



Building Perceptive Robots with

INTEL® EUCLID™

DEVELOPMENT KIT

Amit Moran

Perceptual Computing
Systems Innovation







A “modern” robot should

Perform a task

**Find its way in our world and
move safely**

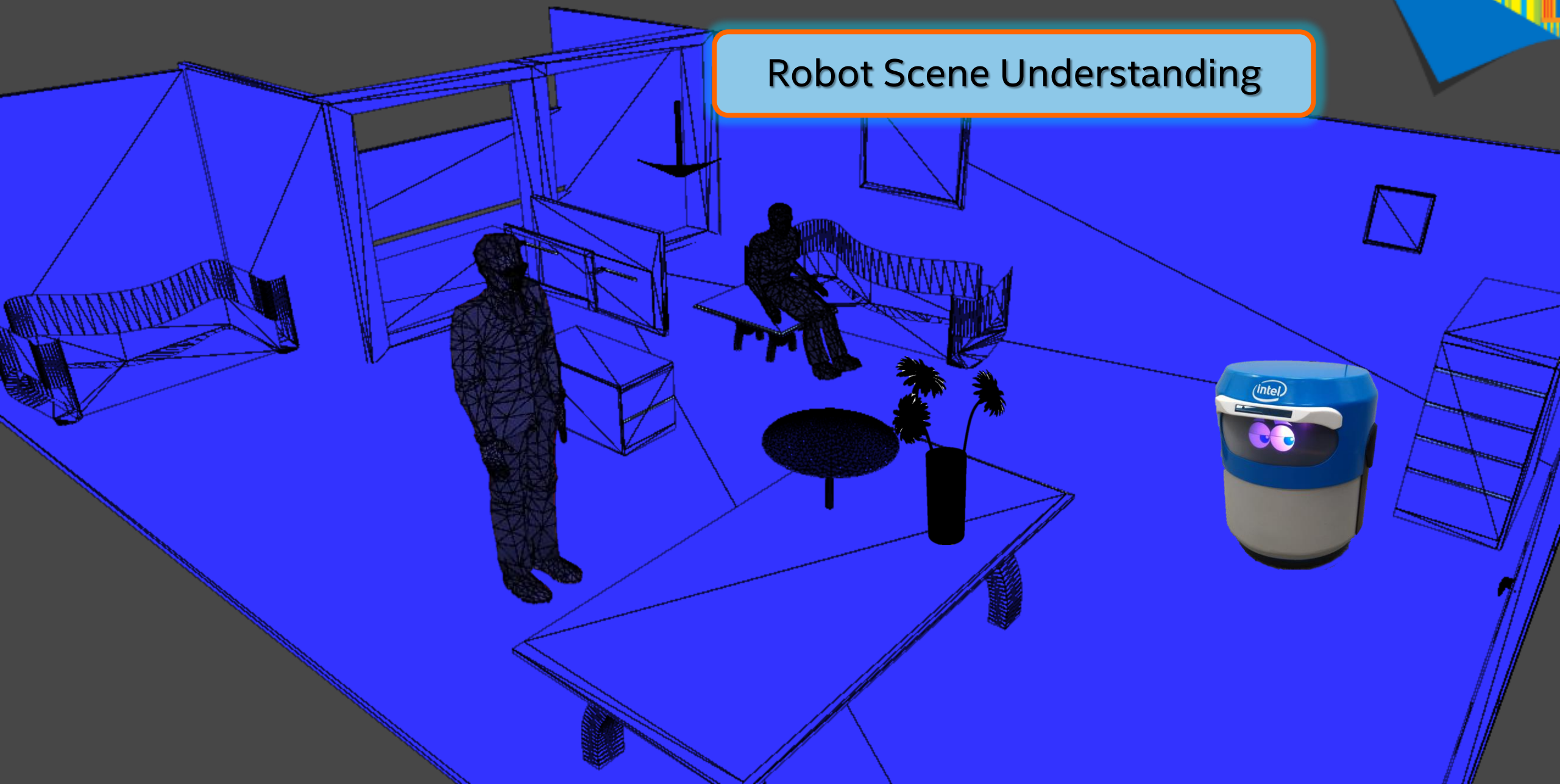
**Understand the environment
and adapt to it**

Interact (naturally)

What do we need to make it happen?



Robot Scene Understanding



Robot Scene Understanding

Human
Recognition

Human

Indoor
navigation

Master

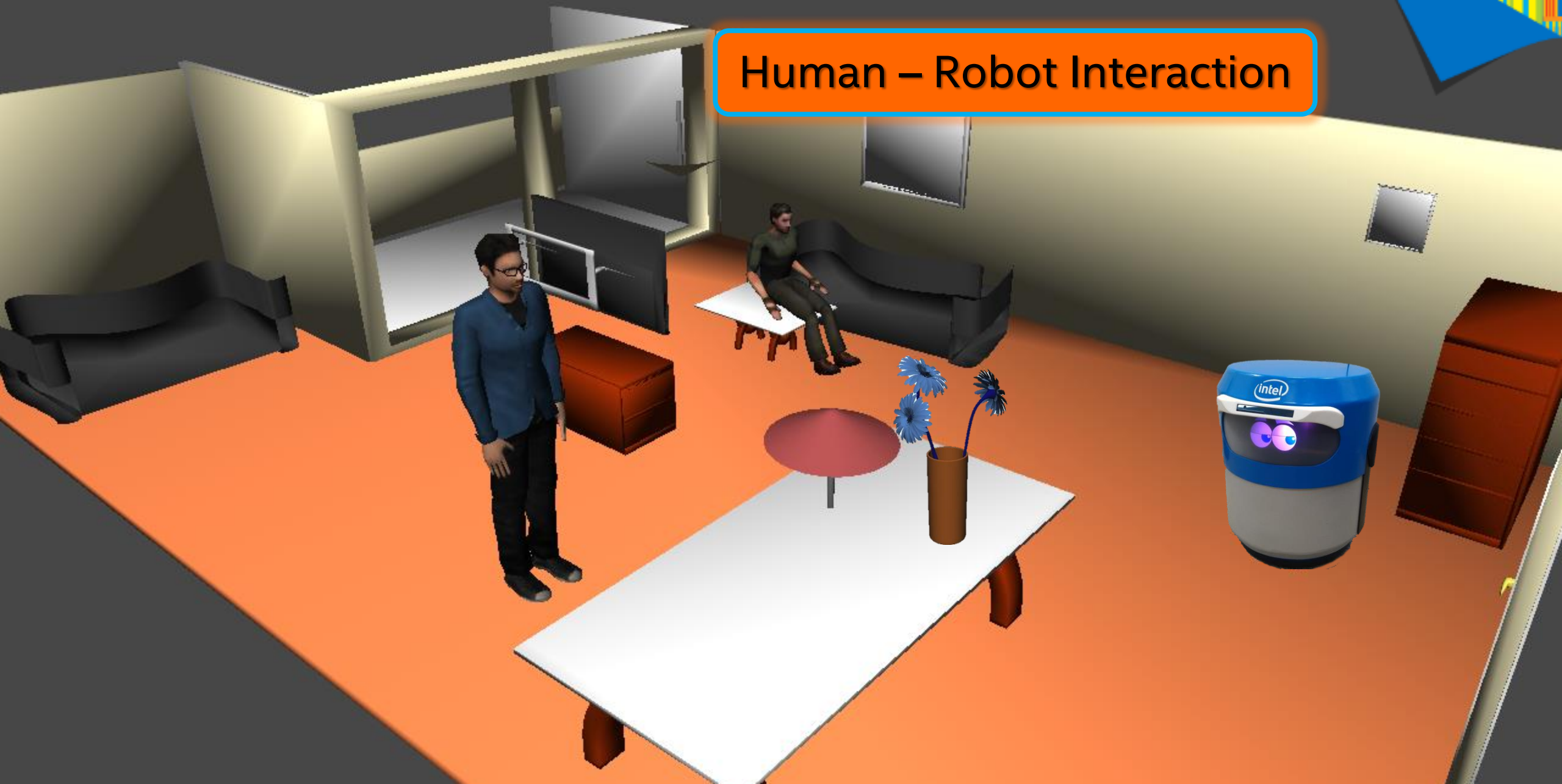
Flowers

Obstacle
identification

Object
Recognition



Human – Robot Interaction



Human – Robot Interaction

Speech
Recognition

Hi Fred,
Water the flowers
for me please.

Emotion
Recognition

Speech (text to
speech)

Humanoid
Behavior

Gesture
Recognition

Intent
Understanding



Robot Scene Understanding

Human
Recognition

Obstacle
identification

Indoor
navigation

Object
Recognition



Human – Robot Interaction

Speech
Recognition

Speech (text to
speech)

Gesture
Recognition

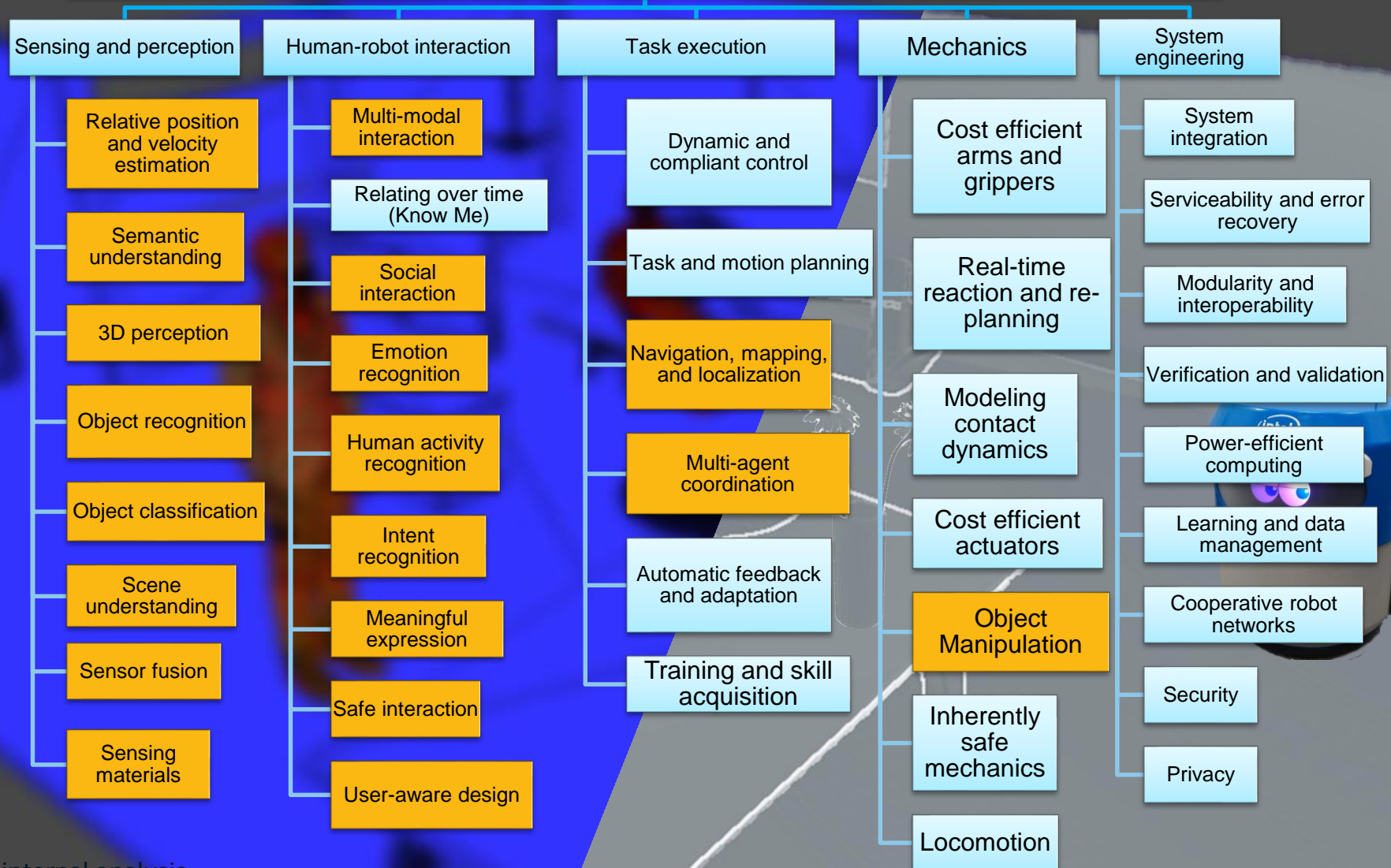
Humanoid
Behavior

Emotion
Recognition

Intent
Understanding

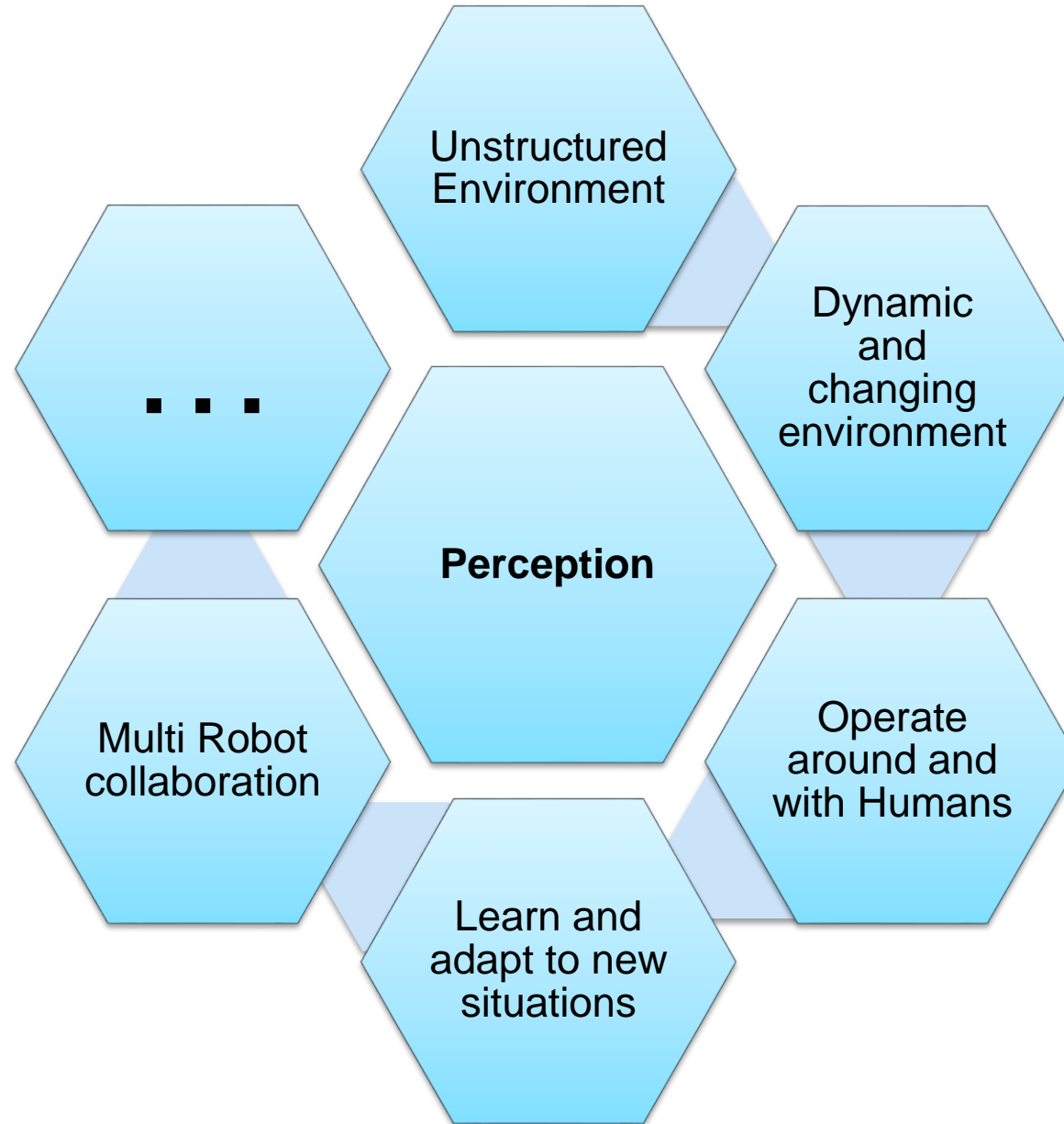


Robotics capabilities

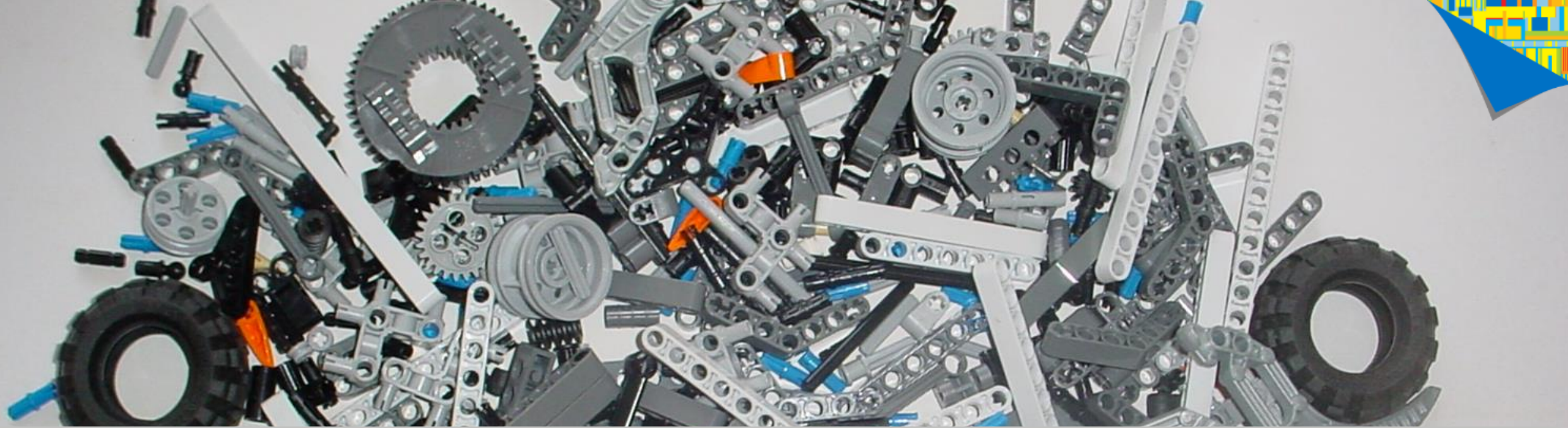


Sources: NASA; euRobotics; internal analysis.

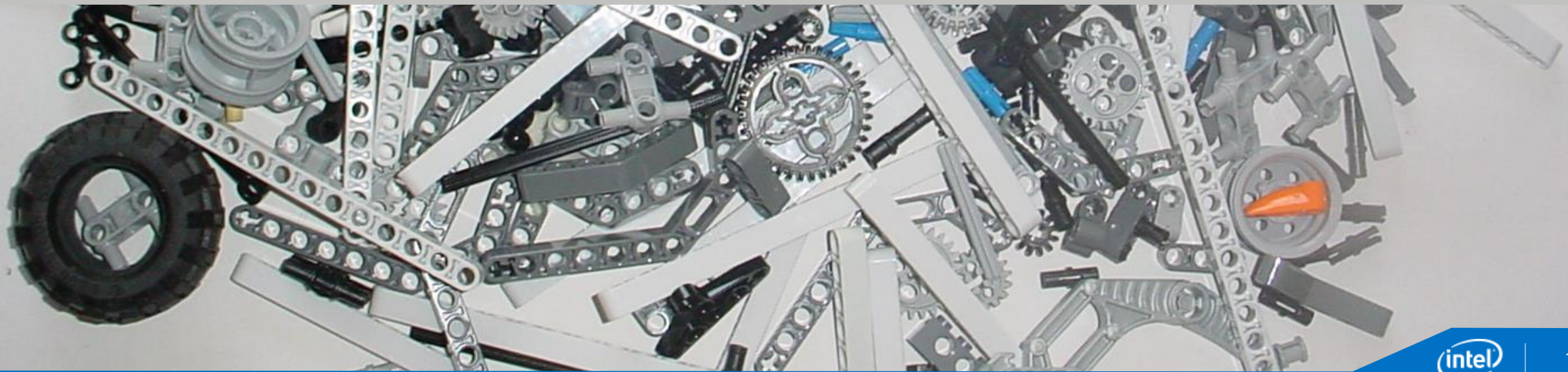
Perception is in the heart of modern robotics



Support roboticists in their quest to innovate
and create the next big thing in robotics



GETTING INTO ROBOTICS IS DIFFICULT...





INTEL® EUCLID™

DEVELOPMENT KIT

*The product, product specifications and data may be subject to change without notice

Intel® Euclid™ - Highlights



Robotician/Makers vision solution

Complete

Standard/Community

Easy to use/ “zero-installation”

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Intel® Euclid™ - Highlights

Environmental Sensors

Audio: Mics, Speaker

Detachable Battery

Soft buttons

ZR300 (Depth & Motion)

Intel® Atom™ Quad-Core SOC

Internal Storage Memory

Coms: WiFi, BT, USB3, UART, HDMI

Roboticist/Makers vision solution

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Disclaimer
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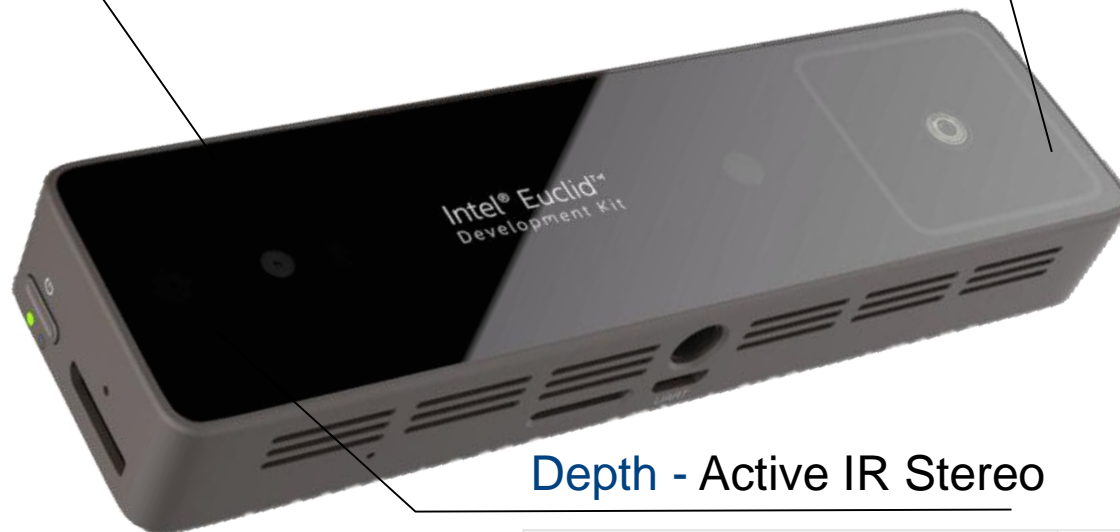
Intel® Euclid™ - Highlights

Color -

RGB Stream	2MP, Up to 1080p @ 30fps, 16:9, rolling shutter, fixed focus
FOV (D x V x H)	75° x 41.5° x 68°

Tracking Module -

Fisheye Stream	VGA @ 30 fps
FOV (D×V×H):	166° × 100° × 133°
IMU - 3-axis accel. & 3-axis gyro.	Time Stamp: 50 μsec accuracy



Depth - Active IR Stereo

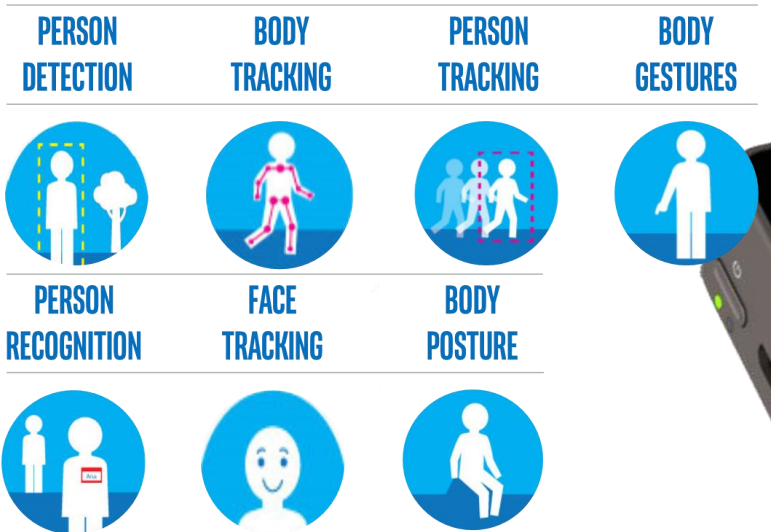
Depth Stream	Up to 628×468 @ 60 fps, global shutter
Depth Output Format	16-bit
Range	0.5m (480x360) - 4m (Varies depending on light conditions)
Stereo Imagers FOV (D x V x H)	70° x 46° x 59°

Robotician/Makers vision solution

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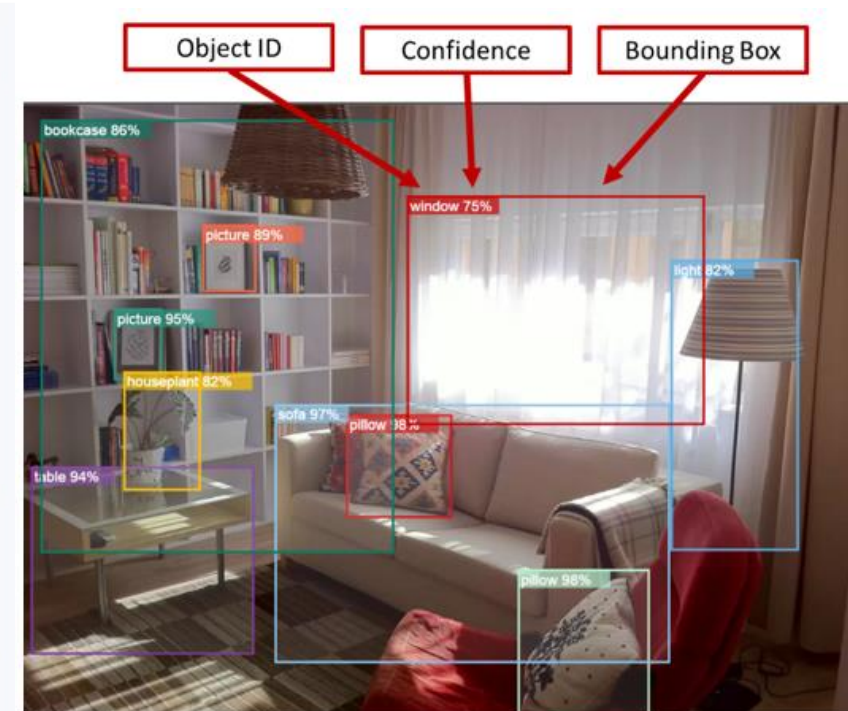
PERSON LIBRARY



SLAM LIBRARY



OBJECT LIBRARY



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Intel® Euclid™ - Highlights



Robotician/Makers vision solution

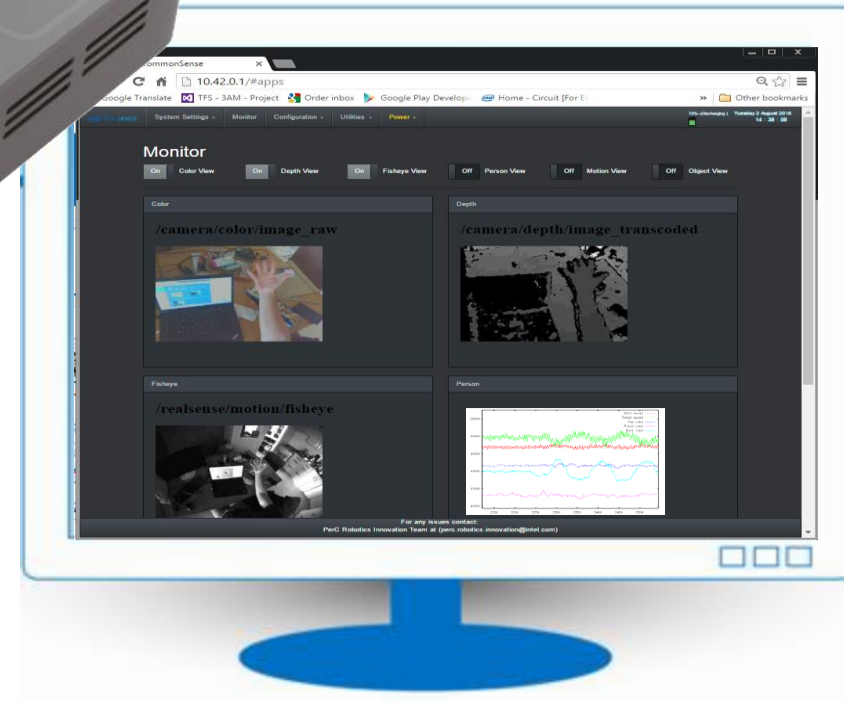
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ubuntu^{*} 16.04

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Intel® Euclid™ - Highlights



Robotician/Makers vision solution

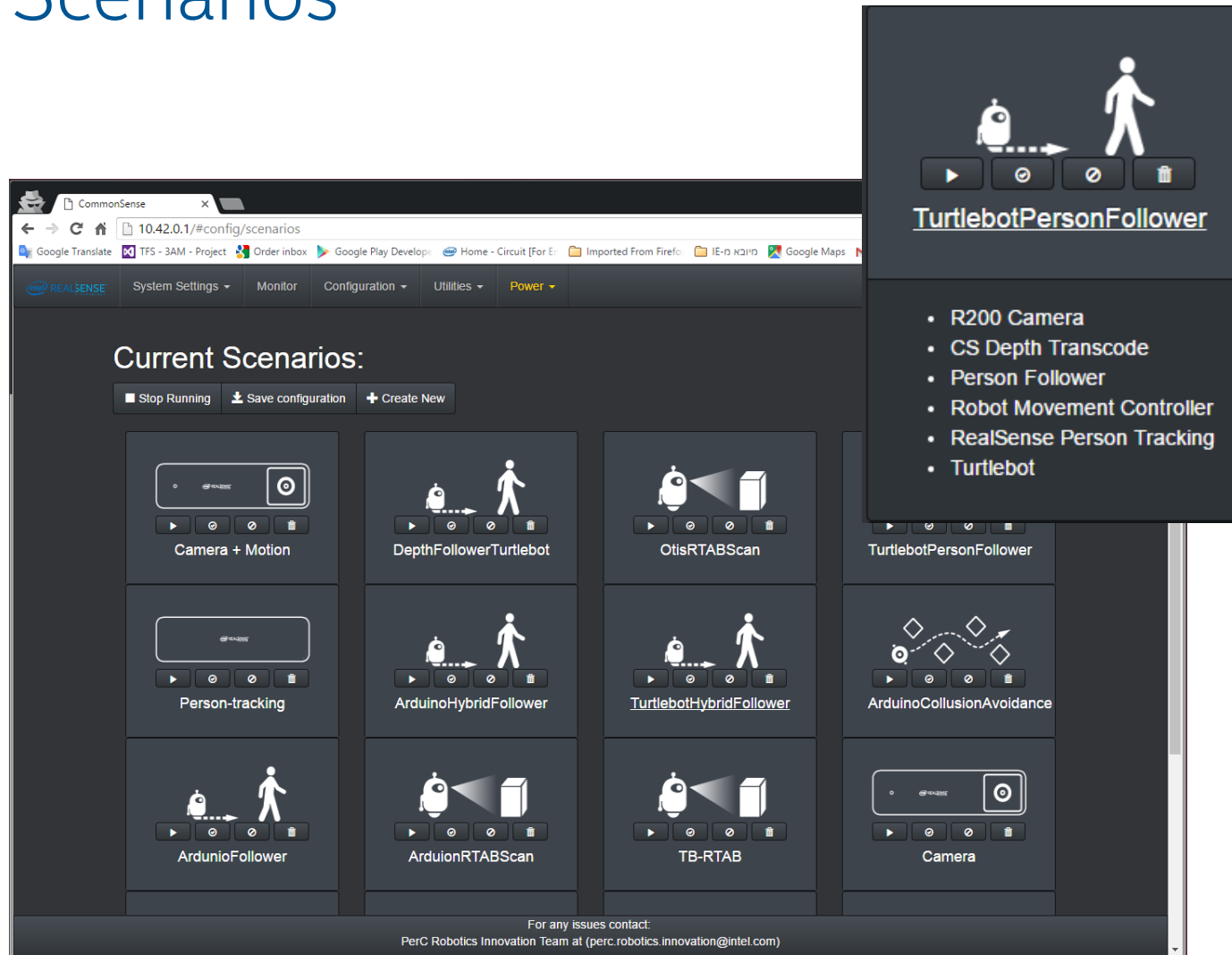
**Complete
Standard/Community**

Easy to use/ “zero-installation”

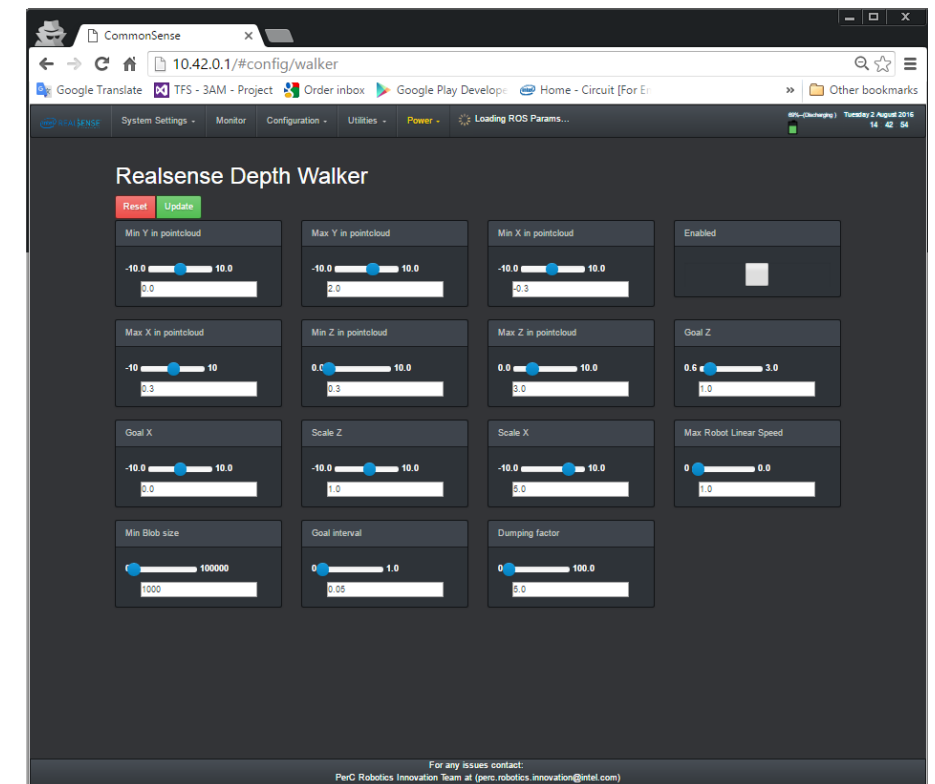
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Intel® Euclid™ - C&C Web interface

Scenarios



Dynamic Reconfigure

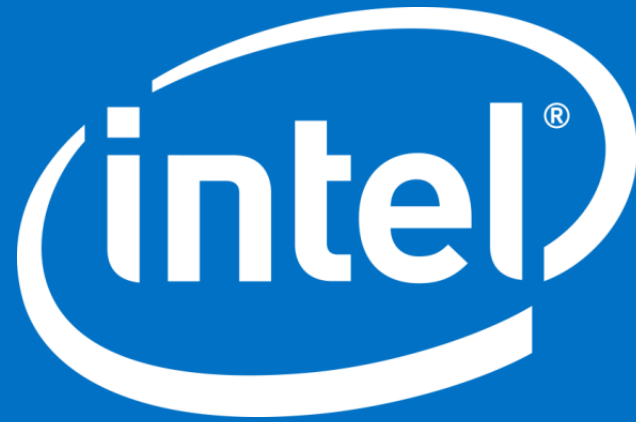


ROS nodes configuration standard



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Look Inside.™