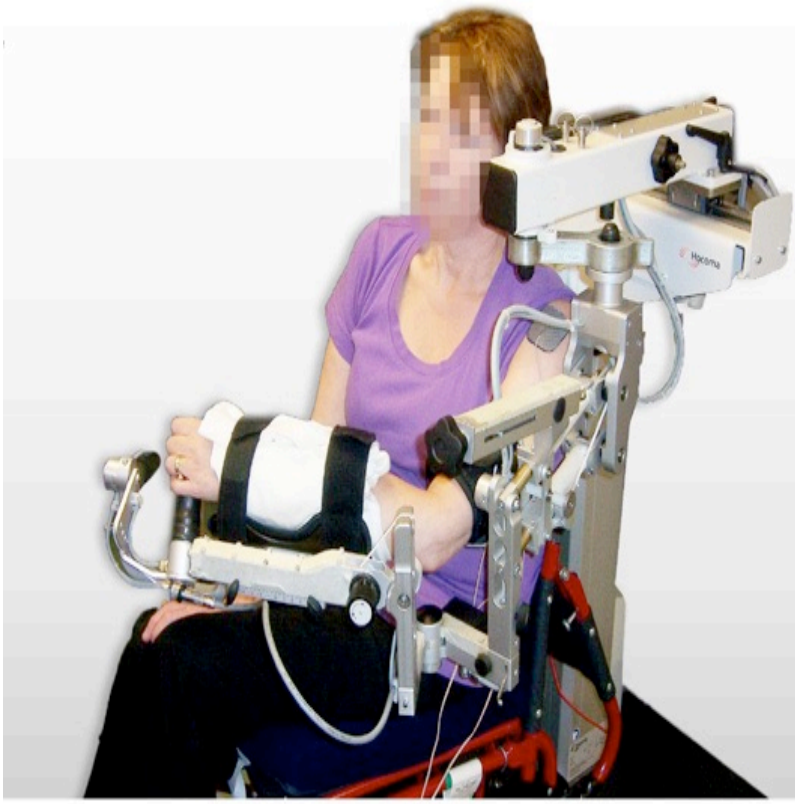
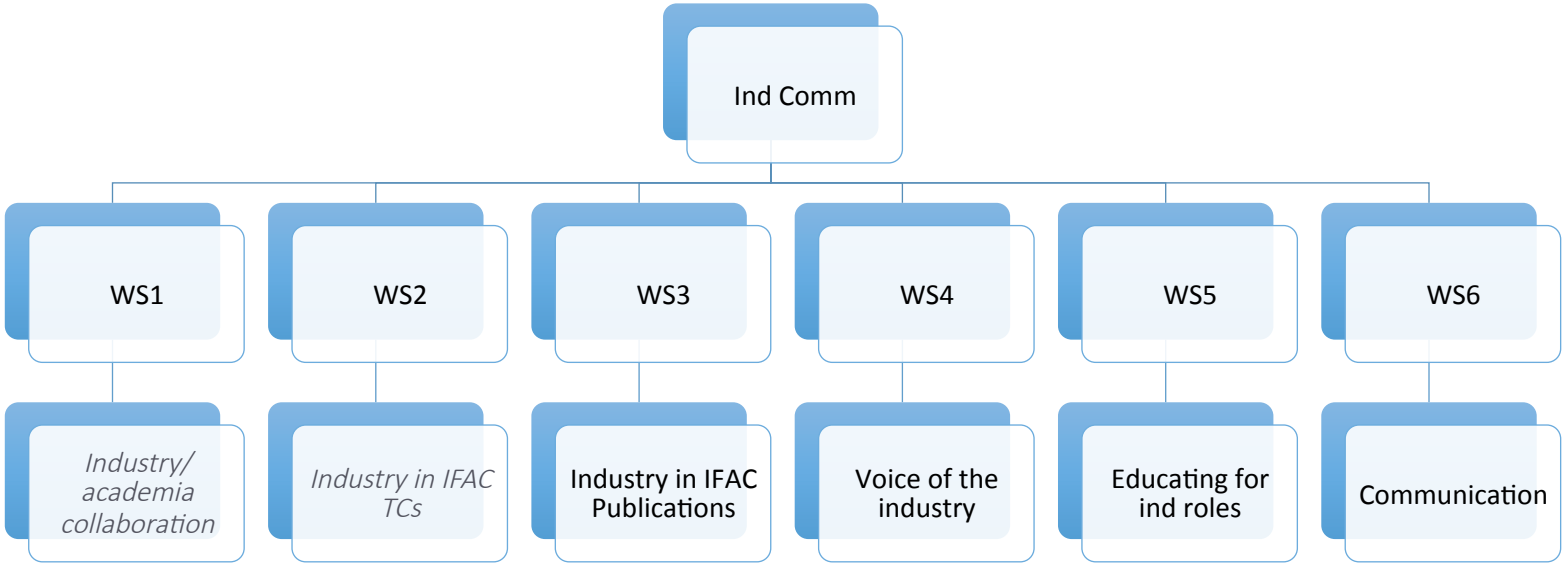




Why Advanced control

Survey results – IFAC Ind Comm

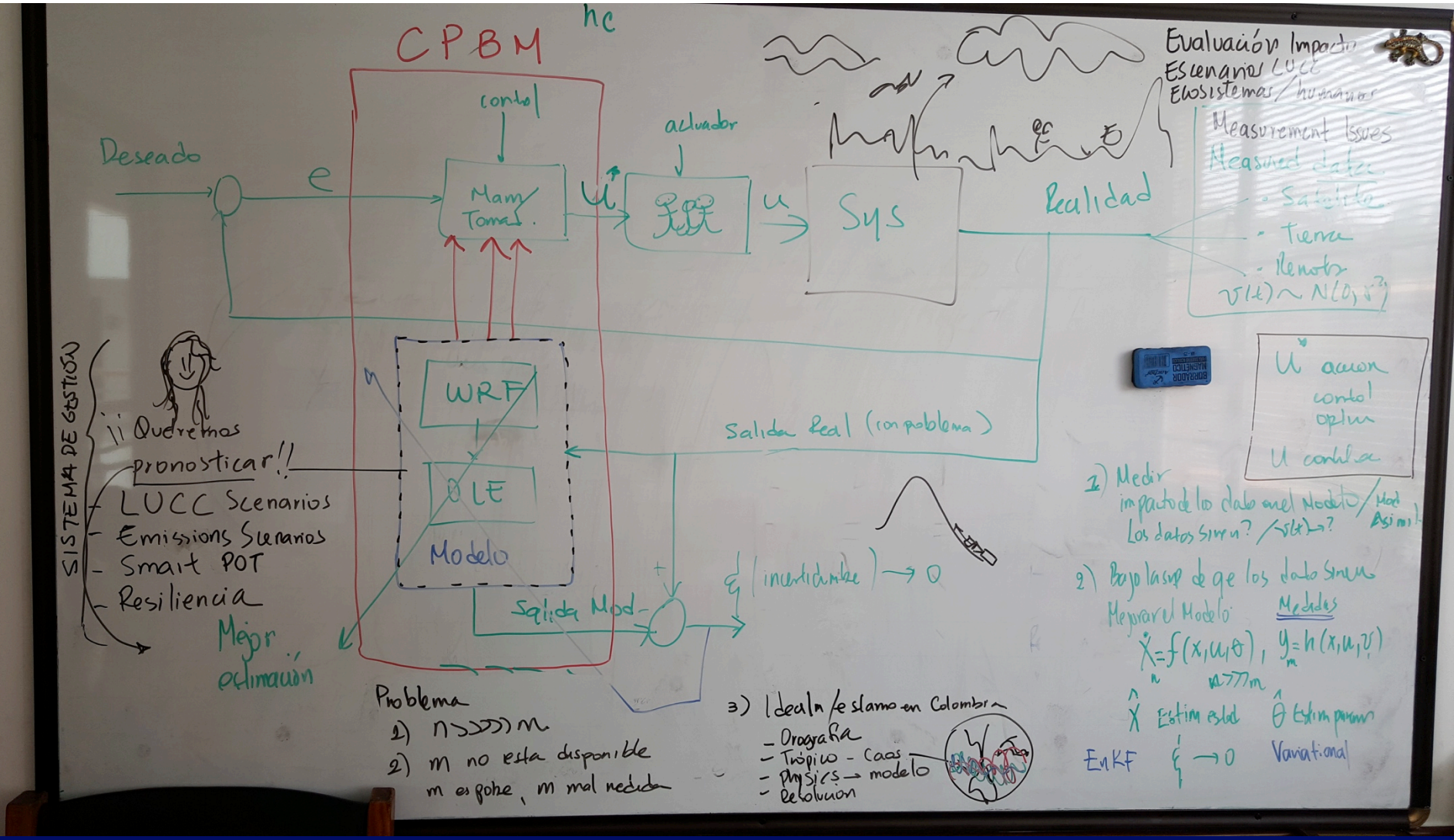


Rank	Control Technology	High-impact rating
1	PID control	100%
2	Model-predictive control	78%
3	System identification	61%
4	Process data analytics	61%
5	Soft sensing	52%
6	Fault detection and identification	50%
7	Decentralized/coordinated control	48%
8	Intelligent control	35%
9	Discrete-event systems	23%
10	Nonlinear control	22%
11	Adaptive control	17%
12	Robust control	13%
13	Hybrid dynamical systems	13%

Human in the loop

Geoengineering the Earth's Climate: The World's Largest Control Problem

Model Based Predictive Control Scheme



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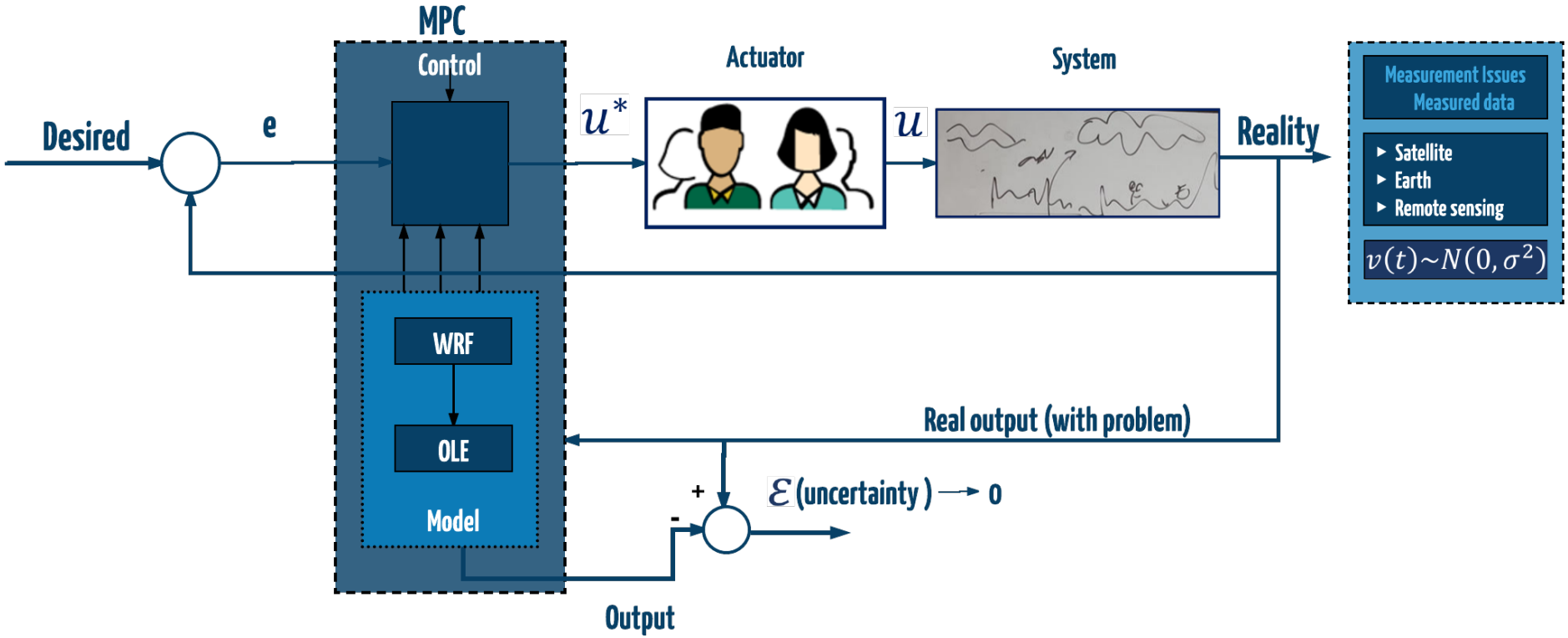
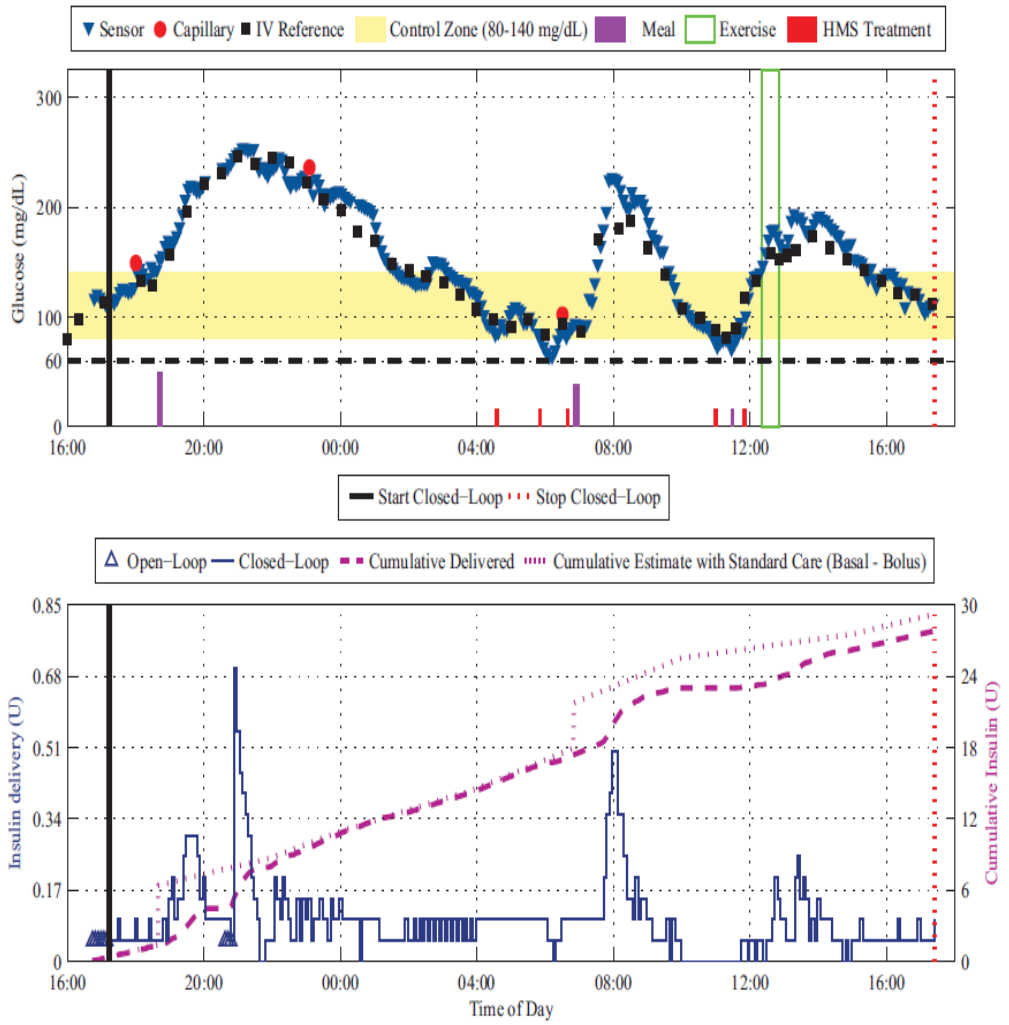


Social and cyber physical systems



Thanks

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