



# 107° National Congress

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## Internet of Things (IoT) in Environmental Physics



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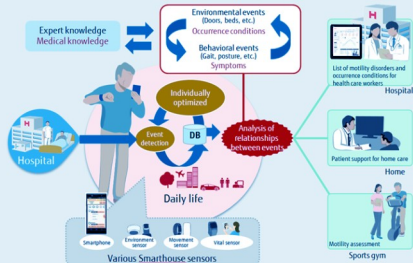
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# Areas of application of IoT technology

## Quality of Life



## Housing



## Industry



## Transport



# Internet of Things

ICT

IoT featuring elements

Microcontroller dev-boards



Sensors (metering)  
Actuators

Wireless shield

datalogging

Network

IoT networks

Tablet &  
Smartphone  
dashboards

cloud

Data  
Management

Big  
Data

Machine  
Learning



# IoT features

- **decrease cost of devices**
- **rapid development**
- **easier sensors interchangeability**
- **increase space density of sensors**
- **enhance scalability**
- **increase connectivity**
- **increase data accessibility**
- **long term data accessibility**
- **increase types of devices**
- **make easier maintenance & update**
- **context management (FIWARE)**
- ...

# IoT and Physics

The IoT describes the network of physical devices ("things") that are connected to the Internet and exchanging data through a cloud computing system. Integrating **sensors** (**metering**) and active controls IoT will enhance the awareness of concepts as:

**MEASUREMENT**

**OBSERVATION**

**CALIBRATION**

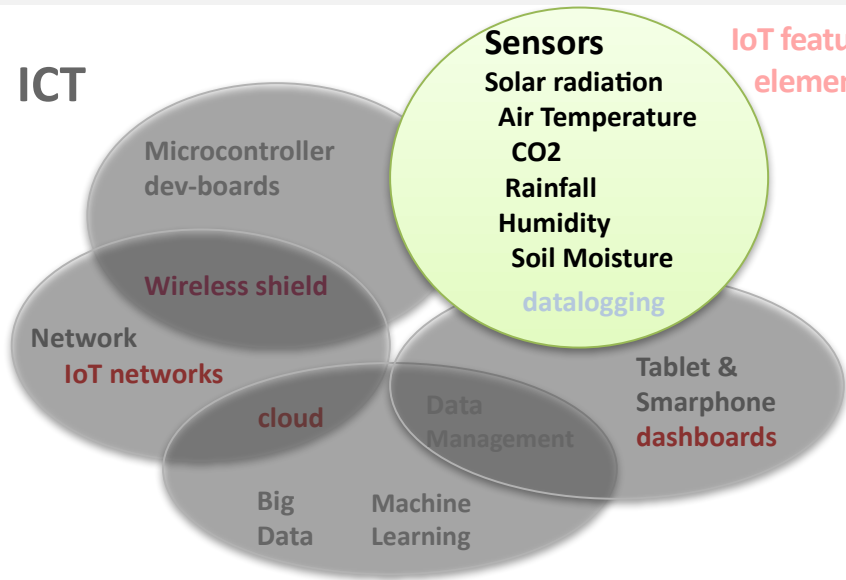
**ELECTRONIC DEVICE DESIGN**

**COMPLEX SYSTEM (DYNAMICS)**

# IoT & Environmental Sensors

ICT

IoT featuring  
elements

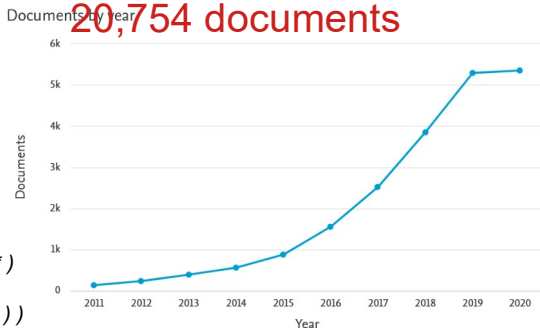


# IoT in Environmental Physics

- **Low Maintenance weather stations**
- **Mobile/relocatable air quality stations**
- **drone and UAV observation (increase space & time frequency)**
- **active systems (safety)**

## Scopus search

```
TITLE-ABS-KEY ( ( "Internet of things" OR iot ) AND ( monitor* OR measure* OR meter* OR device* OR sensor* OR station* ) AND ( clima* OR environ* OR weather* OR meteo* OR pollut* ) ) AND ( PUBYEAR > 2010 ) AND ( PUBYEAR > 2021 )
```



# IoT audience and actors

## Academy - Labs of Physics

electronics .. assembling devices  
computer science .. cloud computing

## Low and intermediate school labs

elements of programming  
electronic 'lego' systems  
animating 'real world' (e.g. robot)

## DIYers & Makers

turning ideas to prototypes (rapid proto)  
develop applications → marketing  
team & aggregation → maker lab



# WeLASER – Weeding with Lasers

<https://welaser-project.eu/>

**WeLASER** is “adoption of autonomous vehicle and laser technology to eradicate pesticides in agriculture”

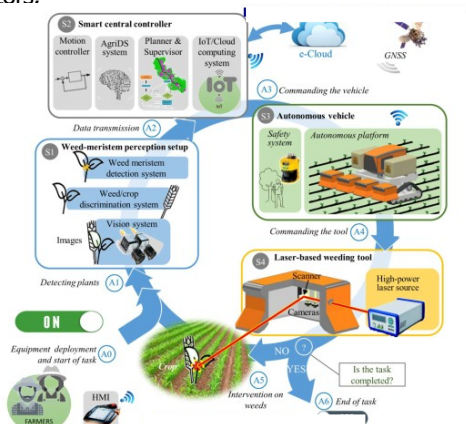
pesticides determine a danger for operators.

their residues enter food chain and endanger ecosystem and environment pesticides being recognised as a major cause of cancer

**WeLASER** combines:

**robot** (IoT compliant ROS operative system)

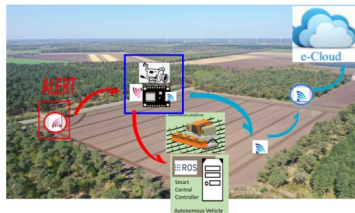
**laser** used to shoot plantlets (IoT controlled)



# WeLASER → role of IoT

robot & field sensors (and cameras)  
increase safety (e-fence)

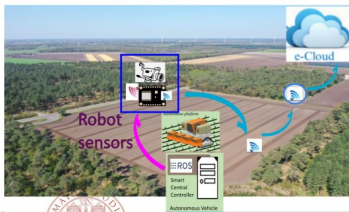
Intrusion Event



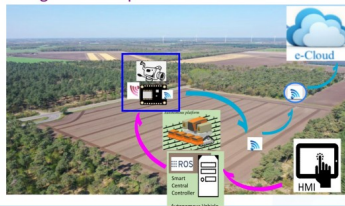
## Receive Events from

- RF Nodes (RF signals)
- ROS signals
- obstacles
- ad hoc requests
- programmatic
- external (HMI)

Obstacle Event



Prog & HMI Request



# WeLASER → role of IoT

monitor crop & environment  
Assessment of sustainability

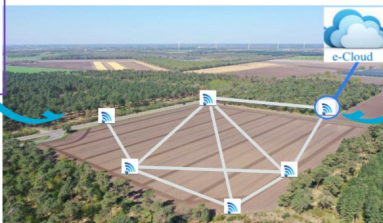
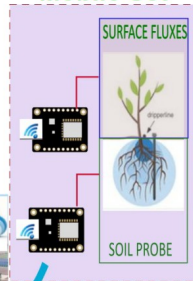
## Weather Station



## Functions

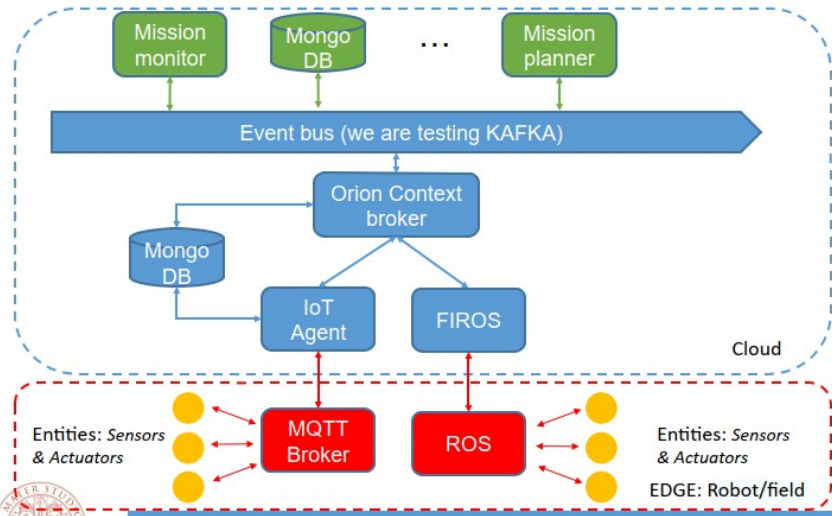
- Environmental monitoring
- Robot impact on soil

## Mobile Set



# WeLASER → role of IoT

cloud computing (data mngmnt, dashboard dev)



# CONCLUSIONS

- *IoT devices, currently adopted in 'metering', are interesting a growing audience raising the awareness of featuring concepts of physics as **measurement** and **complex systems**.*
- *Such an audience is growing in depth, enrolling many **youngsters**, is broadening to include **DIYers**, and affecting several academic activities, including **course contents** and research collaboration & **interaction patterns with other areas of research**.*
- ***Applied Physics** and more tangibly **Environmental Physics**, are going to be the areas **more affected from IoT** that will go to be **massively** used in researches dealing with **productive, economical and social aspects**.*

*THANK YOU  
FOR YOUR  
ATTENTION*

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