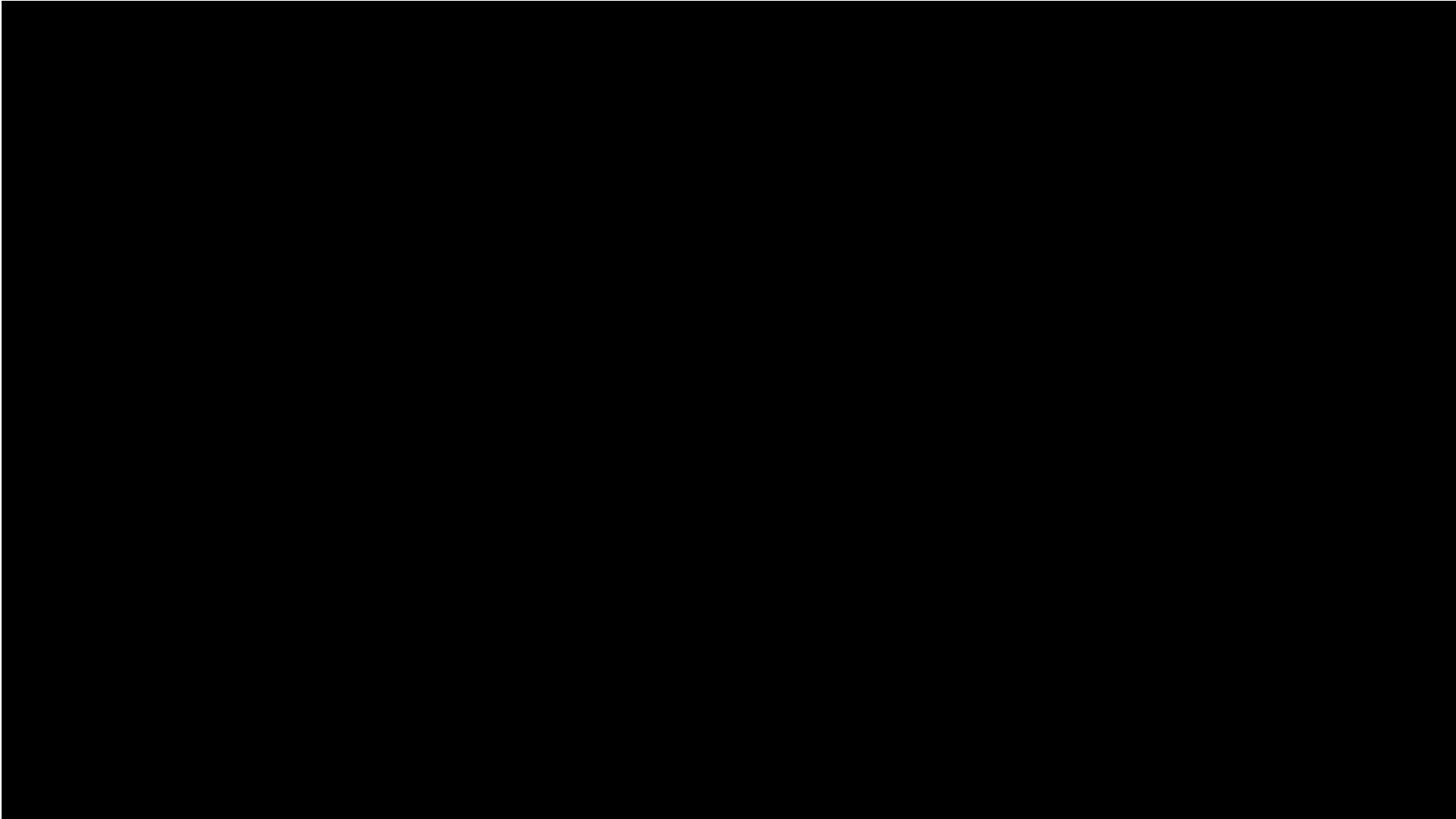


Agro Food Robotics - overview

February 5, 2019 Erik.Pekkeriet@wur.nl





Wageningen worldwide

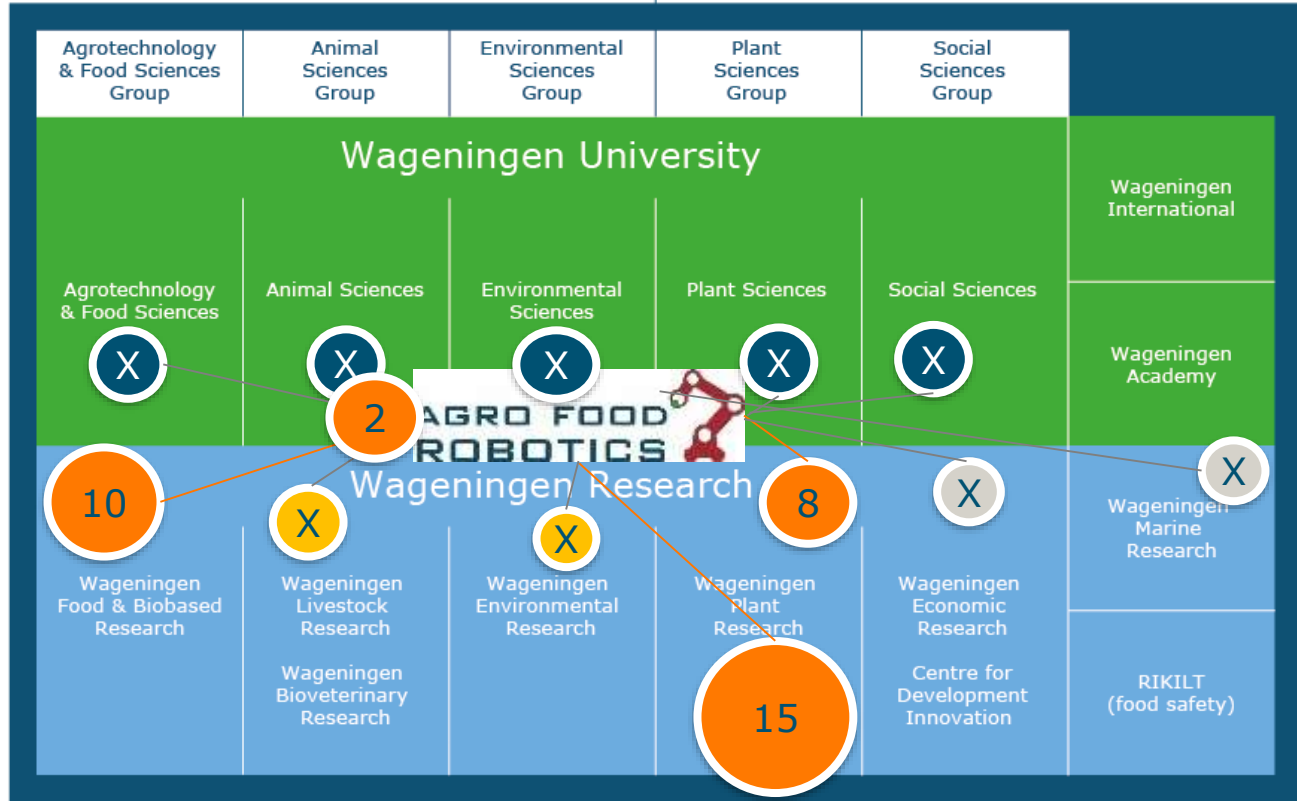
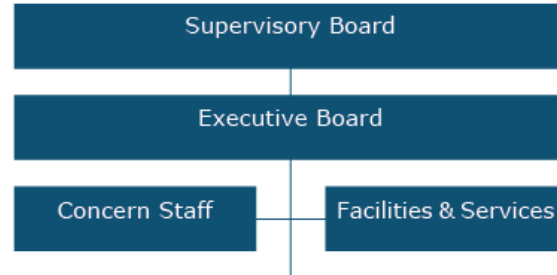


Wageningen University & Research is active in many regions of the world. From China to Chile and from Ethiopia to the Arctic, we work together with partners in research programmes.



Team Agro Food Robotics





AGRO FOOD ROBOTICS



Optimal breeding performance



More & better with less resources



Hands-free production



Objective quality control



Smart & high quality food processing

Vision

Learning
(AI)



Spectral

Robotics

AGRO FOOD ROBOTICS



Optimal breeding performance



More & better with less resources



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Learning
(AI)



Spectral

Robotics

Drivers to produce food using robotics, IT & vision



Challenges & opportunities

- Huge market
- Flexibility in batches and runs
- Hygienic issues (fresh vs candy, frozen & bakery)
- Harsh labor conditions
- Variability in shape, colour, stiffness and internal features

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Huge Market

- 2 billion farm workers
- 1 billion people are picking natural food products at harvest
- Most agricultural products are handled at least twice at harvest and at packaging
- Storage often done in binns, crates, cubic meter boxes, containers
 - Also product parts (meat processing)
 - Ideal for storage space, cooling, air treatment, transport, track and trace
- To compare 200 million people worldwide are working in industry

Flexibility in bathes and runs

- Seasonal
- Continental
- Fresh = unpredictable in quality & timing
- Variation in logistic streams (1 of 3 trucks= A/F)
- 500 new products/year in supermarket
- Retail pressure
- Targeting consumer behaviour (Christmas, mothers day, Easter, Kingsday)

KBBE.2012.2.3-03:

Call: "Automation in food packaging systems"

- Food industry is facing:
 - high numbers of food products and varieties and packaging types
 - small batches and small runs
 - need for operational flexibility



Challenges

- Huge market
- Flexibility in batches and runs
- **Hygienic issues (fresh vs candy, frozen & bakery)**
- Harsh labour conditions
- Variability in shape, colour, stiffness and internal features

Hygienic issues (fresh vs candy, frozen & bakery)

- It's a science, different standards (farm, fresh, meat, processed)
- Typical in food processing 2 shifts of production, one shift cleaning
- Closed rooms, no daylight, clothing and washing corridors
- Machinery need to be washable, resistant against hot water and aggressive foams, no organic matter should be found after cleaning, material list that is approved
- If you are not familiar, do a workshop

Challenges

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- **Harsh labour conditions**
- Variability in shape, colour, stiffness and internal features



Labour conditions

- Shoulder to shoulder
- Cold and wet environment (preferably 1-4 °C; no oxygen)
- Contamination risks and zoonosis
- Clothed as an astronaut (ear, clothing, hair, gloves, rubber shoes)
- Human mistakes
- Tracking and trace issues
- Heavy, repetitive, short cycle

Challenges

- Huge market
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- **Variability in shape, colour, stiffness and internal features**

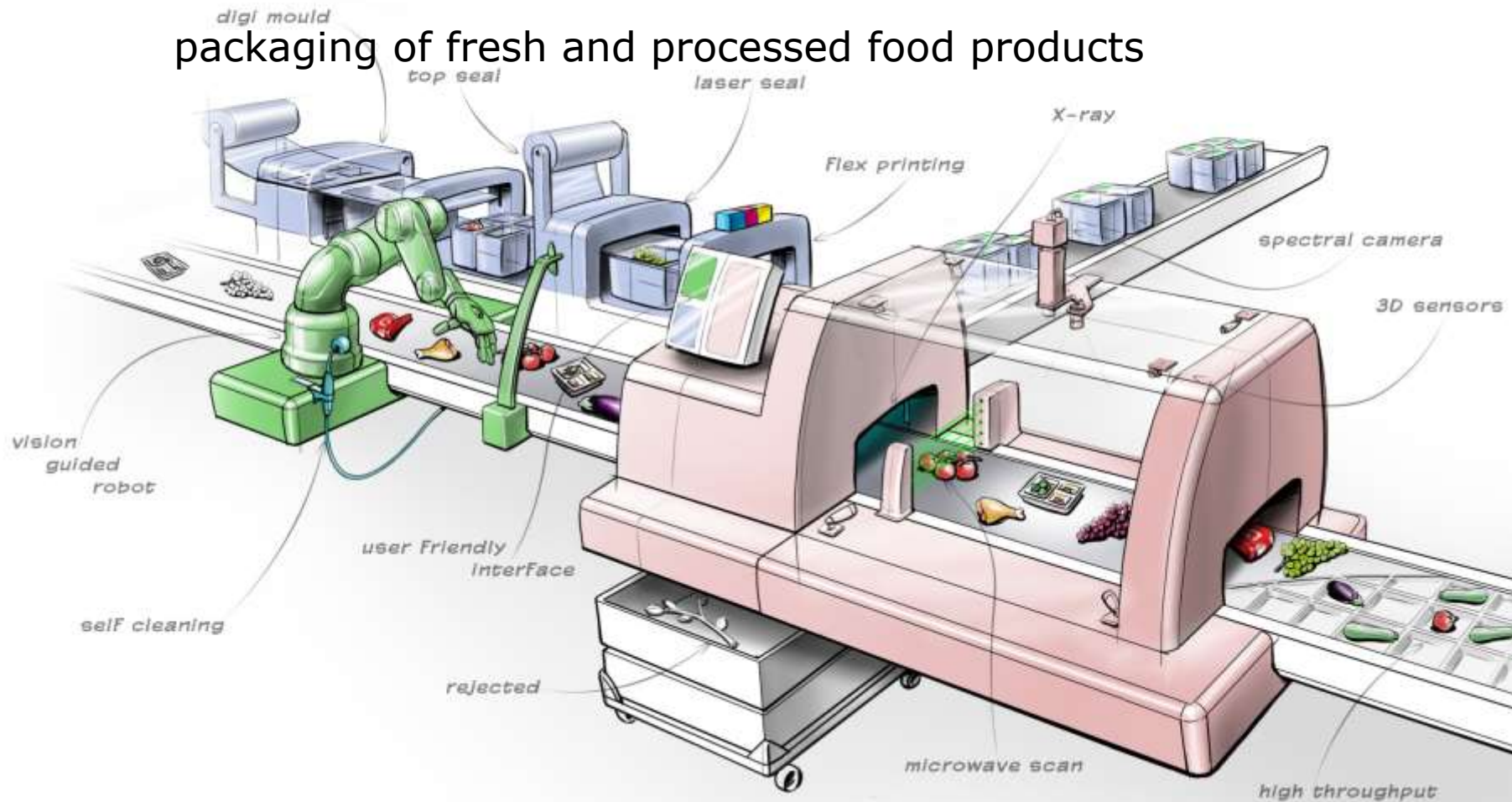
Robots for food

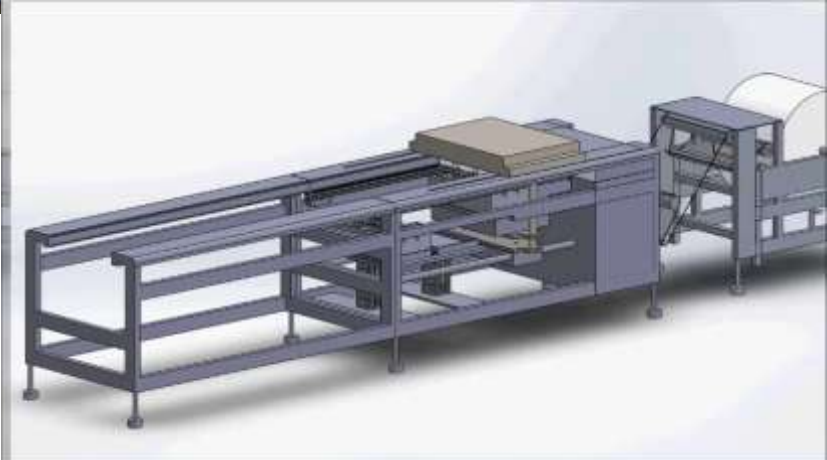
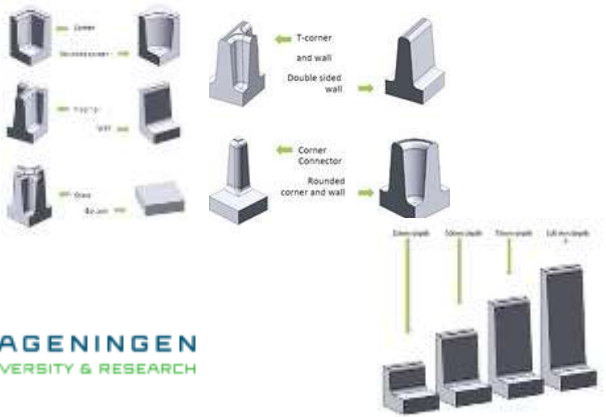
- Flexible
- Cleanable
- Minimal footprint, minimal machinery
- Robust and reliable
- Wheel in - wheel out
- Fast (typical 1-2 sec/ piece)
- To be operated by foreign low educated personnel

Robots tasks in food

- Bin picking
- Packaging
- Specials (de-coning, slaughtering/cutting, binding, etc)

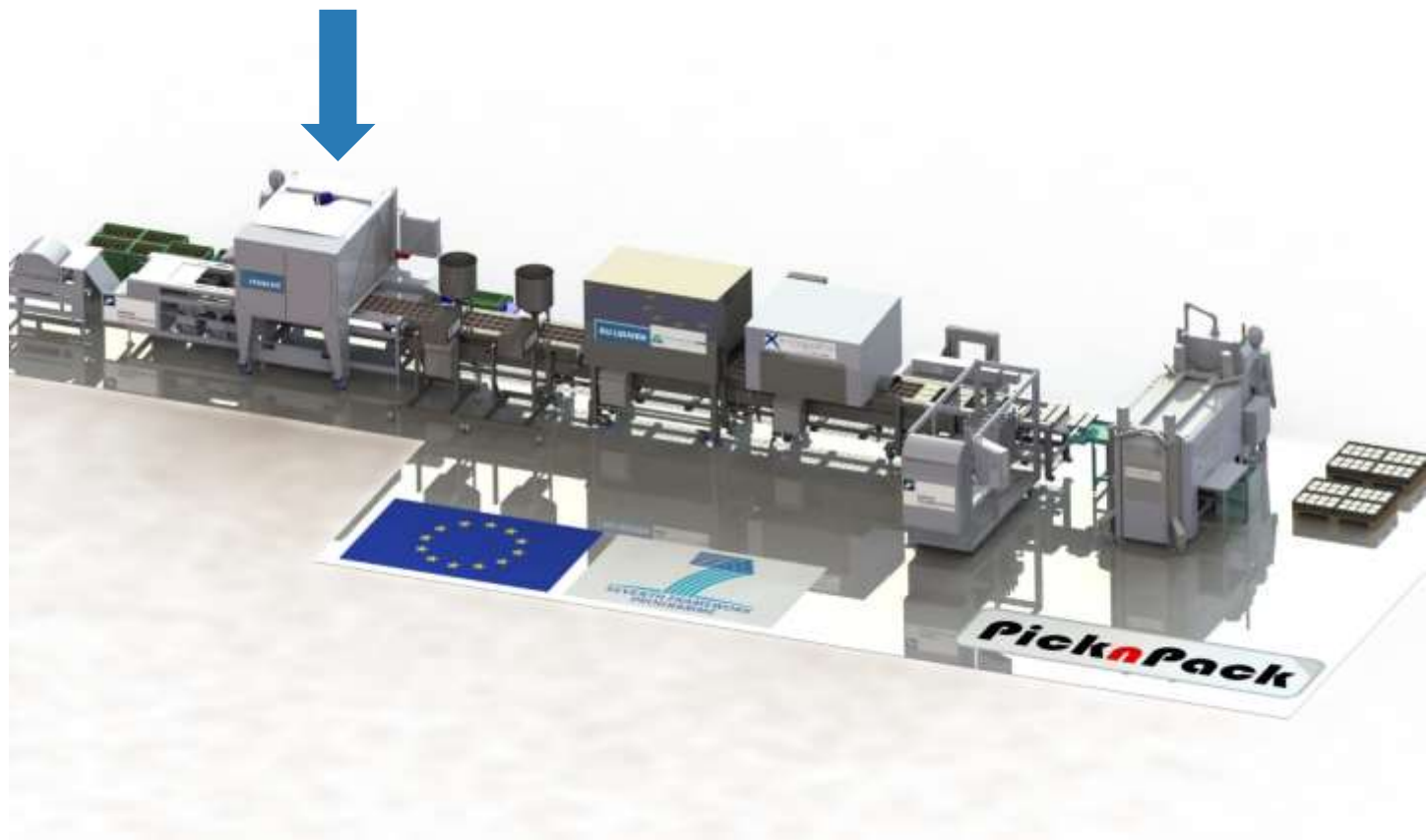
Flexible robotic systems for automated adaptive packaging of fresh and processed food products





Benefits

- Flexible sizes on every grid 40x40mm blocks
- Low cost mould
- Fast change over in seconds
- Fast and cheap designing lead time
- Short time to market
- Reliable forms





Robotic Bin Picking of Chicken Breasts Project "PicknPack"



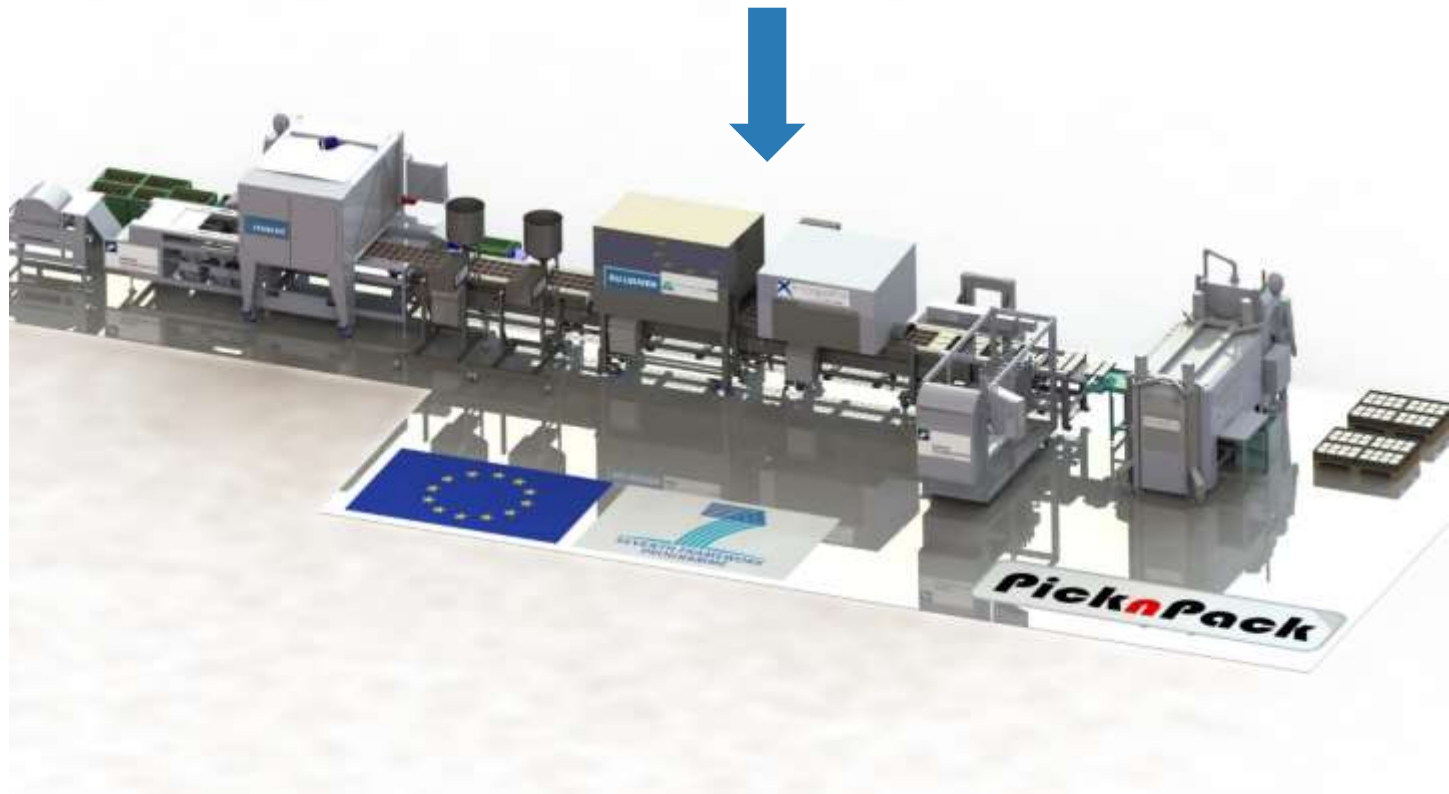
For more info, contact:
Gert.Kootstra@wur.nl

LACQUEY
Robot grasping solutions



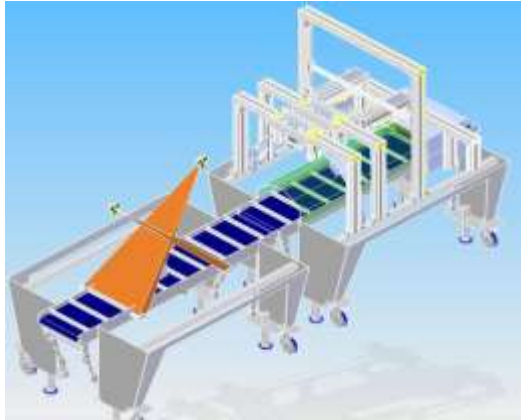
WAGENINGEN UR

For quality of life



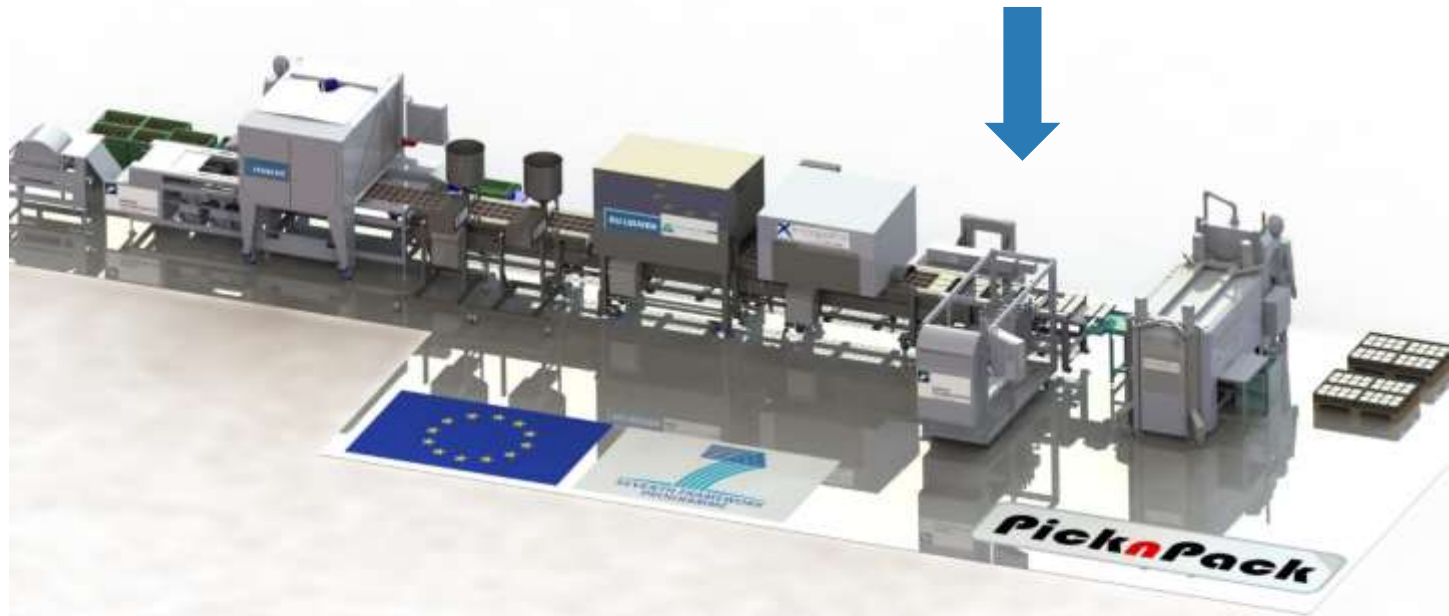
Quality parameters

- Combination of sensor information to estimate quality



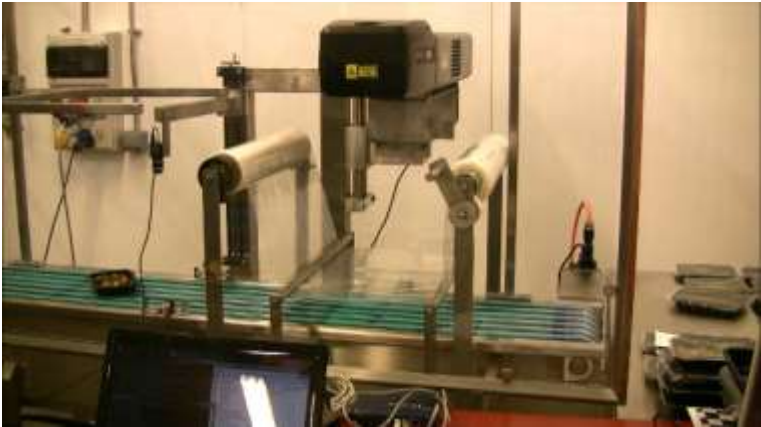
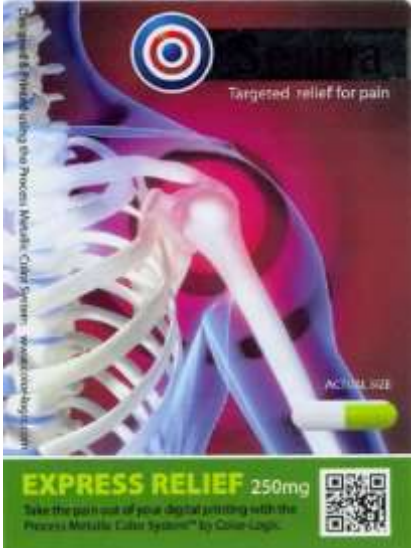
1. @ Object level:
Quality properties
2. @ pixel level:
Virtual images

Property		Measurement device
Vine tomatoes		
1	Maturation stage	Hyperspectral + RGB
2	External defects	Hyperspectral + RGB
3	Internal damages	3D X-ray
4	Colour	Hyperspectral + RGB
5	size	RGB + 3D
6	Shape	3D
Table grapes		
1	External defects	RGB + hyperspectral + 3D
2	Internal damages	3D X-ray
3	Colour	Hyperspectral + RGB
4	size	RGB + 3D
5	Shape	3D
Ready meals		
1	Colour	Hyperspectral + RGB
2	Topping	Hyperspectral + RGB
3	Size	RGB + 3D
4	Composition	Microwave



PicknPack WP6

- Print, seal and cut







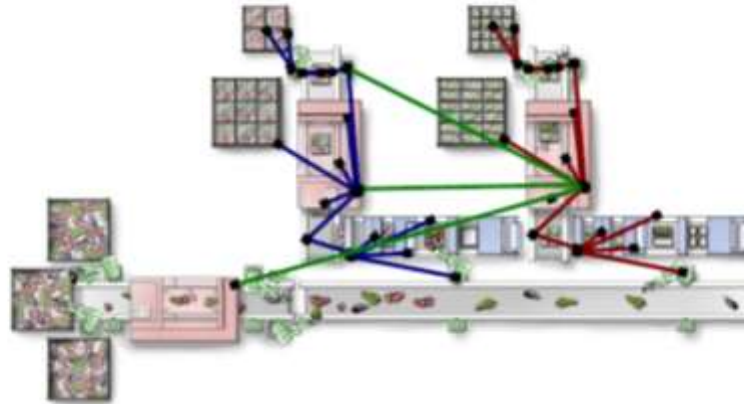
Clean In Place delta robot



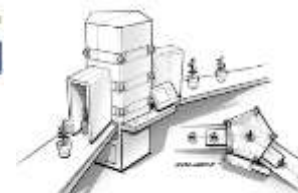


Data connection variability

Communication structure \neq mechanical interconnections!



3D herkenning









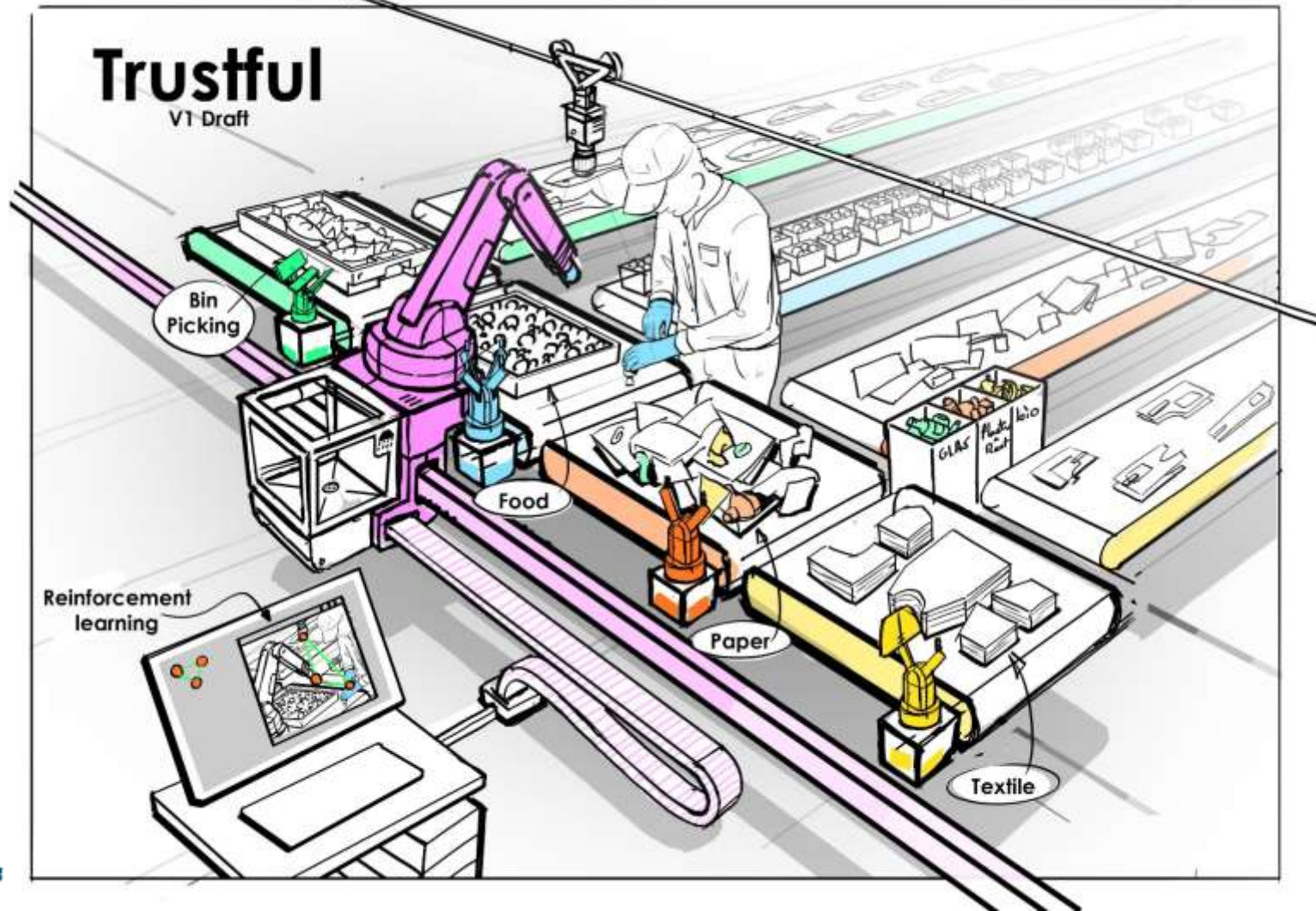
FTNON



Sweeper

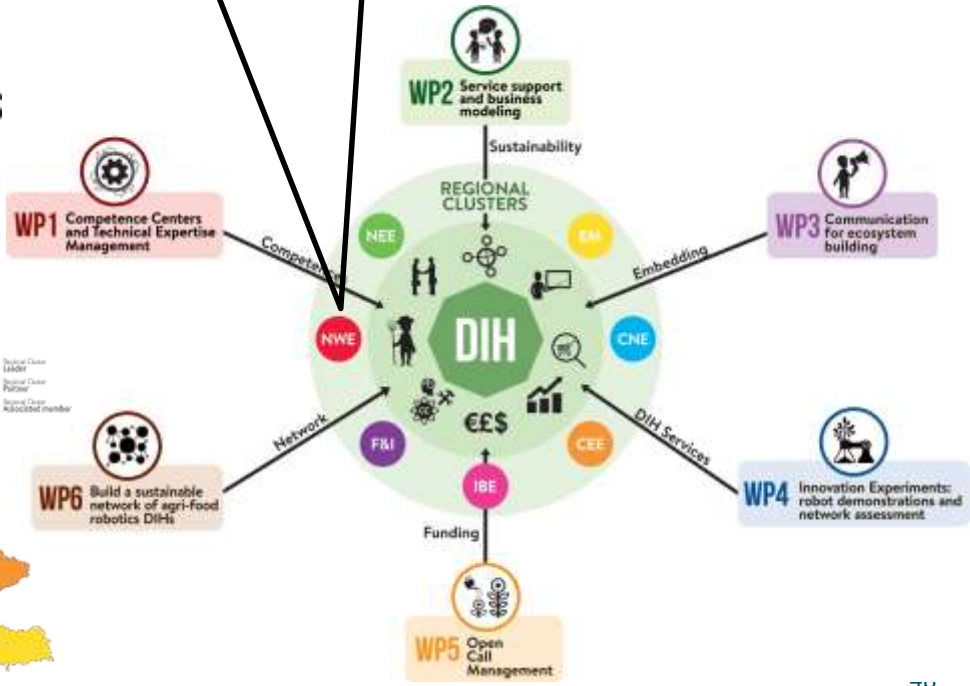
Trustful

V1 Draft





NETWORK OF DIGITAL INNOVATION HUBS IN ROBOTICS



That's all

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