

Practical solution to digital transformations

Training school

Friday

09:30-10:00



- What digital transformation means
- Why automate?
- Dimensions of digital transformation
 - Action: Machines and industrial robots
 - Sensors
 - Cybernetics
 - Artificial cognition/memory
 - Virtual robotics: Algorithms, conventional statistics, neural networks, machine learning, deep learning, artificial intelligence, business intelligence (ERP, MES, PLS), big data, etc.
 - Later: Andrea Capobianco Donadoma: Vision based systems
 - Later II: Viktor Almqvist: Remote ante and post mortem solution
 - Later III: Simone Belluco: From pathology, microbiology to epidemiology
 - Later IV: Lis Alban: Risk-based handling in relation to meat inspection



- Digitisation:
 - Documents from paper to pdf
 - Photos from Kodak film to pixels on a smartphone
 - TV from broadcasting electromagnetic waves to on&off in cables
- Digital transformation:
 - Sensors, AI, statistics, business intelligence, dashboards, augmented & virtual reality, etc
 - Digital technologies will not only exchange analogue technologies, but alter the way we work, stakeholders' natural roles, and division of labour (Zaoui & Souissi, 2020).
Example: Banking 1986 vs 2023



- The essence: Digital transformation comes (has come), we need to learn and contribute to the development
- Competence needs in Food Business Operators, Competent Authorities and academia
- Gather, structure, select and analyse data: INFORMATION for better decision-making
- It is not an app or a project – it is a working mode
- Constant need for development, maintenance and funds



- Increase productivity
 - Volume
 - Specialisation
 - Automation
- Access to industrial labour
 - Difficult worldwide
 - Occupational risk – absenteeism
 - Repetitive operations
 - Heavy work and strain
- Better quality
 - Objective
 - More stable



- Machines: Stupid
 - Usually simple tasks performed on repeat
 - Low level of sensors or cognition
 - Few degrees of freedom regarding movements
 - Several in the meat industry
- Robots stupid
 - More versatile
 - Several degrees of freedom
 - Usually one arm
 - Restricted human robot interface
 - Some cognition, but not necessarily
- CoBots – collaborating robots
 - Low forces, no dangerous tools
 - Close(r) interface between robot and humans
 - Some sensing
- General: More and more cognition being introduced
 - More complex material (meat)
 - More dynamic



- Distance
- Time
- Speed
- Force
 - Haptic (force feedback)
- Weight
- Temperature
- Spectroscopy: Electromagnetic waves (Microwaves, Near Infra Red (NIR), x-ray): sender + receiver: measure change in frequency, amplitude or phase.
- Sound: Ultra sound: simple echo e.g. doppler to 3D imaging



- Vision: visible spectra (BW & RGB), infra red (thermosensitive), x-ray (CT), magnetic resonance (MR)

- 2D pictures: Black and white: 3 data per pixel
- 2D pictures: Colour: 6 data per pixel
- 3D pictures: Black and white: 4 data per pixel
- 3D pictures: Colour: 7 data per pixel

- AI: 2D BW = shelfware
- AI: 3D C = theoretically OK
= struggle with datapower

2D pixel:

X
Y
Hounsfield
(greytone)

2D pixel:

X
Y
Greytone
R
B
G

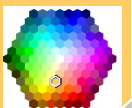


3D voxel:

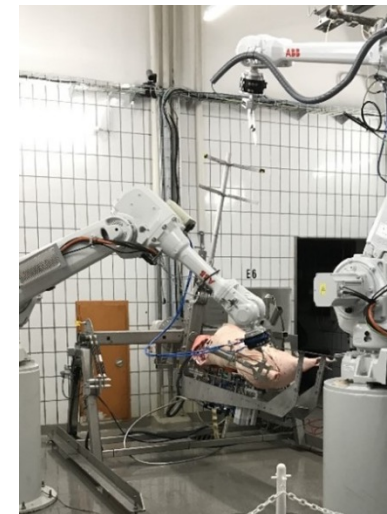
X
Y
Z
Hounsfield
(greytone)

3D voxel:

X
Y
Z
Greytone
R
B
G



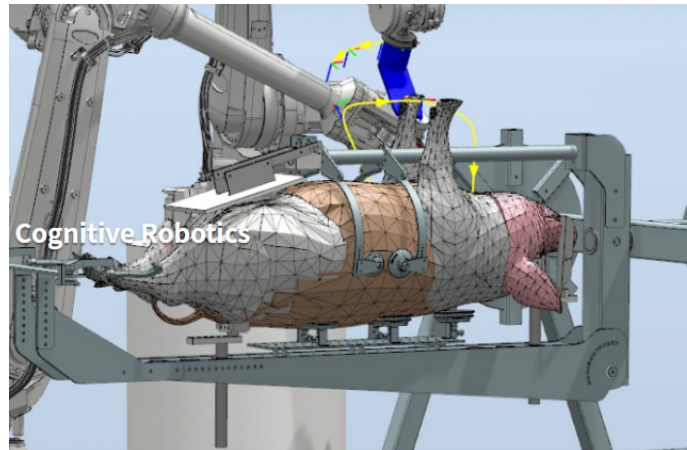
- “the science of control and communications in the animal and machine.”
This definition relates cybernetics closely with the theory of automatic control and also with physiology, particularly the physiology of the nervous system.
- Programming deterministic actions (blind)
- Introducing local sensors: Programmable Logic Controller (PLC)
- Introducing distant orders
- Introducing on the flight data processing
- Introducing distant orders to different collaborating limbs (cameras/sensors, robot, tool)
- Orchestrated dynamic automation (wow!)

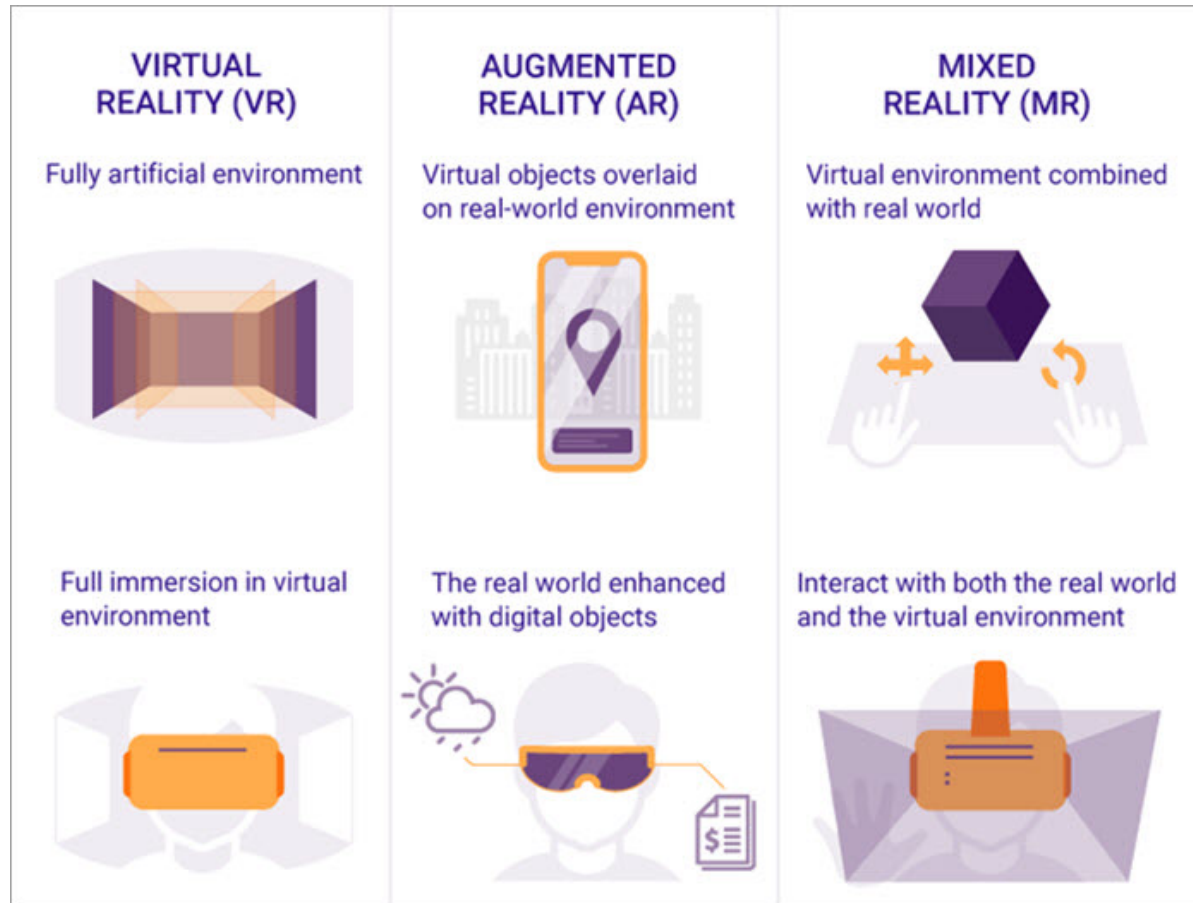


- Doesn't really exist (being discussed)
- An example from RoBUTCHER:
 - "Butcher's eyes": 3D camera see the external surfaces
 - "Butcher's knowledge on anatomy": 3D atlas of CT scanned pigs
 - Butcher's brain: Algorithms to match "hand with glove"
 - Butcher's feeling: Force feedback or spectroscopy in tool (knife)
 - Butcher's decision making: Heavy computer
 - Butcher' progression: Recalculations on the fly
- Memory (stupid) and strict "simple" calculations is the key of computers



A digital twin can be used to optimize proposed and imagined operational changes in a 'safe' virtual environment without running the risk of causing unforeseen and potentially disastrous consequences in production. Simulating changes virtually can then be replicated in the real world if proven of value and effective. Such operational changes are not limited to manufacturing operations, but can also be used in the context of individual business or authority processes in all sectors.





Thank you for the attention.
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