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CyberExcellence

Identification & classification of CPS

Journée des chercheurs – ULg 6 avril 2023

<https://cyberwal.be>

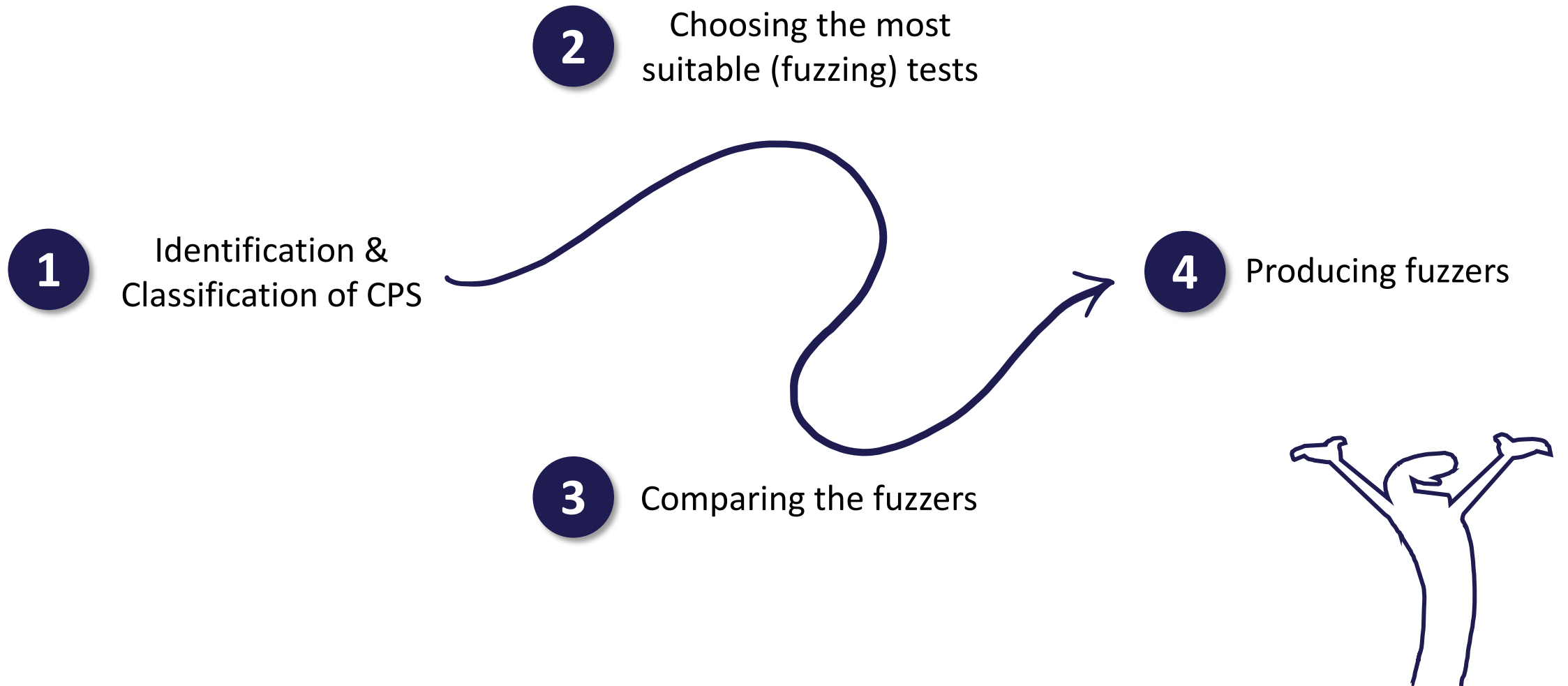
<https://cyberexcellence.be>

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Introduction



CPS in the literature

“Cyber-physical systems (CPS) are physical and engineered systems whose operations are monitored, coordinated, controlled and integrated by a computing and communication core. This intimate coupling between the cyber and physical will be manifested from the nano-world to large-scale wide-area systems of systems. The internet transformed how humans interact and communicate with one another, revolutionized how and where information is accessed, and even changed how people buy and sell products. Similarly, CPS will transform how humans interact with and control the physical world around us.”

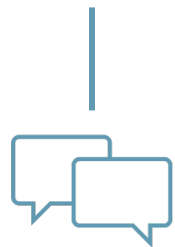
R. Rajkumar, I. Lee, L. Sha, and J. Stankovic, “Cyber-physical systems,” in Proceedings of the 47th Design Automation Conference, Anaheim California: ACM, Jun. 2010

CPS in the literature

CPS concept map from Berkeley



A feature-based ontology for cyber-physical systems - Tekinerdogan



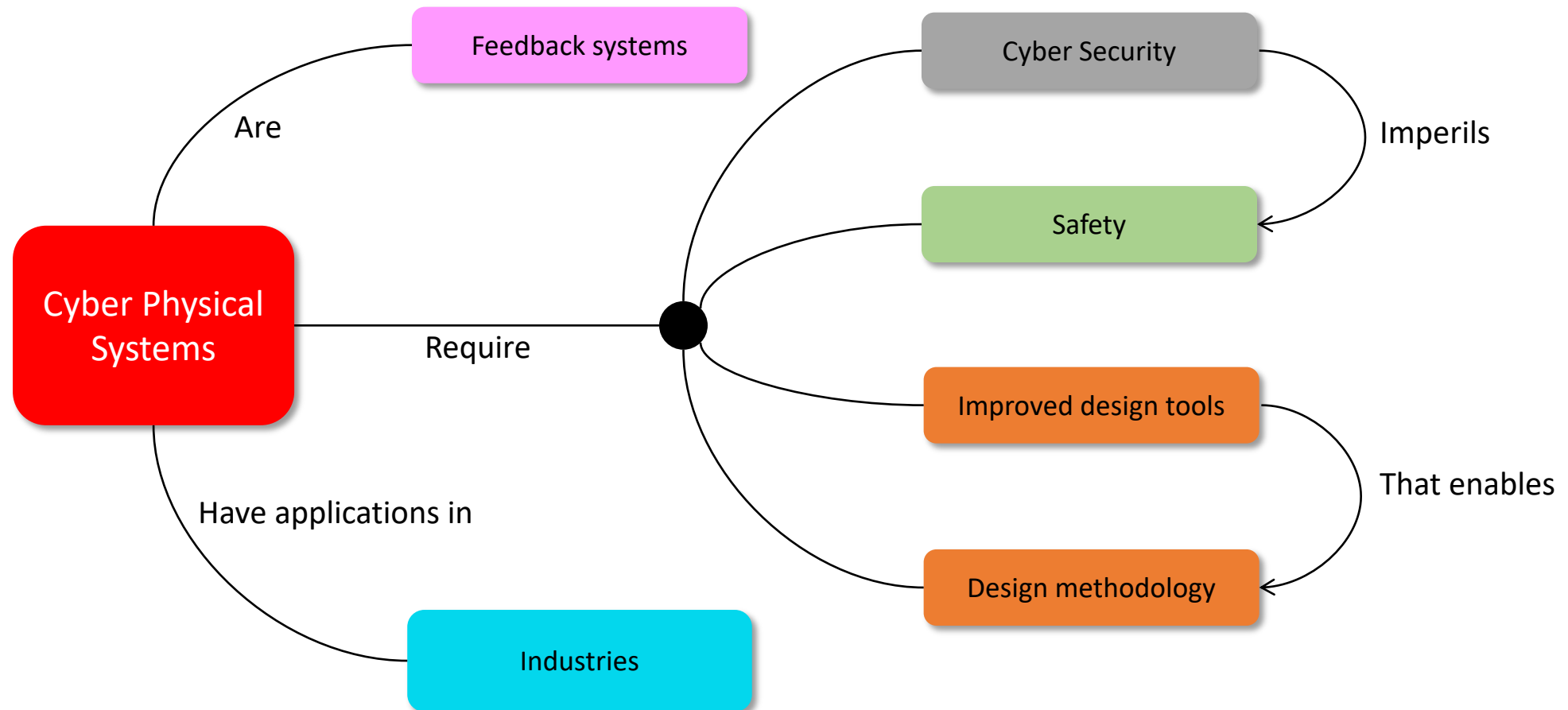
Workshop at NSF



Integrated Computing and Engineering Design – Fei Hu

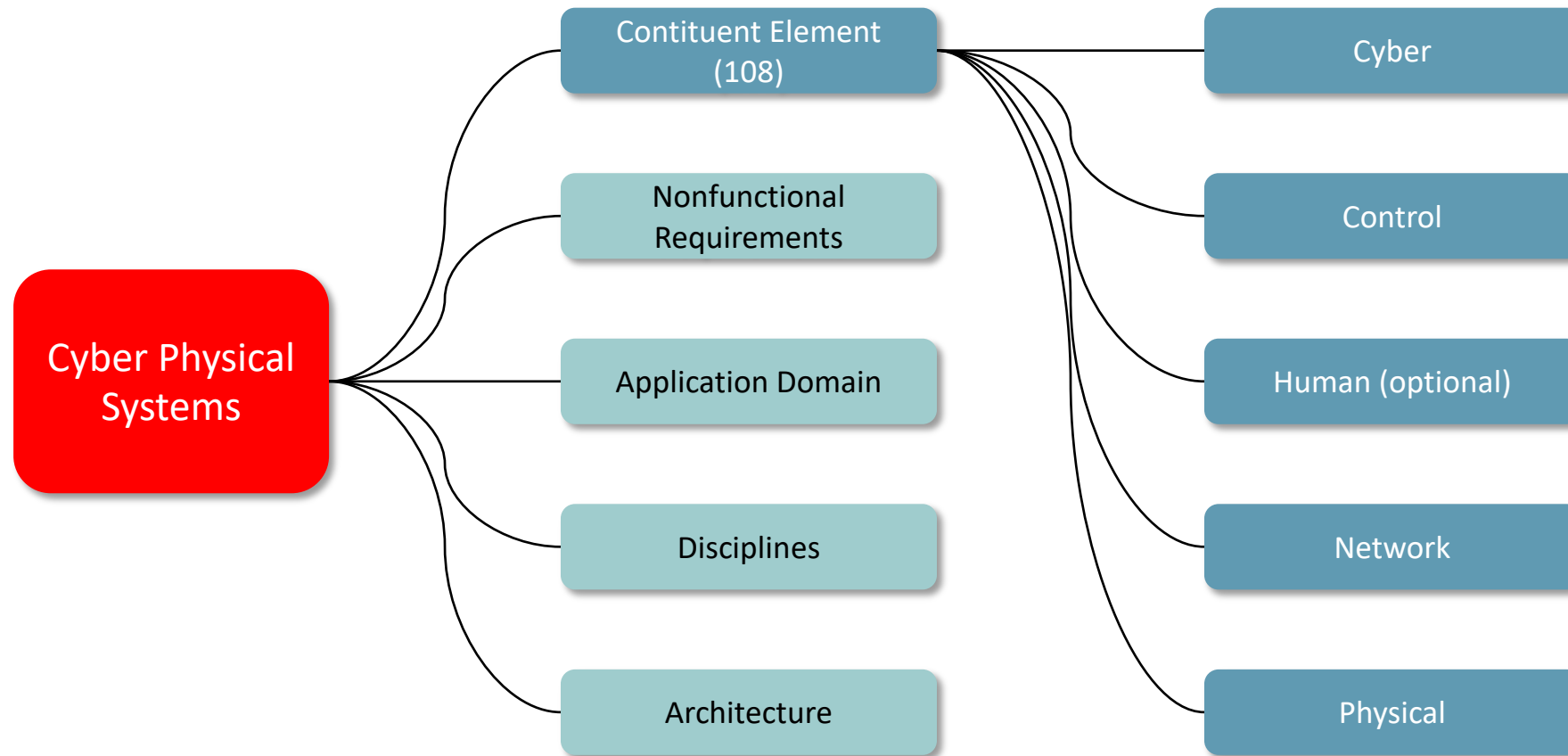
CPS in the literature

Concept map from Berkeley (shortened):



CPS in the literature

A feature-based ontology for cyber-physical systems (shortened):



CPS in the industry

Healthcare

Smart operation room

Smart medical devices



Agriculture

UAV, UGV, wireless sensors, data analysis

Increase the productivity



CPS in the industry

Healthcare

Smart operation room
Smart medical devices



Agriculture

UAV, UGV, wireless sensors, data analysis
Increase the productivity



Energy

Transition to smart grid management
Increase the efficiency



CPS in the industry

Agriculture

UAV, UGV, wireless sensors, data analysis

Increase the productivity



Energy

Transition to smart grid management

Increase the efficiency



Factory

Industry 4.0

Increase the efficiency

Increase the productivity

Individualisation




CPS in the industry

Energy

Transition to smart grid management

Increase the efficiency




Factory

Industry 4.0

Increase the efficiency


Increase the productivity

Individualisation



Aerospace

Ingenuity copter had to adapt to aerodynamics on Mars



CPS in the industry

Factory

Industry 4.0

Increase the efficiency

Increase the productivity

Individualisation



Aerospace

Ingenuity copter had to adapt to aerodynamics on Mars



Surveillance

HCI and surveillance systems in smart cities

Increase the security



CPS in the industry

Aerospace

Ingenuity copter had to adapt to aerodynamics on Mars



Surveillance

HCI and surveillance systems in smart cities

Increase the security



Automotive

ADAS and other technologies

Self driving and connected cars



CPS in the industry

Surveillance

HCI and surveillance systems in smart cities

Increase the security



Automotive

ADAS and other technologies

Self driving and connected cars



Housing

Sensors, actuators

Home control and monitoring

Support the residents



CPS in the industry

Automotive

ADAS and other technologies

Self driving and connected cars



Housing

Sensors, actuators

Home control and monitoring

Support the residents



CPS in the industry



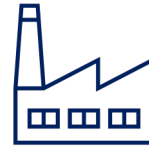
- Unmanned vehicles
- Interconnection
- Internet connection
- Autonomous
- Control and Monitor
- Adaptivity / Individualization

Differences



Literature

- Security during the design phase
- Continuous testing
- Regularly check fitness of installations
- Resource monitoring and segmentation
- Secure protocols
- Heavier workload for deployments
- Industry specific



Industry

- If it works, it does not need fixing
- Pushing new products
- Long homologation processes for devices
- Unfitness of IT processes to OT (audits)
- Open protocols
- Safety risks and Cyber Security risks collide
- Many different technologies working together for a single product
- Product specific

Challenges

Various application domains

Multiple and various components and technologies for a single “product”

Internal and external review for component introduction

Risk Analysis

IEC international standards and conformity

Narrow test windows

OT oriented systems

Test orchestration



CyberExcellence

By CyberWal

Projet CYBEREXCELLENCE (Convention n° 2110186)
funded by the SPW Recherche

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