

CONNECTING

LIGHTING WITH

HUMAN

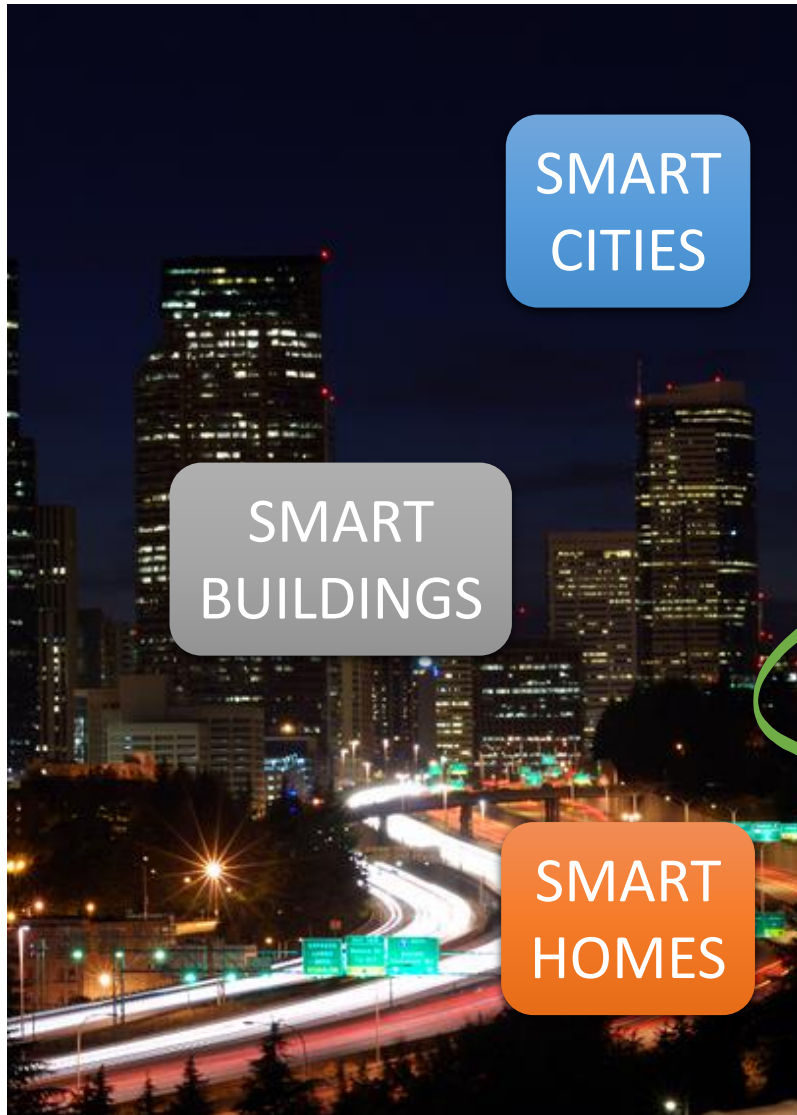
ACTIVITY

Smart-Building, Smart Cities & Smart Homes  
The first low cost sensor of human activity perception

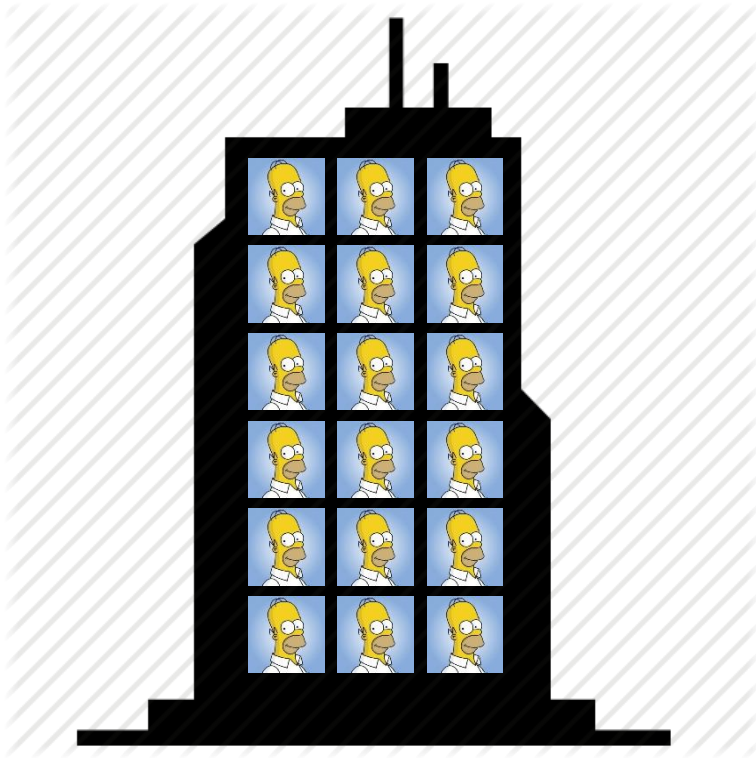
By Lionel Chaverot



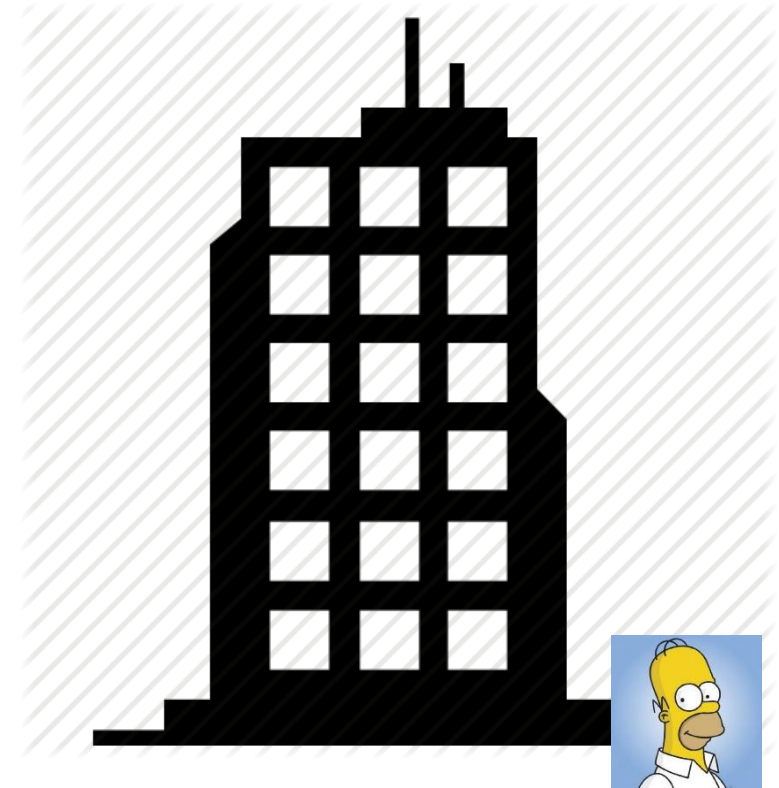
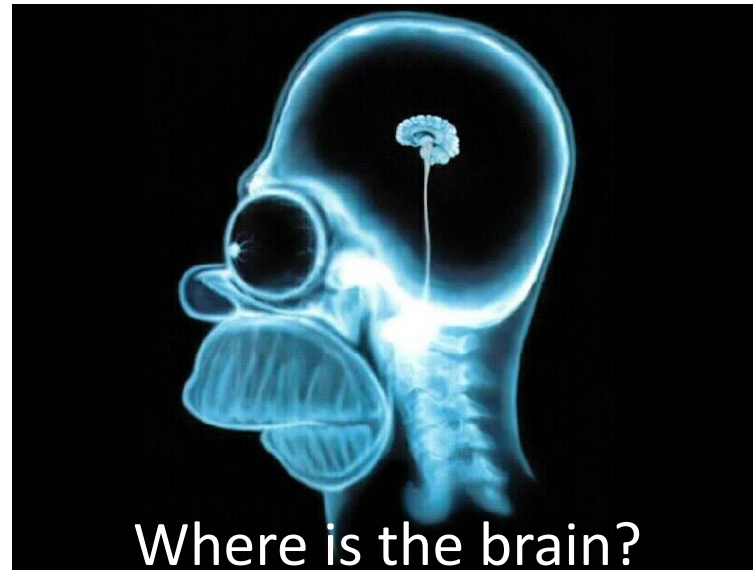
# Context : connected smart lighting



# Challenges : Lighting control topologies



LOCAL  
ACTION



CENTRAL  
ACTION

# Challenges (cont'd) : Lighting use



**WHEN** it is needed

**WITH** the right intensity

**WHERE** it is needed

How to perceive human activity ?

# Constraints

011010101  
101010110  
101100010  
101111101





# Current solutions

011010101  
101010110  
101100010  
101111101

Advanced



Cost



Plug and play



Ethics

## Automation sensor



X



## Visible Camera

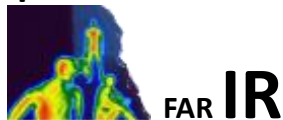


X

X

X

## High perf IR camera



X

X

X

# Focus on infrared sensors: about thermopile

## IR DETECTORS



- Non differential measurement
- Main application : temperature sensing
- Resolution : < 32x32 pixels
- Thermal resolution :  $\sim 0.4^{\circ}\text{C}$
- Frame rate : < 8Hz
- Main players
  - EXCELITAS
  - OMRON
  - HEIMANN SENSOR
  - BOSCH
  - MELEXIS
  - PANASONIC
  - LAPIS

# Focus on infrared sensors: about microbolometer

## IR IMAGERS



- Non differential measurement
- Main application : IR imager
- Resolution :  $> 80 \times 60$  pixels
- Thermal resolution :  $\sim 0.1^{\circ}\text{C}$
- Frame rate :  $< 9\text{Hz}$
- Main players
  - FLIR
  - ULIS
  - NEC
  - DRS



# Focus on infrared sensors: about pyroelectric

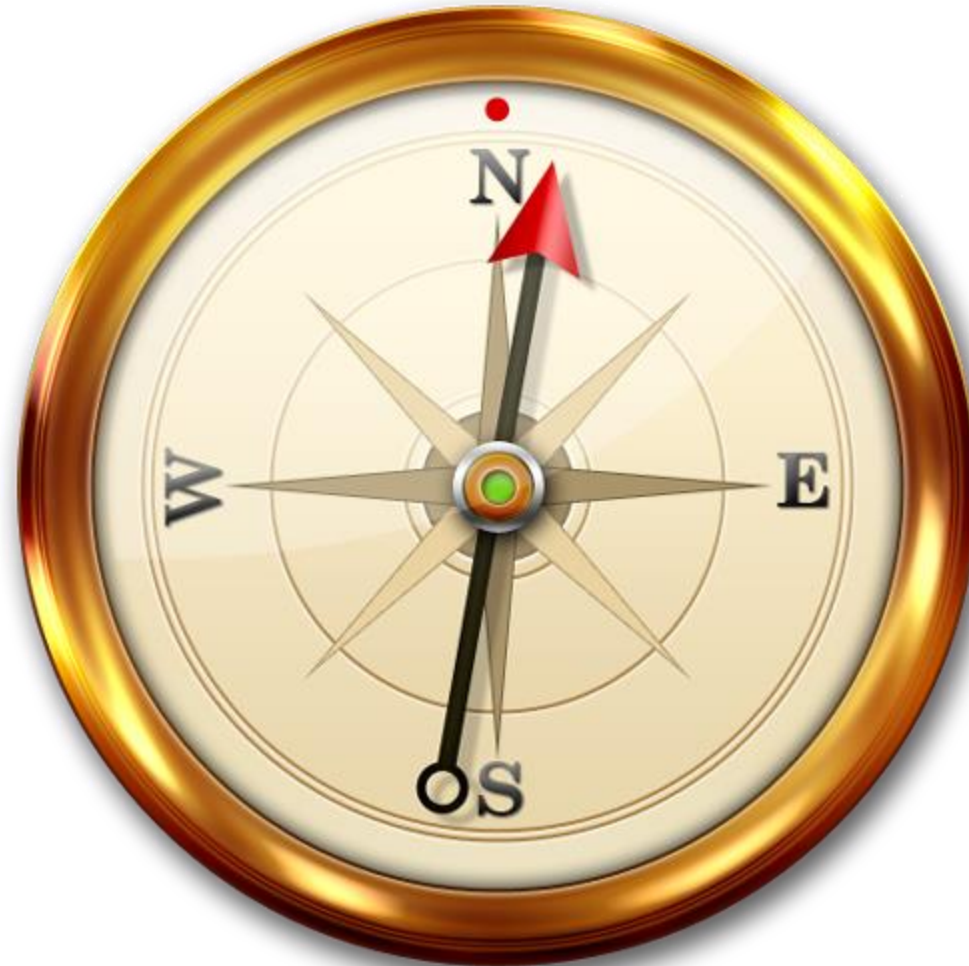
## IR DETECTORS



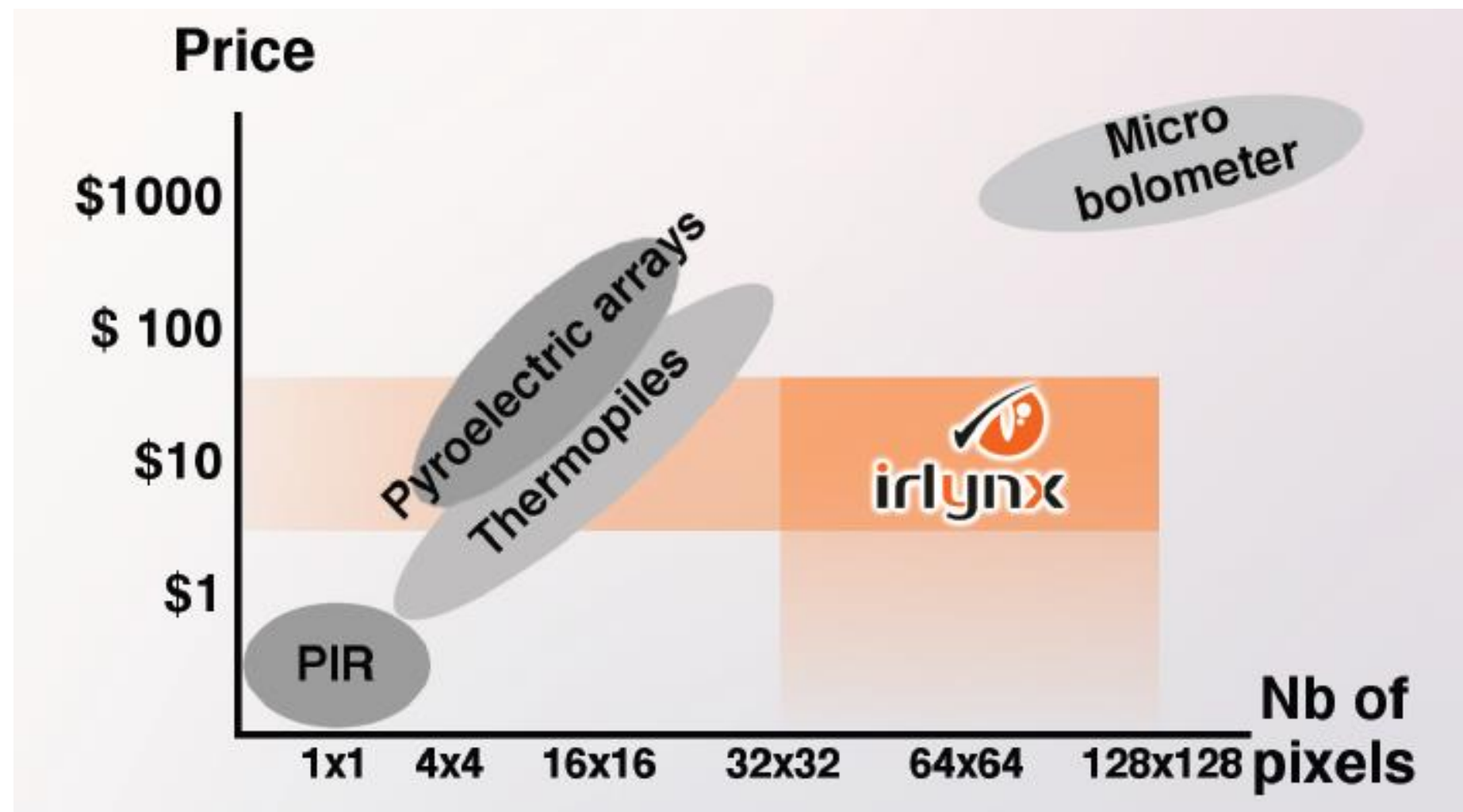
- Differential measurement
- Main application : movement detection
- Max resolution : 16 x16 pixels
- Main players
  - MURATA
  - HAMAMATSU
  - IRISYS
  - PYREOS

# New trend

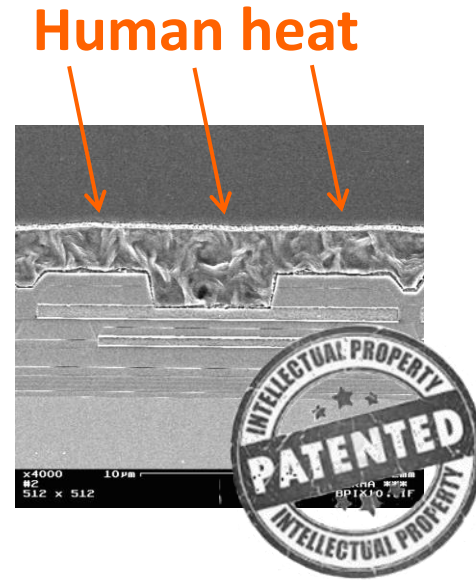
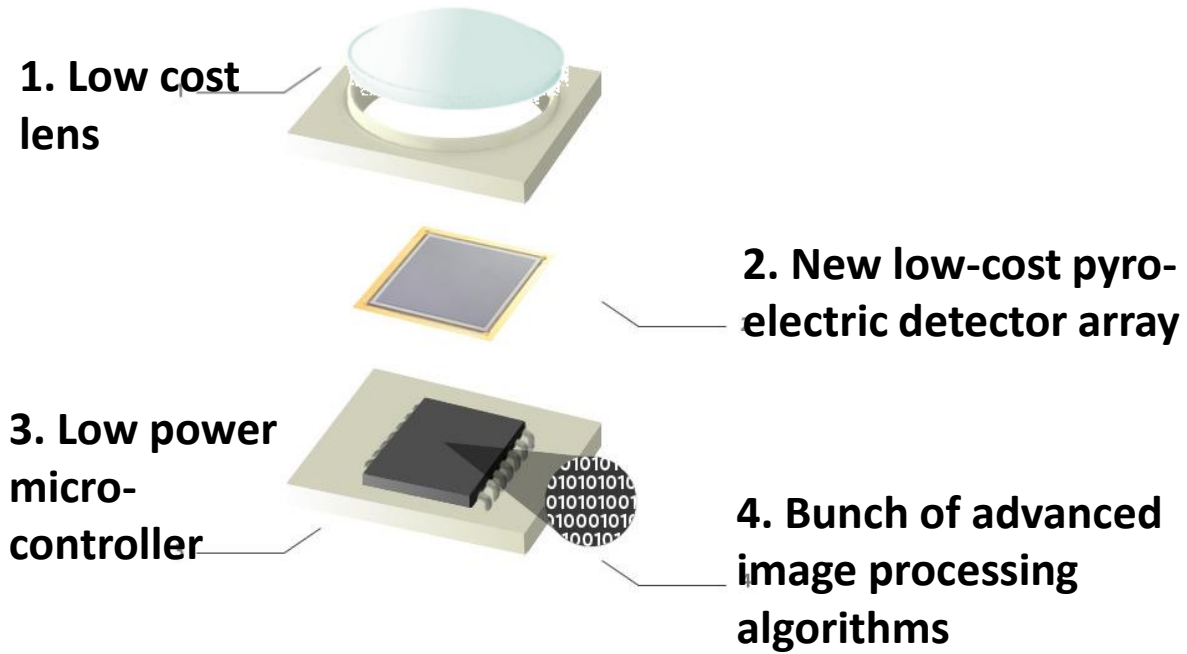
## Advanced sensors



# Advanced sensors: Medium resolution FIR Sensor



# Our module approach



**LOW COST**



**COMPACT**

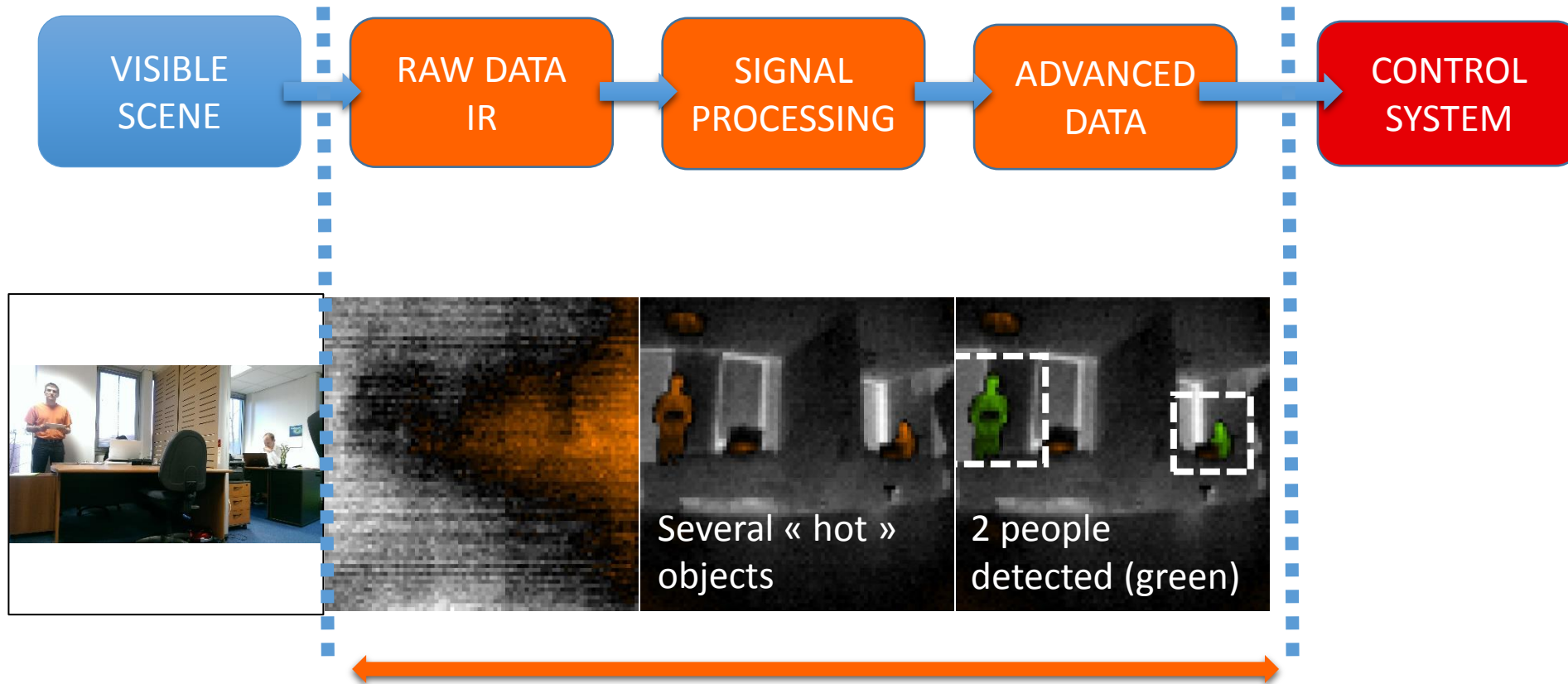


**LOW POWER**



**ALL-IN-ONE**

# About Thermal Infrared detection

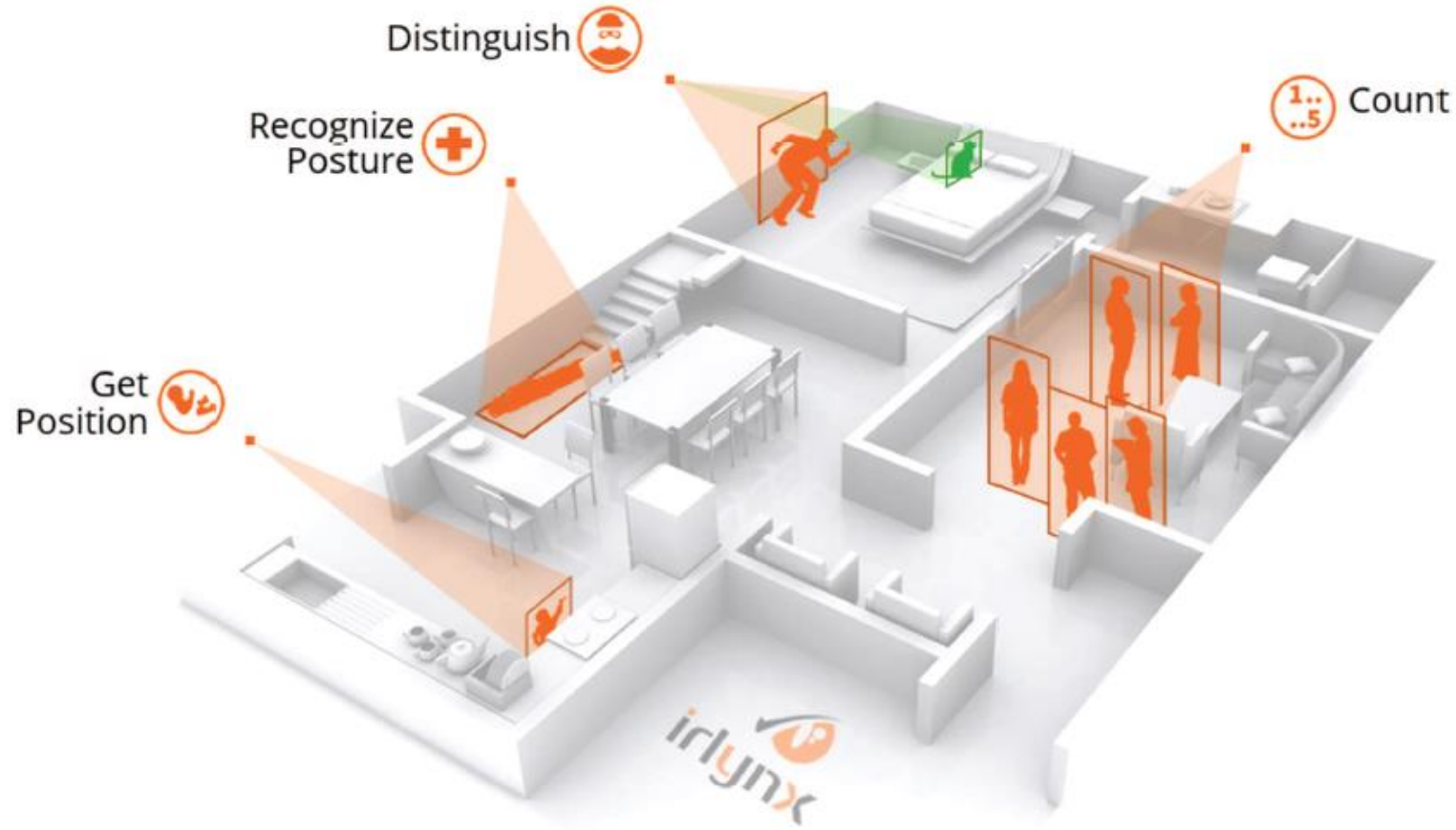


# More than words





# Advantages



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101010110  
101100010  
101111101



Advantages (cont'd)



Day & Night

# Benefits



Thank you

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