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Robotics: Manipulation

Area 2 – Technologies

Lesson 7 – Robotics

Sequence ID – 24

CSIC





DISCLAIMER

A2.L7.T2 Robotics: Manipulation

Jeremy Karouta, jeremy.Karouta@CSIC.es, CSIC, Spain, [0000-0002-0804-6463](tel:0000-0002-0804-6463)

Ángela Ribeiro, Angela.Ribeiro@CSIC.es, CSIC, Spain

Dionisio Andújar, D.Andujar@CSIC.es, CSIC, Spain

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Ways of Manipulation



Techniques

Tasks

Task Group	Task	Technique		
Prep & Seeding	Tillage	●	●	●
	Seeding	●	●	●
Crop Care	Fertilising	●	●	●
	Irrigation	●	●	●
	Weeding	●	●	●
	Crop Protection	●	●	●
	Pruning/Thinning	●	●	●
	Monitoring	●	●	●
Harvest	Harvesting	●	●	●
	Transportation	●	●	●

Mechanical Interaction		Liquid Application		No Contact
Crop Handling	Soil Manipulation	Spraying	Misting	Data Acquisition
Plant Handling	Weeds Handling	Pouring / Sprinkling	Other	Other



Remember...



Why use Robots in **SPA**?
And why is it so difficult?

SUSTAINABLE PRECISION AGRICULTURE

- Reduce Waste
- Non-depleting
- Return on Investment

- Single plant care
- Precise
 - Dose
 - Position
 - Time

- In the field
- Growing Plants
- Changing conditions

Aims

Hurdles

Benefits

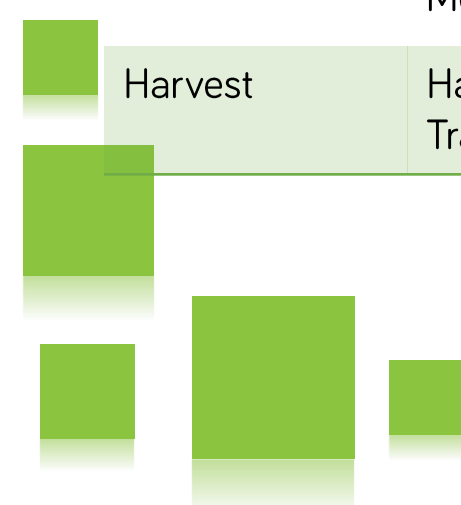


Ways of Manipulation

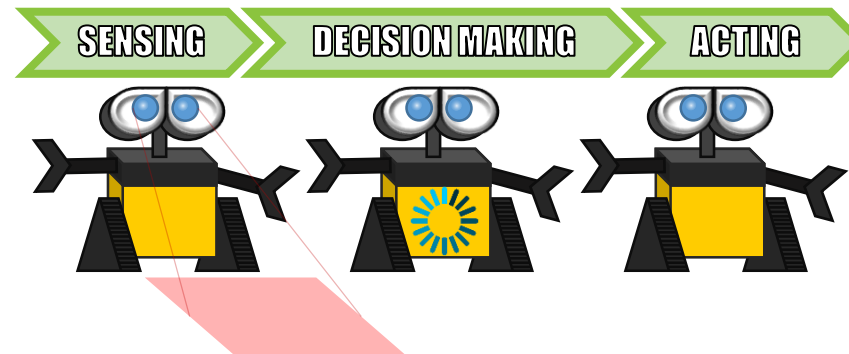


Task Group	Task	Technique		
Prep & Seeding	Tillage	●		●
	Seeding	●		●
Crop Care	Fertilising	●	●	●
	Irrigation		●	●
	Weeding	●	●	●
	Crop Protection		●	●
	Pruning/Thinning	●	●	●
	Monitoring			●
Harvest	Harvesting	●		●
	Transportation	●		●

Mechanical Interaction		Liquid Application		No Contact
Crop Handling	Soil Manipulation	Spraying	Misting	Data Acquisition
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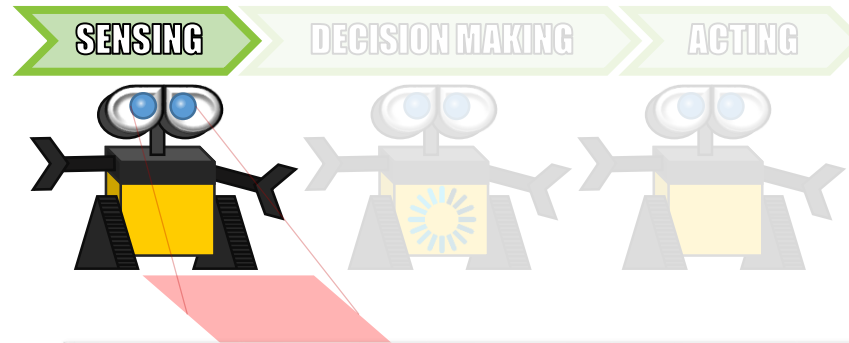
Crop Handling



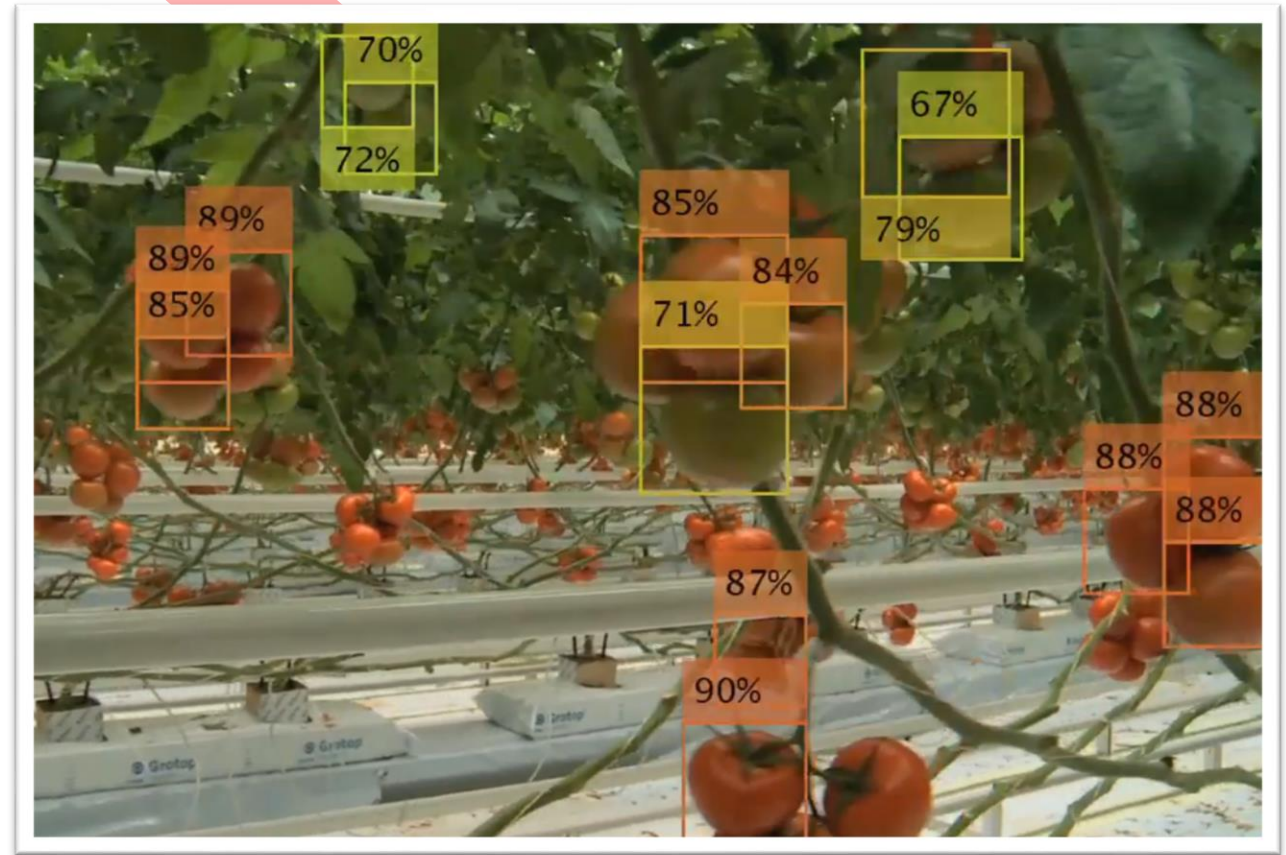
Video - Object Detection - Tomatoes



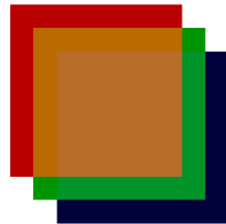
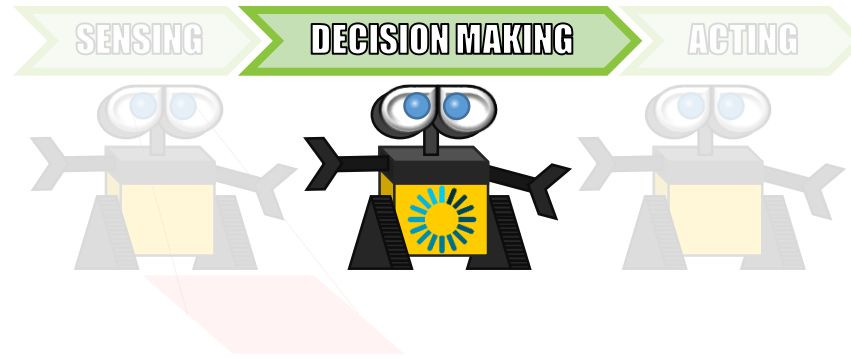
Crop Handling



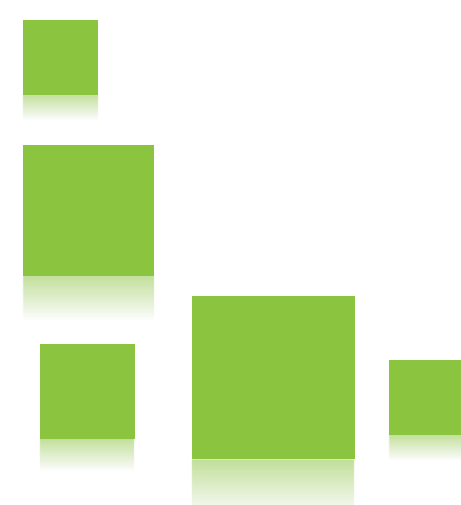
- Cameras
- IR Cameras
- Multispectral
- Depth Sensors



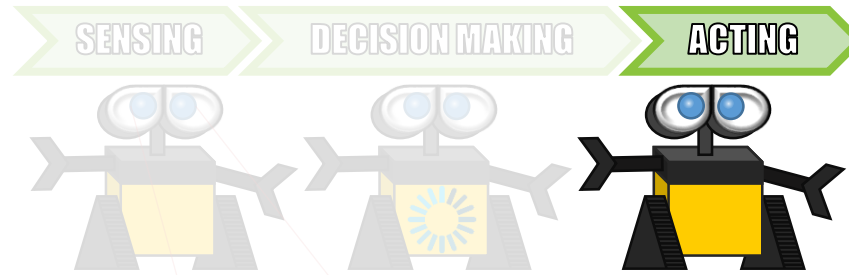
Crop Handling



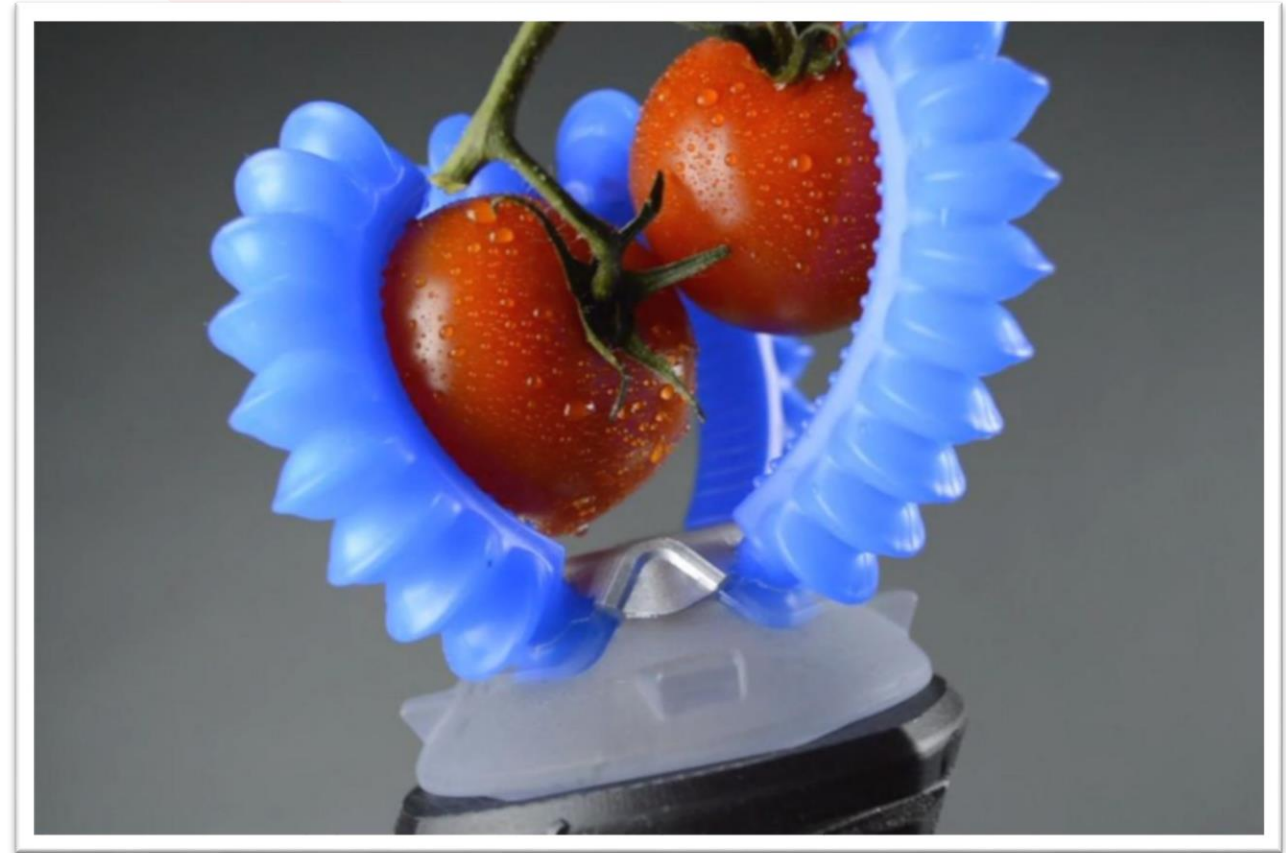
- Object Detection & Classification
 - Machine Learning
 - Deep Learning
 - Convolutional Neural Networks
 - Artificial Intelligence
- Localisation (optional)
 - Depth Information
- Motion Construction



Crop Handling

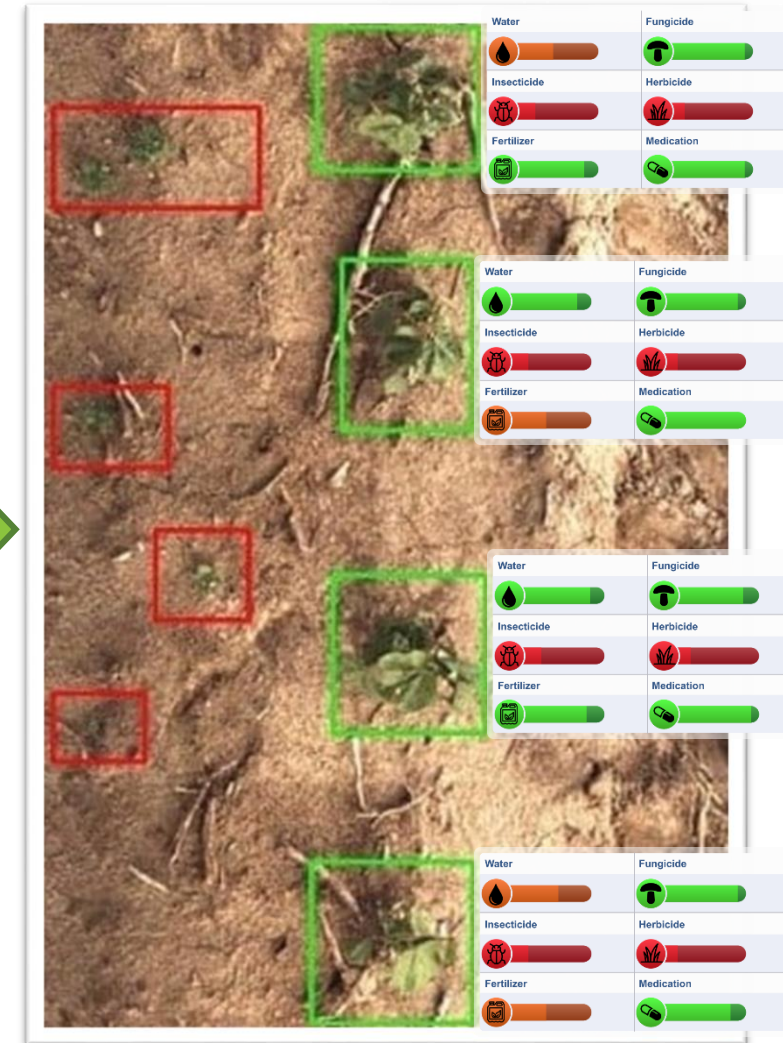
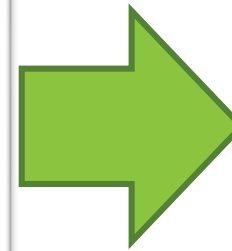
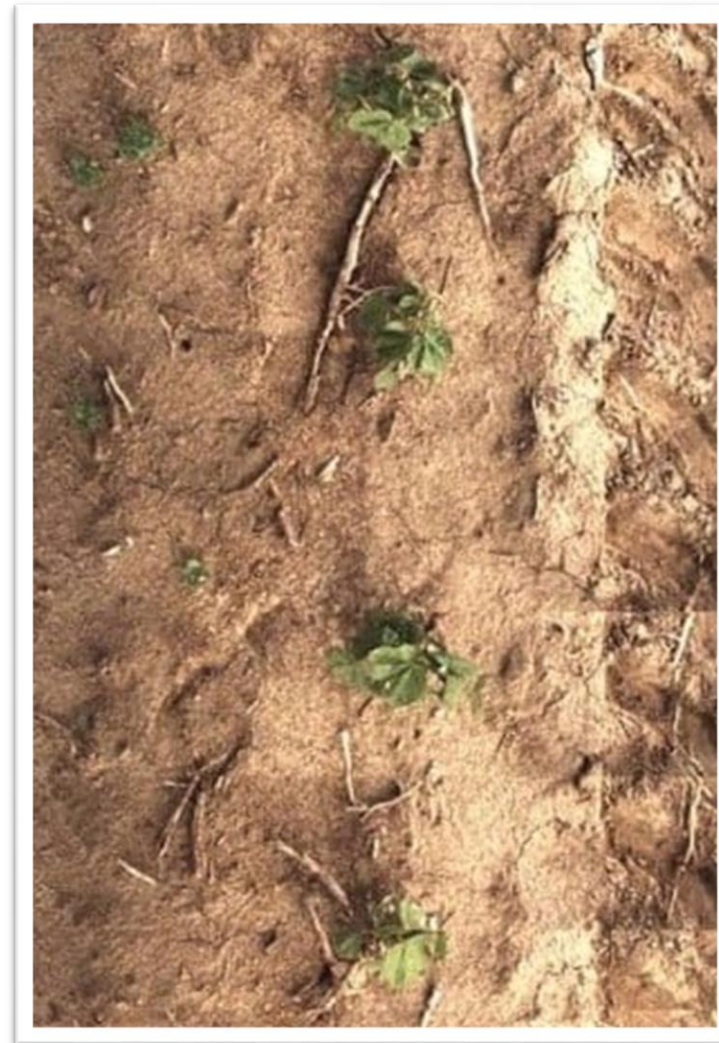


- Hardware
 - Materials
 - Shape
 - Extra tools
- Software
 - Real-Time Feedback
 - Motion Design

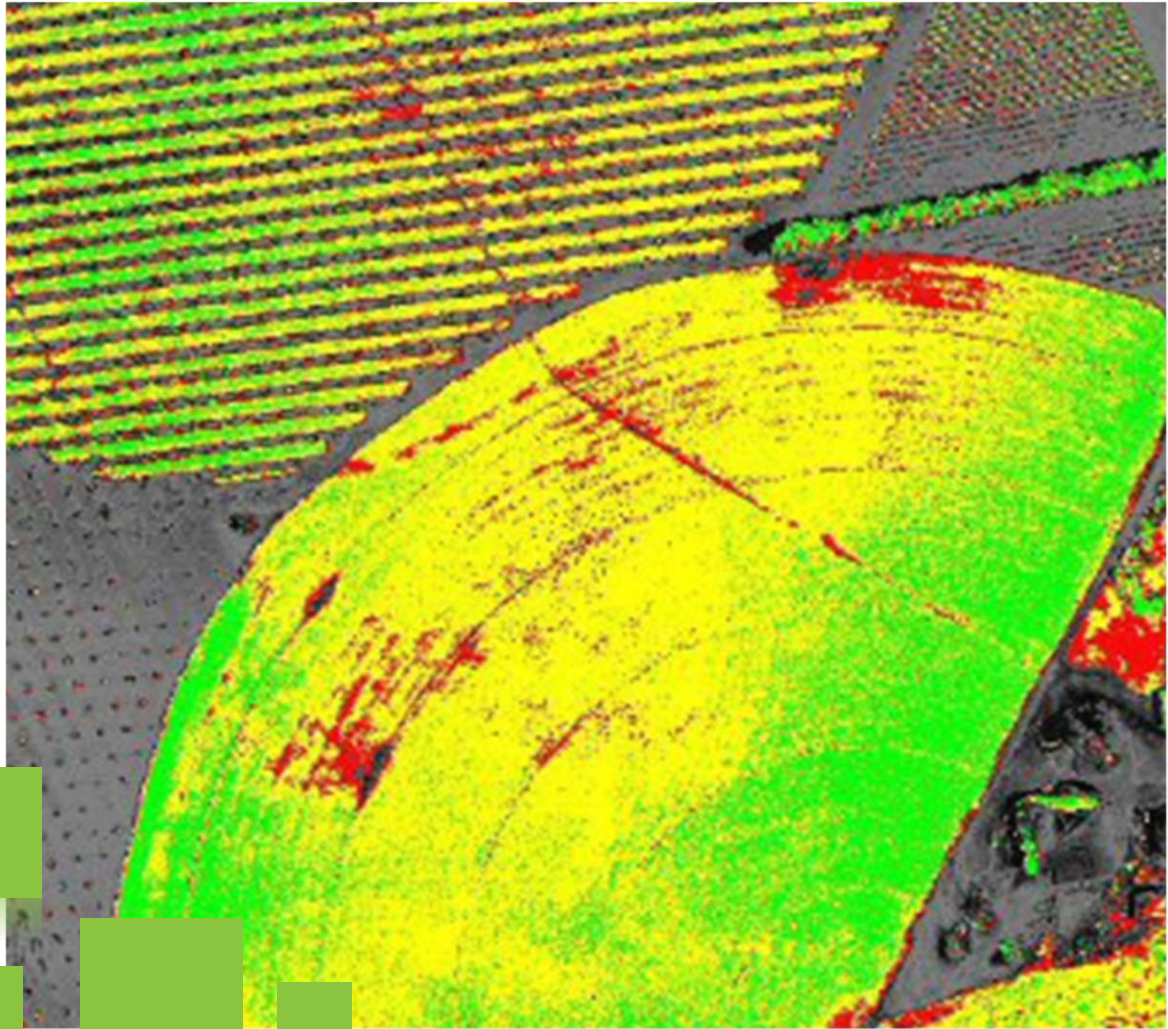


Spraying

- Herbicide
- Insecticide
- Fertilizer
- Fungicide
- Treatments
- ...Watering?



Monitoring



- Progress
- Health
- Needs
- Predictions

- Input for Path Planning!