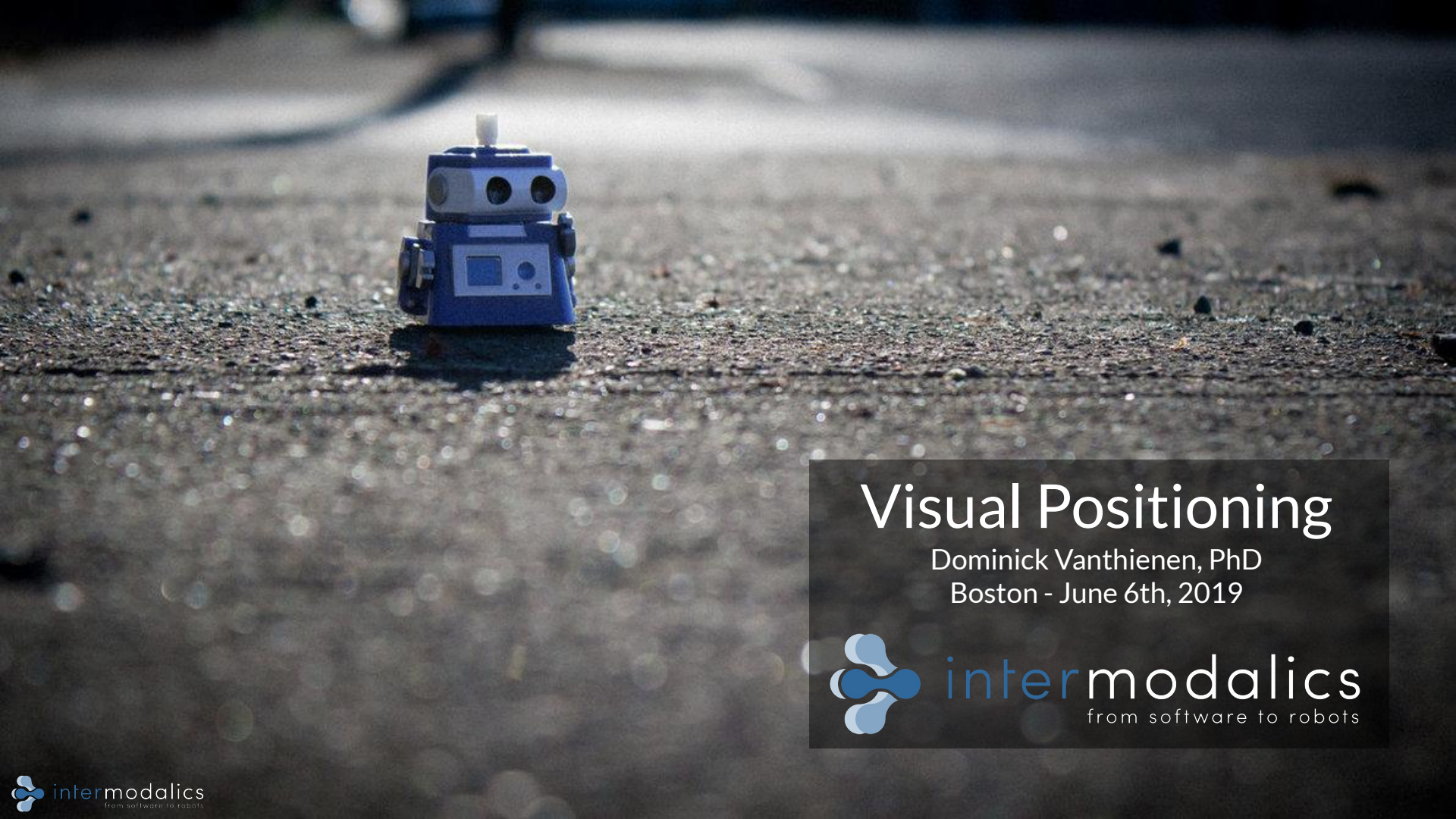


Visual Positioning

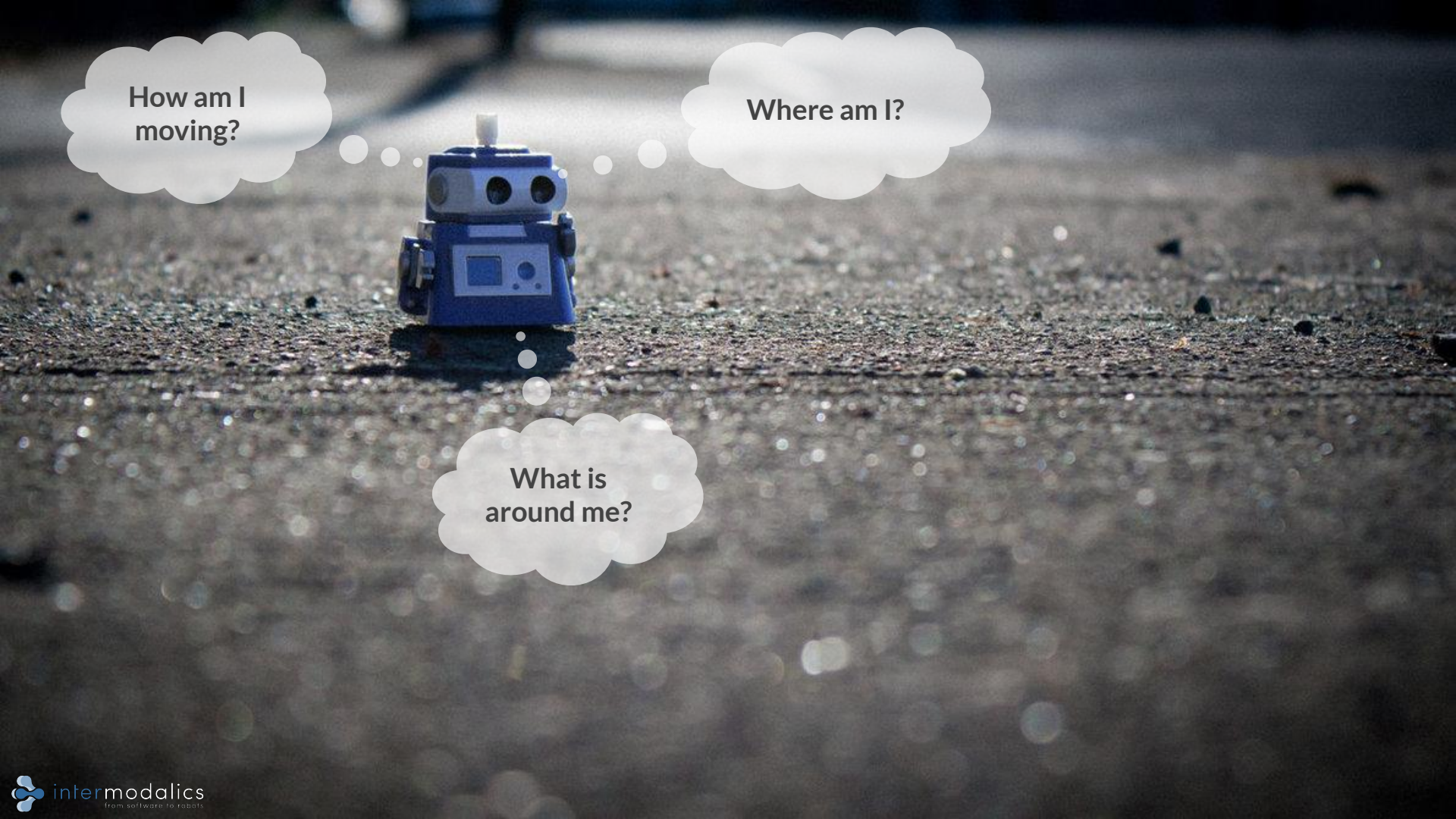
Dominick Vanthienen, PhD

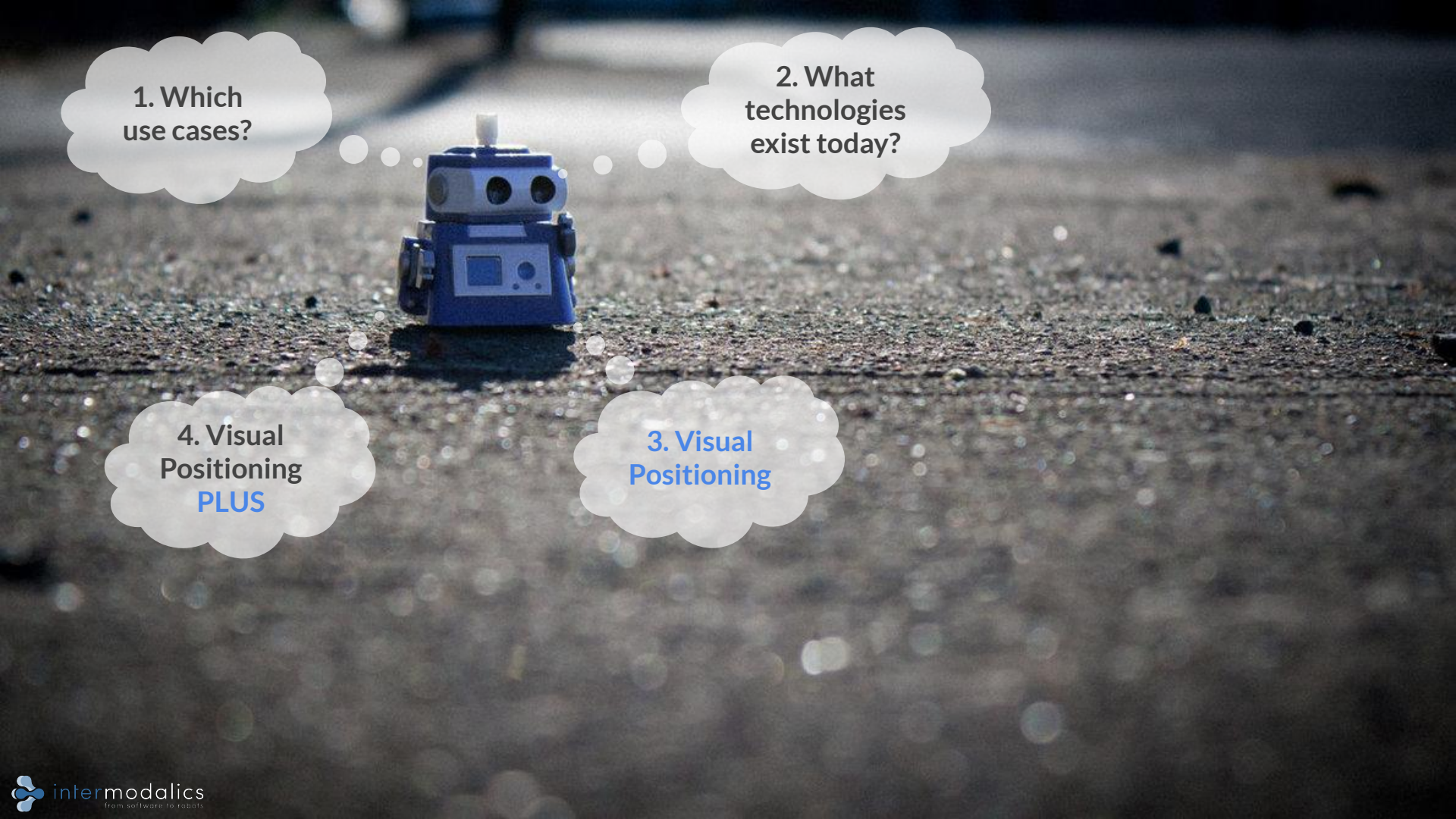
Boston - June 6th, 2019

intermodalics

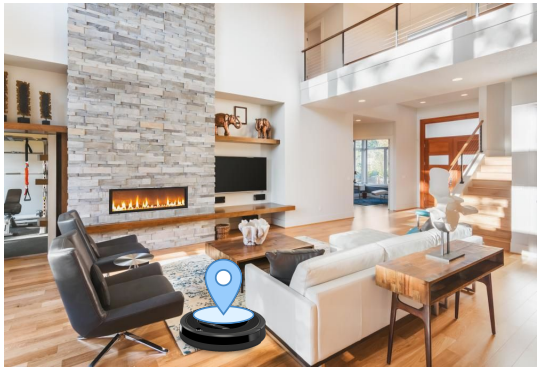
from software to robots

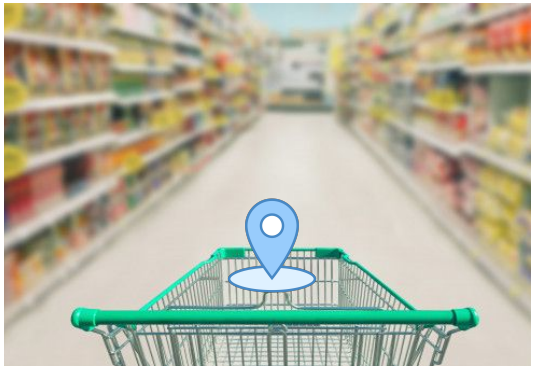
intermodalics
from software to robots


How am I moving?
Where am I?
What is around me?

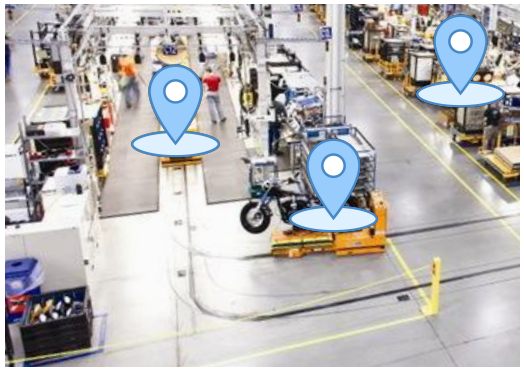


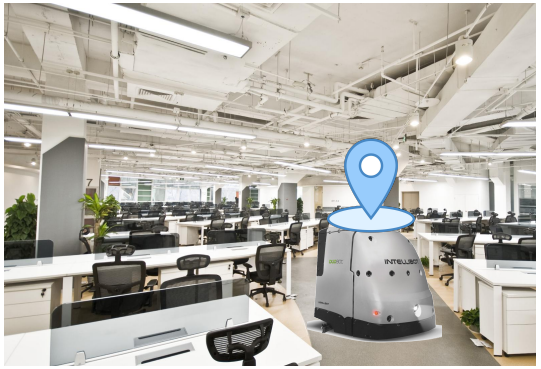
intermodalics
from software to robots

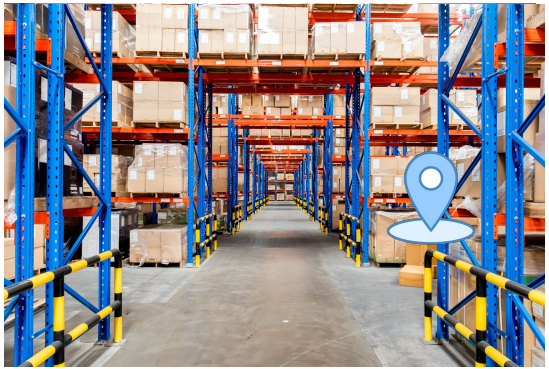




Indoor





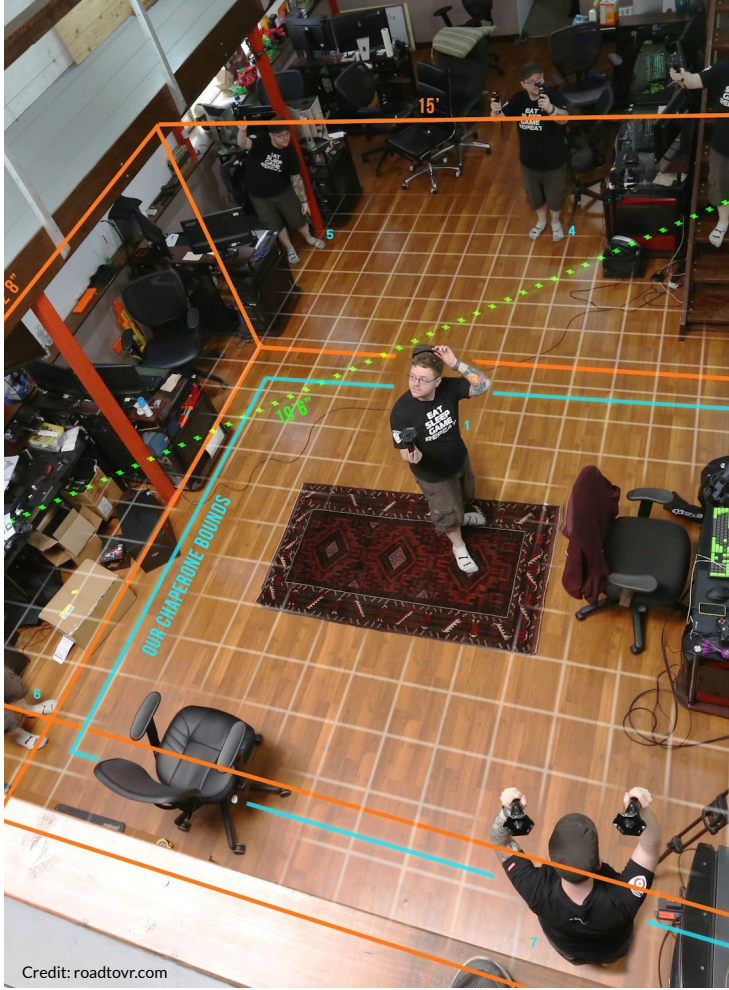


intermodalics
from software to robots

Inventory

AR-VR-MR apps

Credit: HTC



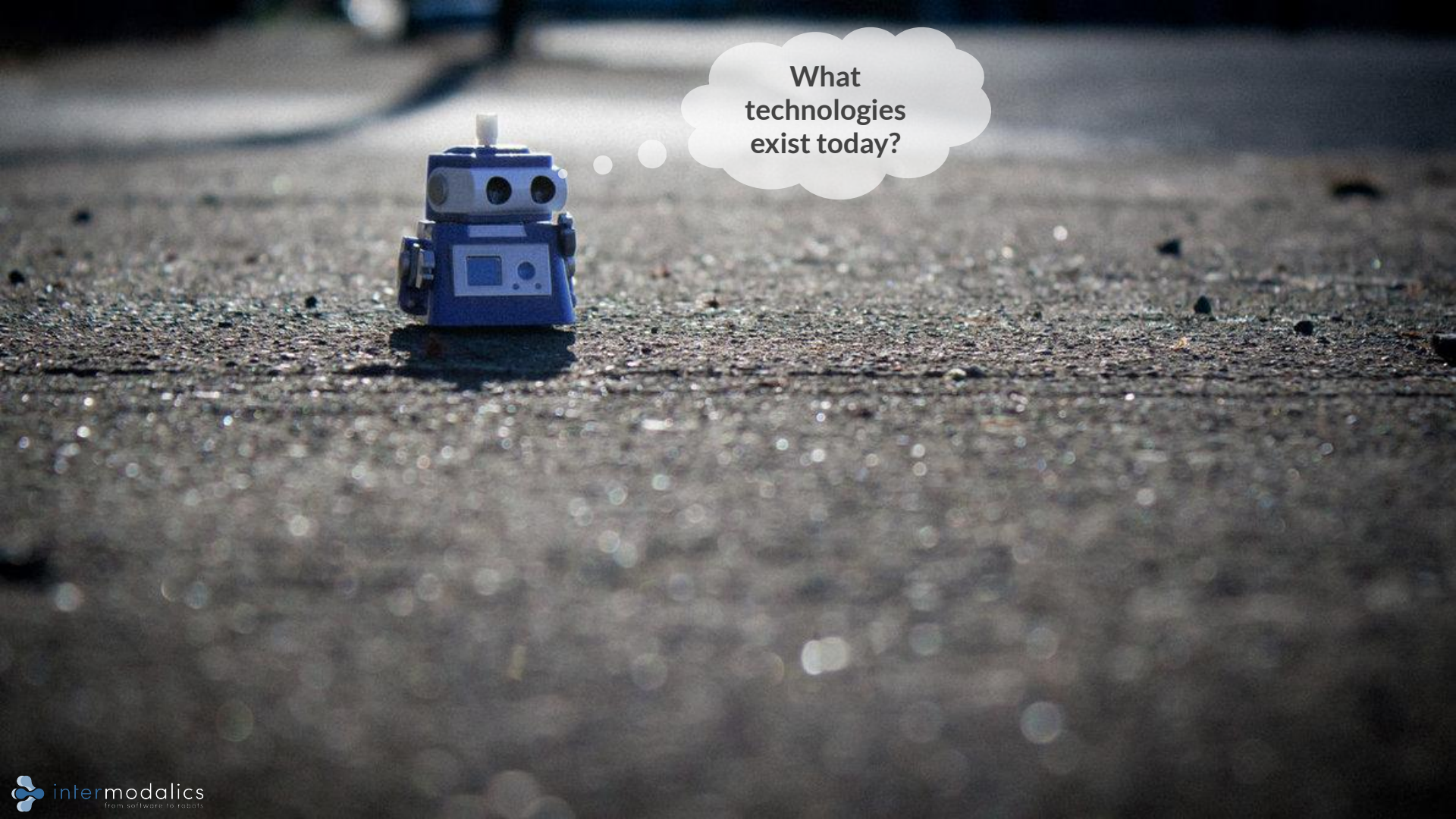
Credit: roadtovr.com

Outdoor

GPS denied

intermodalics
from software to robots

Precise inspections


What technologies exist today?

Fiducials

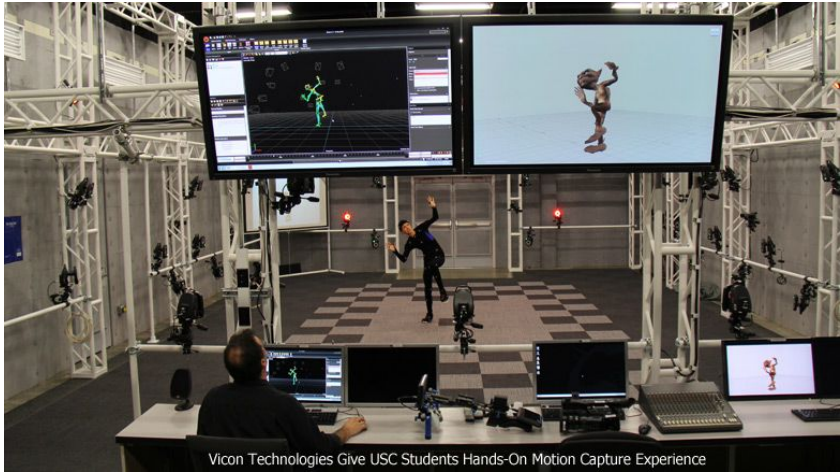
Credit: Linde robotics

Fiducials

Time of Flight

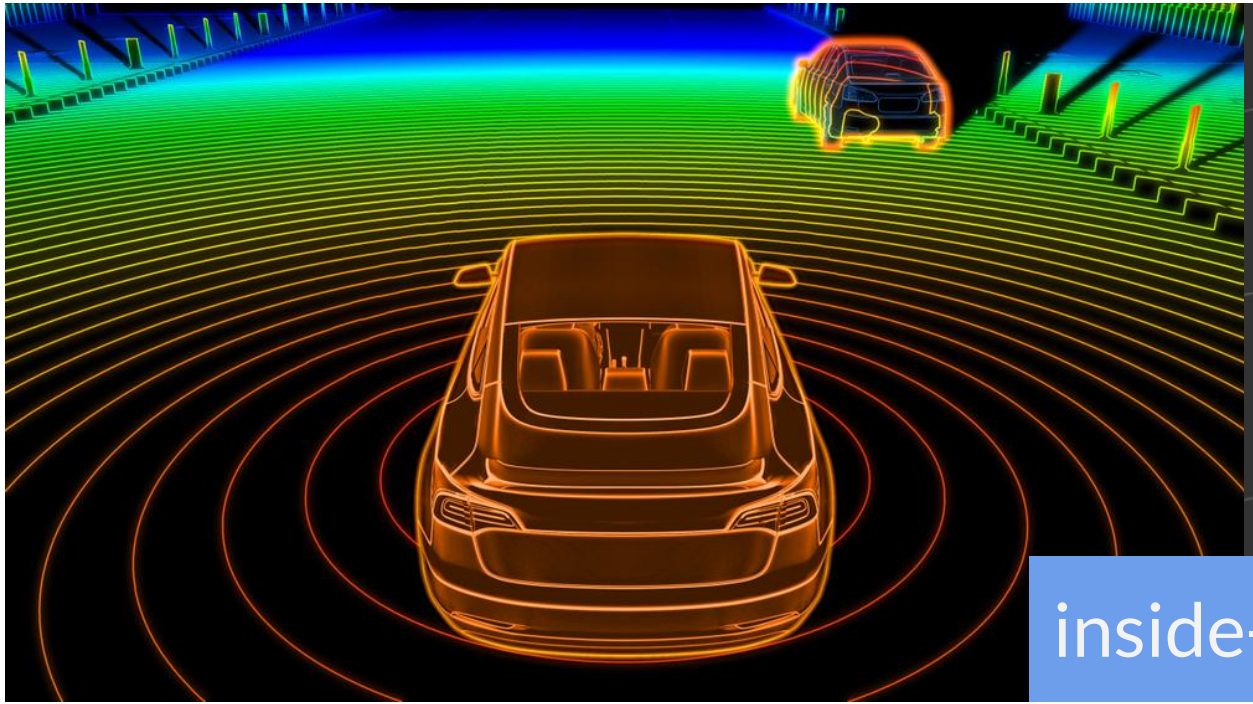
Time of Flight

Line of sight



outside-in

Line of sight



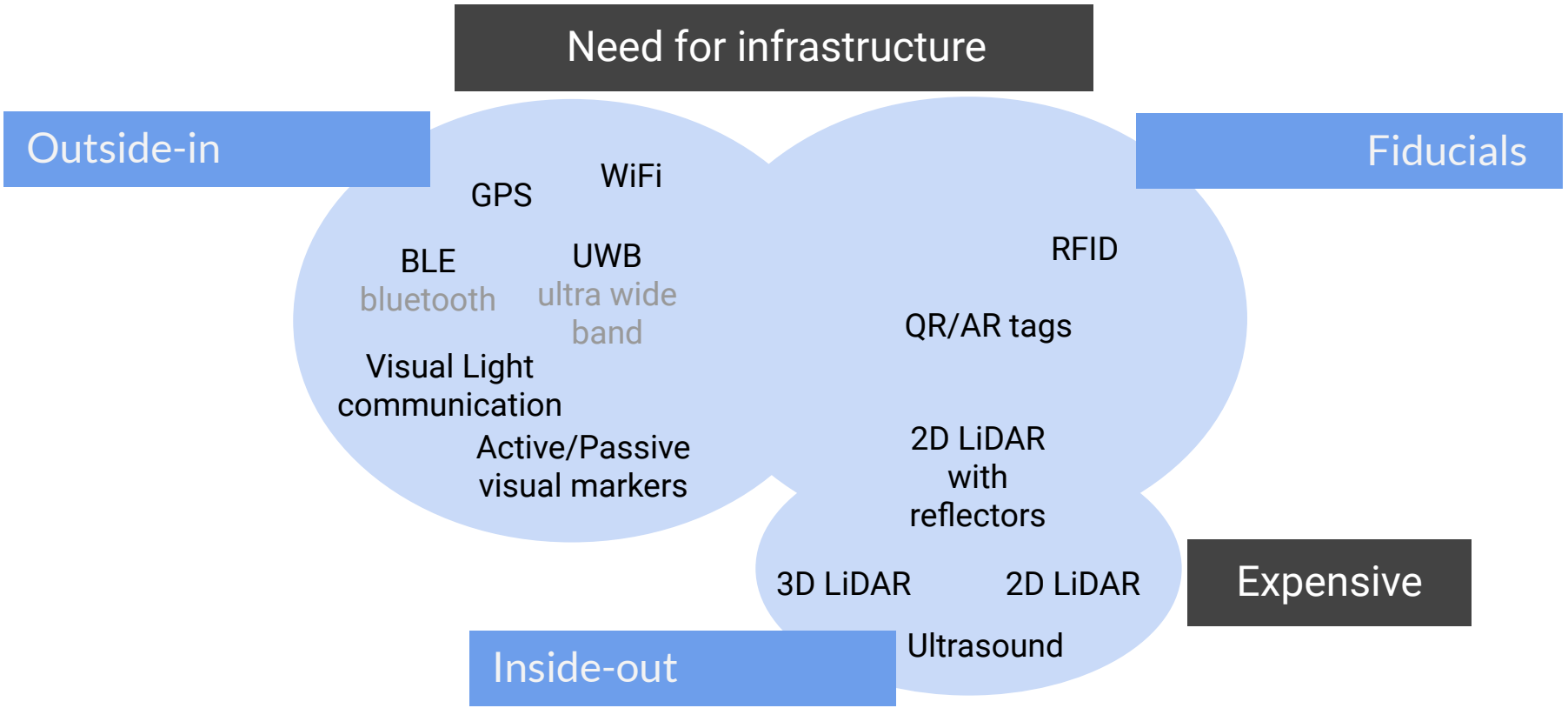
inside-out

Line of sight

*"**Lidar** is a fool's errand. Anyone relying on lidar is doomed. Doomed! [They are] expensive sensors that are unnecessary. It's like having a whole bunch of expensive appendices. Like, one appendix is bad, well now you have a whole bunch of them, it's ridiculous, you'll see." - Elon Musk, CEO Tesla*

inside-out

Technologies



Technologies

Need for infrastructure

Outside-in

Fiducials

GPS

WiFi

BLE
bluetooth

UWB
ultra wide
band

RFID

QR/AR tags

Visual Light
communication

Active/Passive
visual markers

Accuracy >50cm

2D LiDAR
with
reflectors

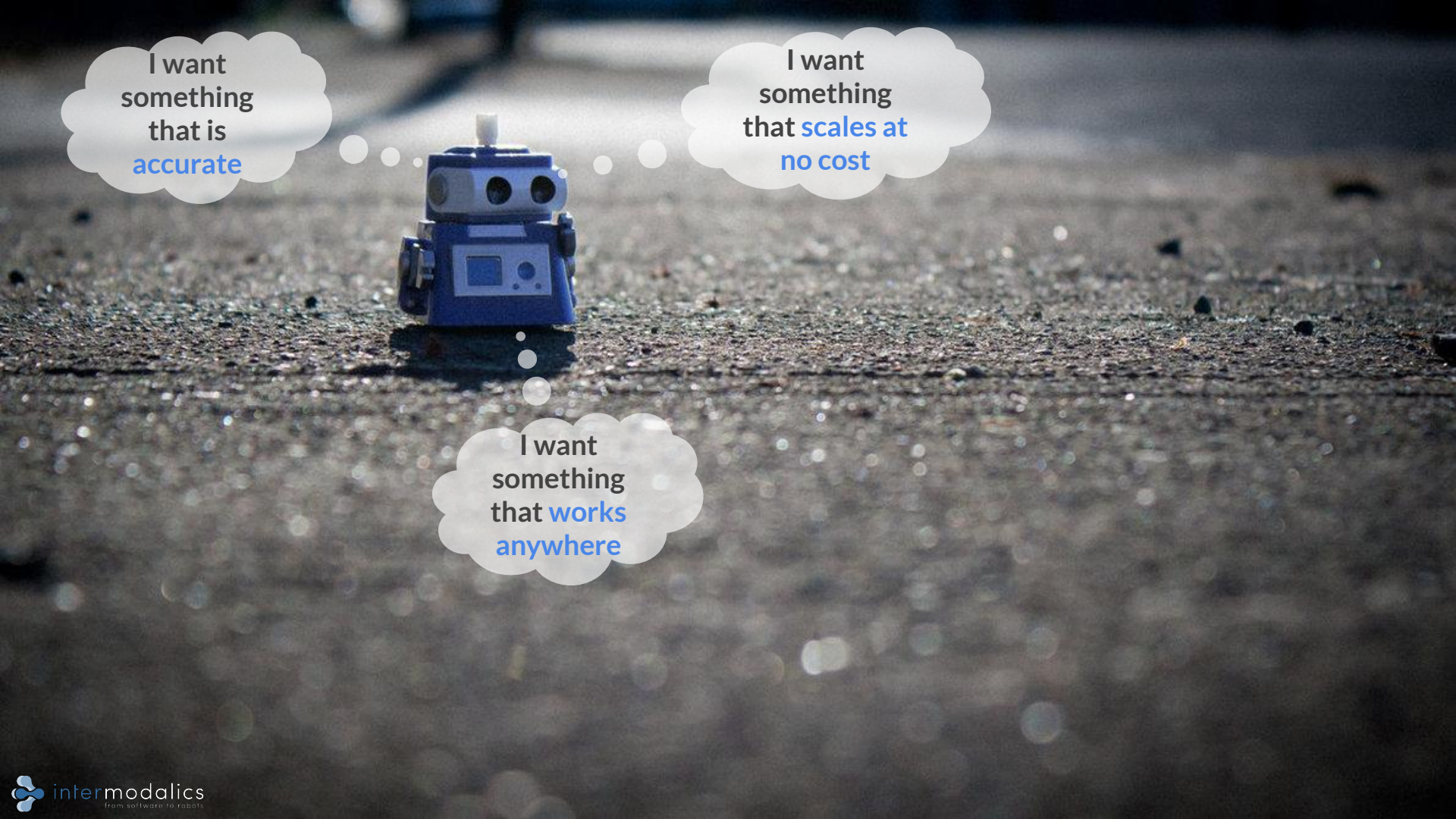
3D LiDAR

2D LiDAR

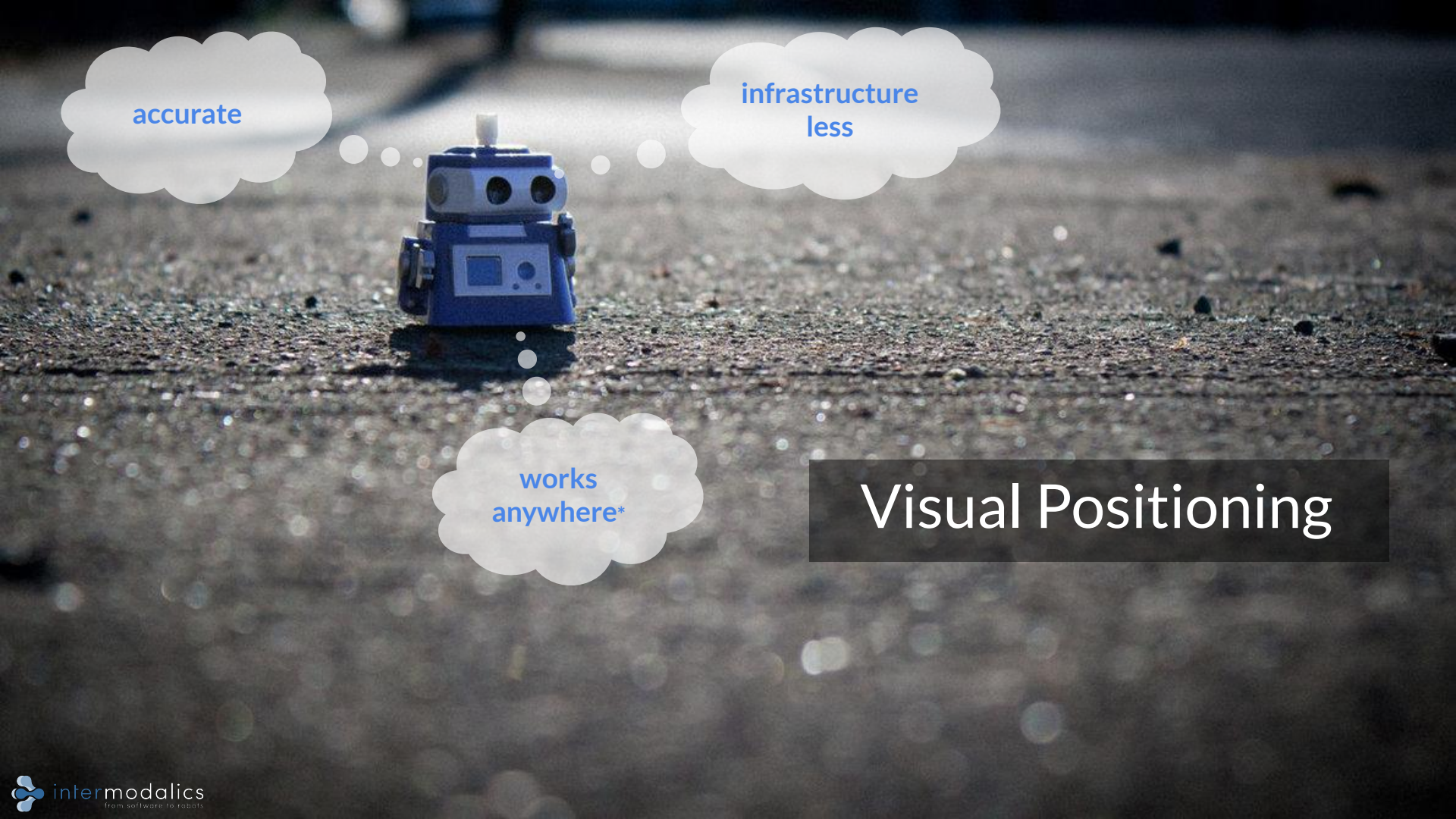
Expensive

Ultrasound

Inside-out



intermodalics
from software to robots

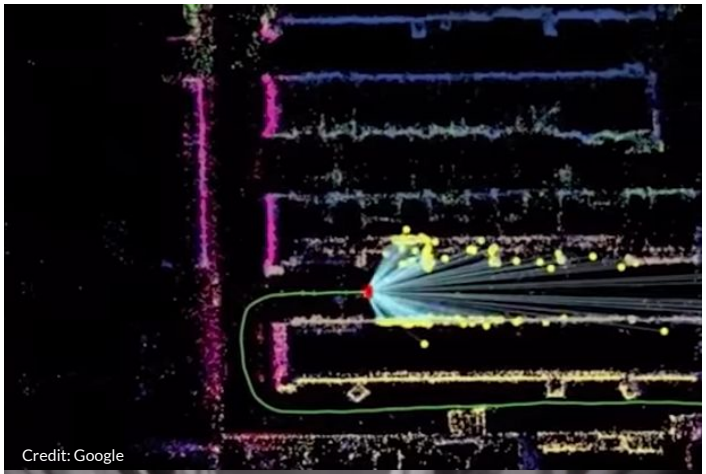


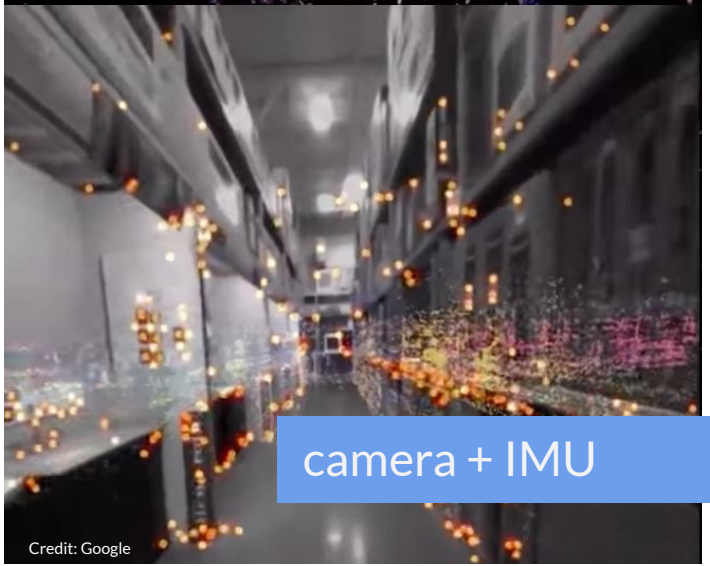
intermodalics
from software to robots

What is Visual Positioning?

→ localization based on visual cues and IMU sensor data

- VIO Visual Inertial Odometry
- (V)SLAM Visual Simultaneous Localization and Mapping
- VPS Visual Positioning System





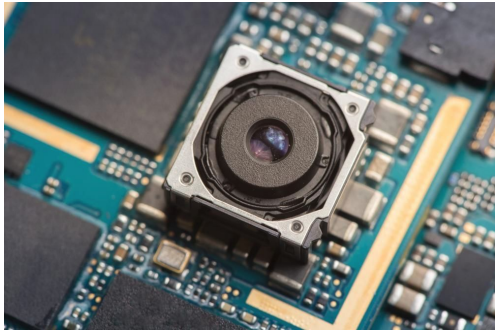
What is Visual Positioning?

Google 2014

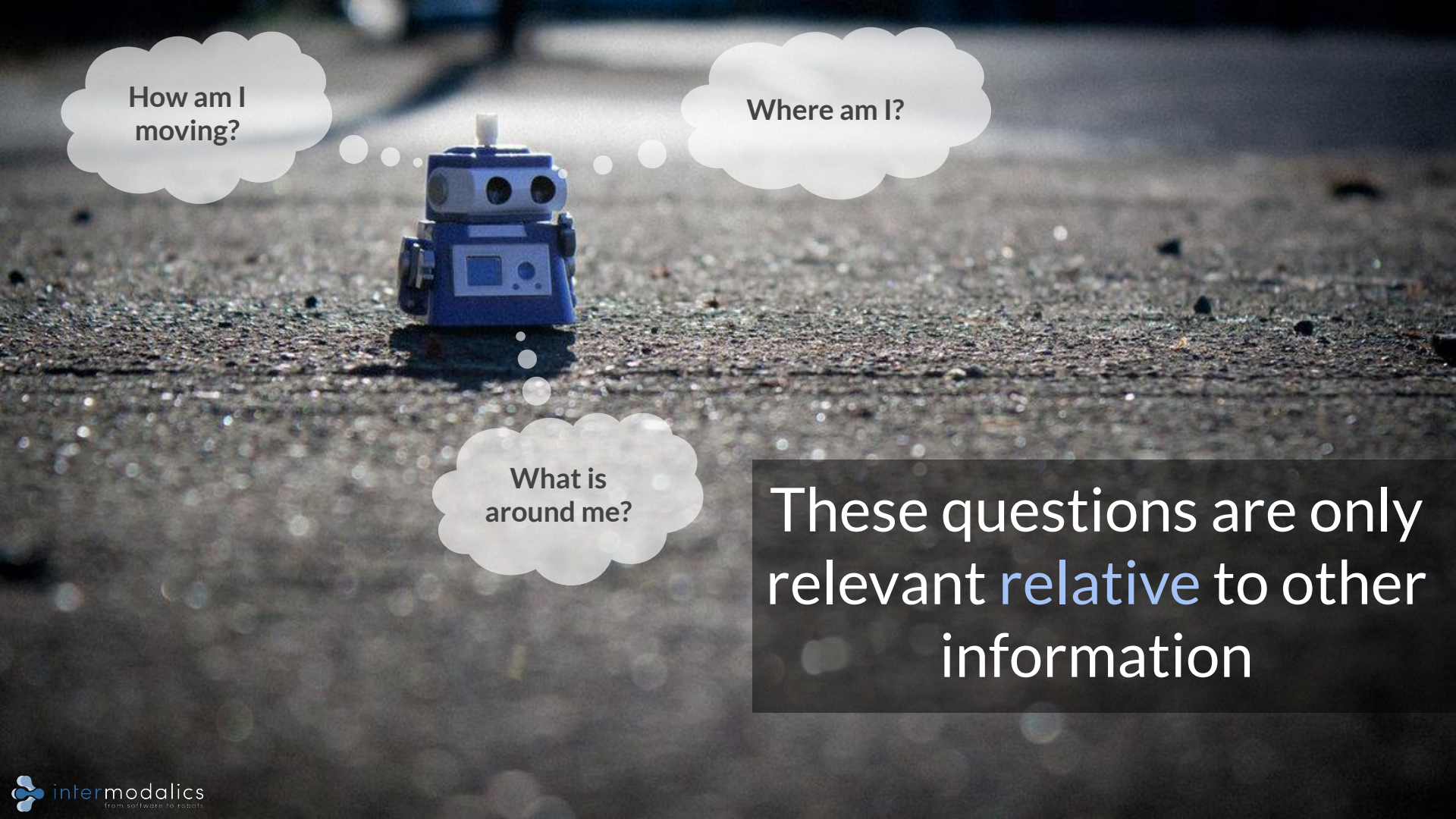
intermodalics
from software to robots

Advantages of a Visual Positioning

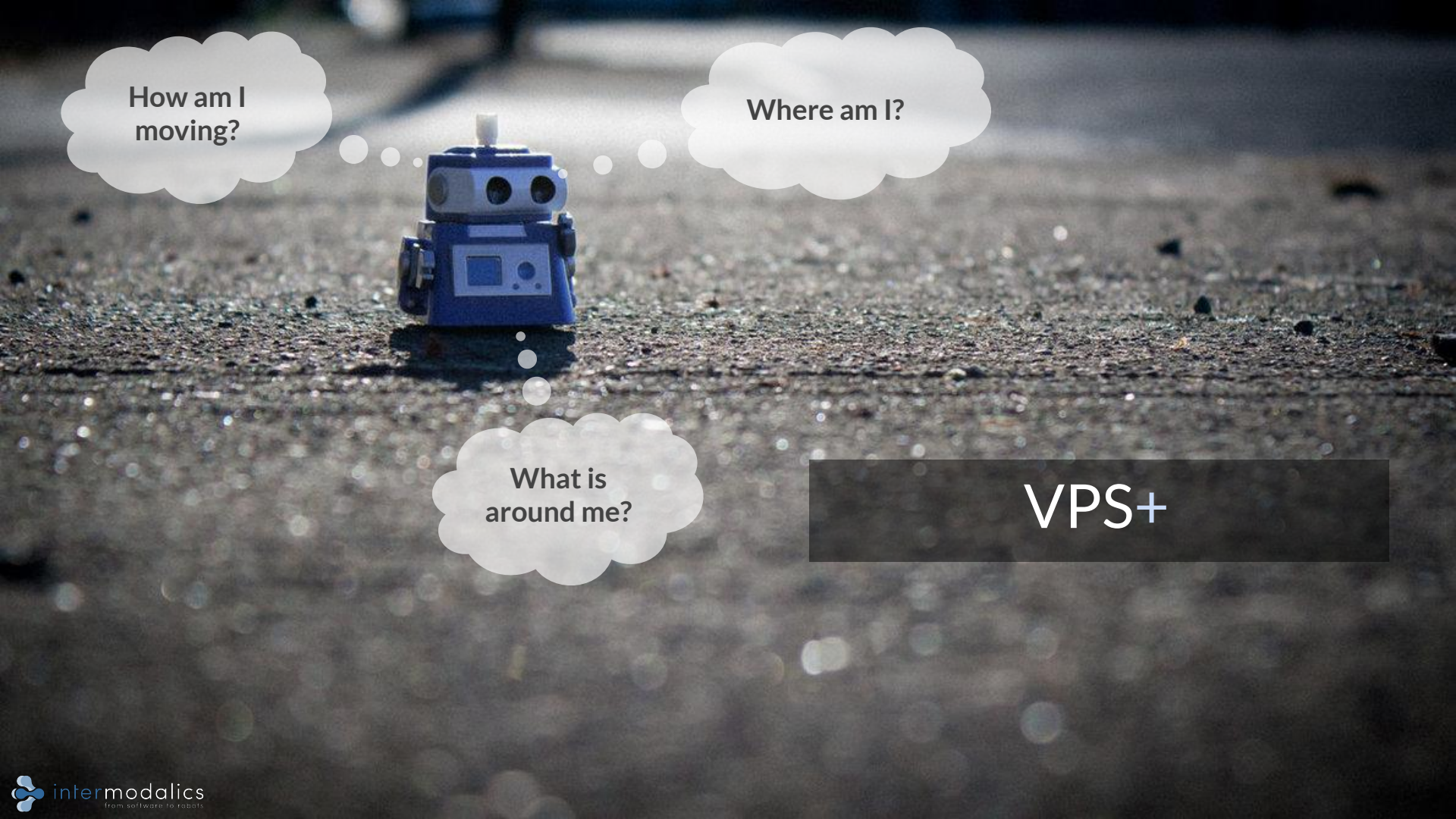
- Scalability in cost and ownership
  - No infrastructure on site - no beacons
  - Ease of deployment or extension
  - Wholesale prices IMU and camera for few € each
- Compact and flexible hardware
  - Choose your form factor and device location
  - No hardware lock in !
- Full 3D pose
  - Which direction are we looking at ?
  - Position and orientation
- Accurate
  - ~10cm in a map



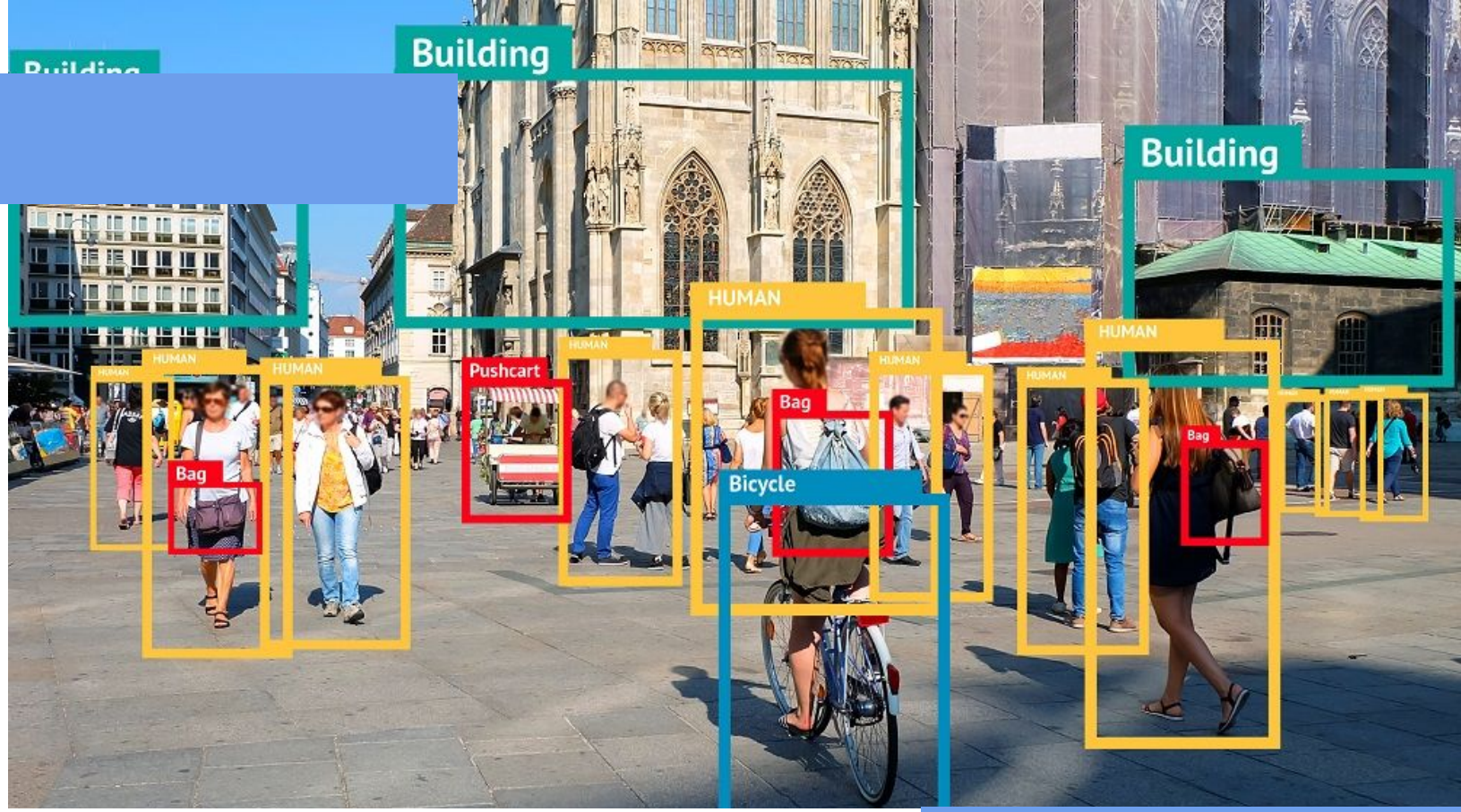
Most scalable



These questions are only relevant relative to other information

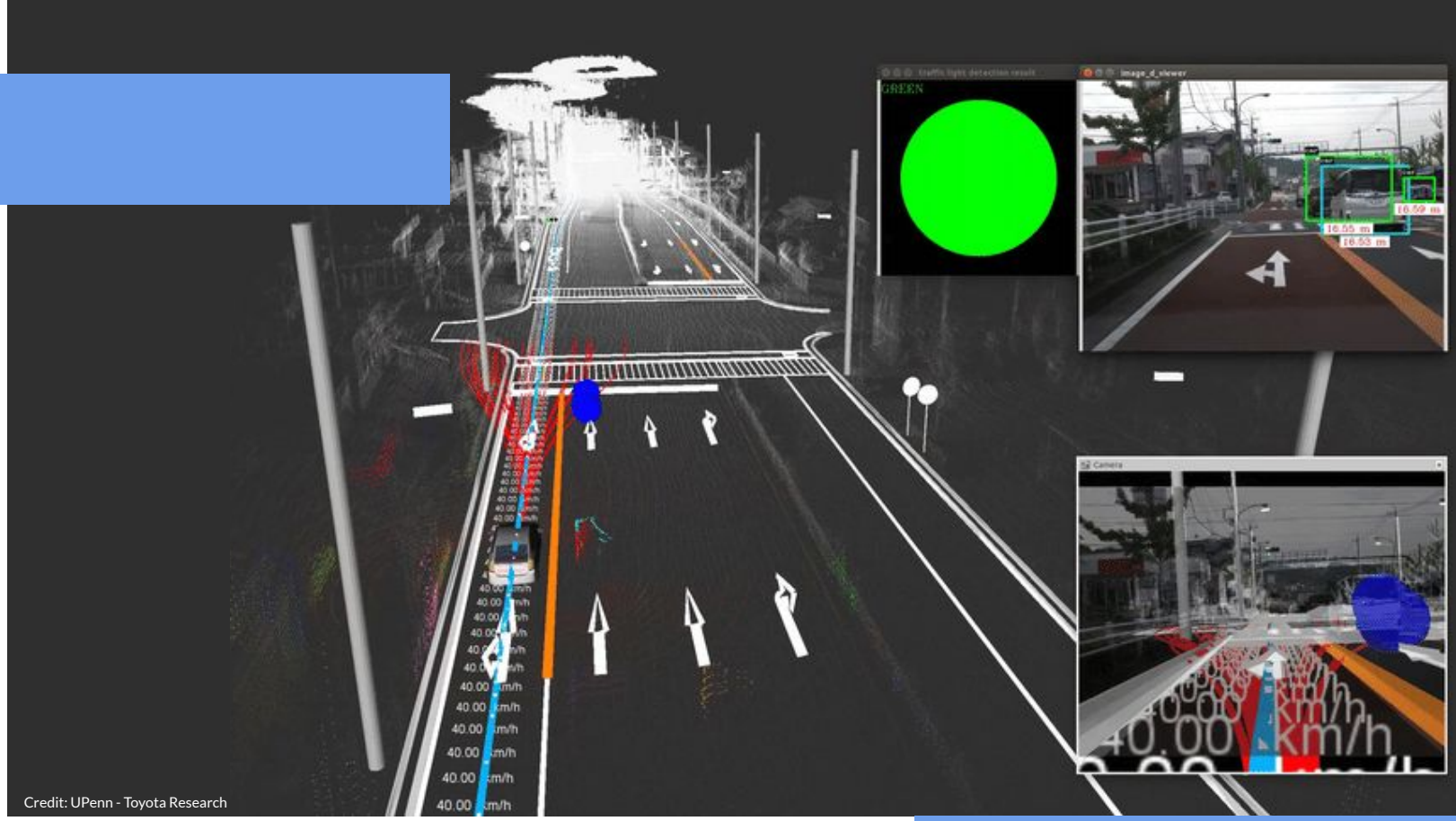

How am I moving?
Where am I?
What is around me?
VPS+

VPS+



Object detection

VPS+

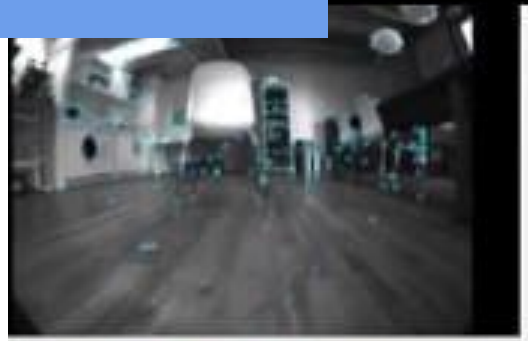


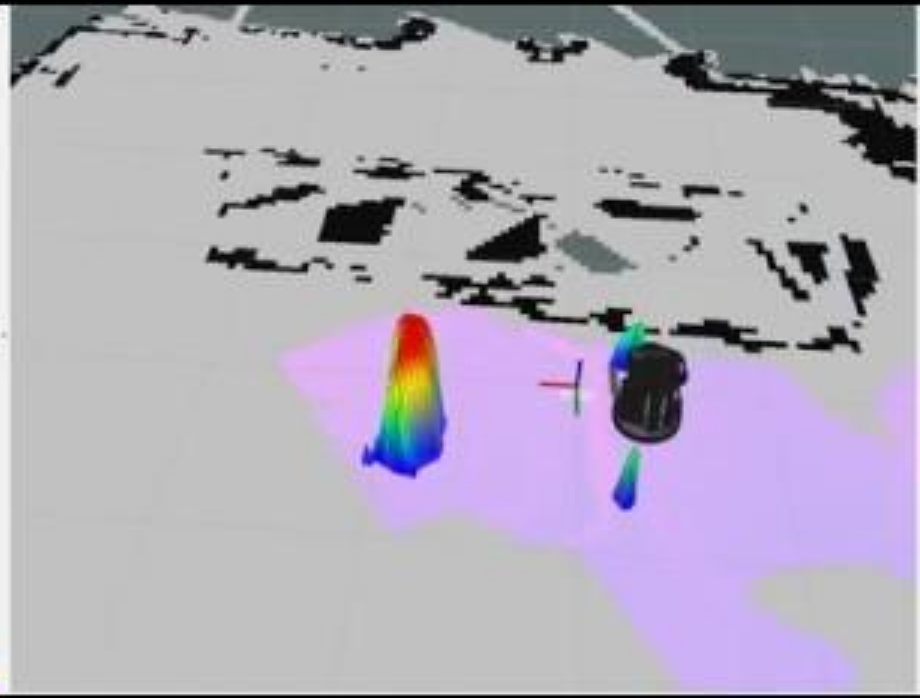
Object localisation

VPS+

Obstacle avoidance

VPS+



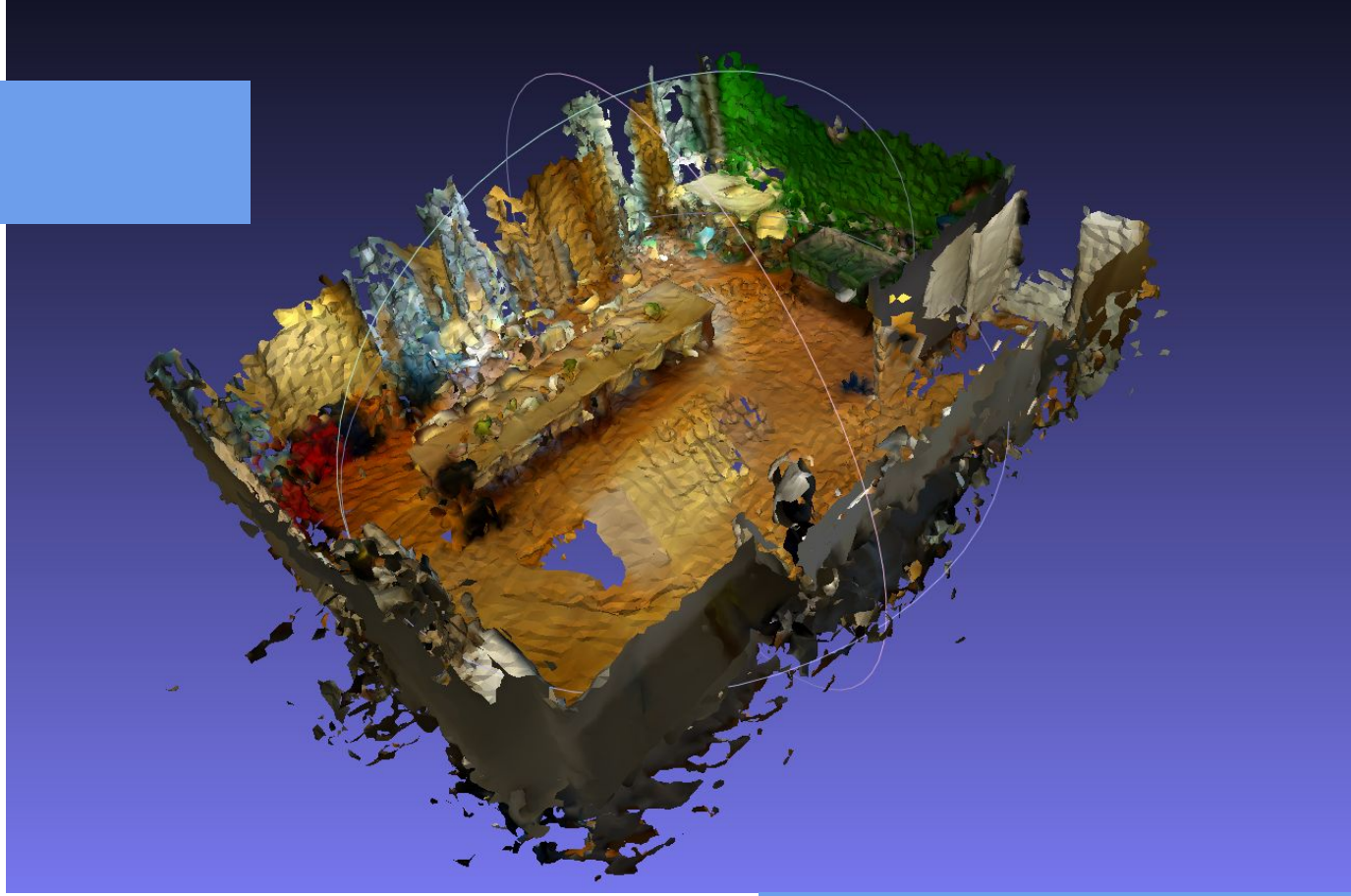


Obstacle avoidance

VPS+

Floorplan generation

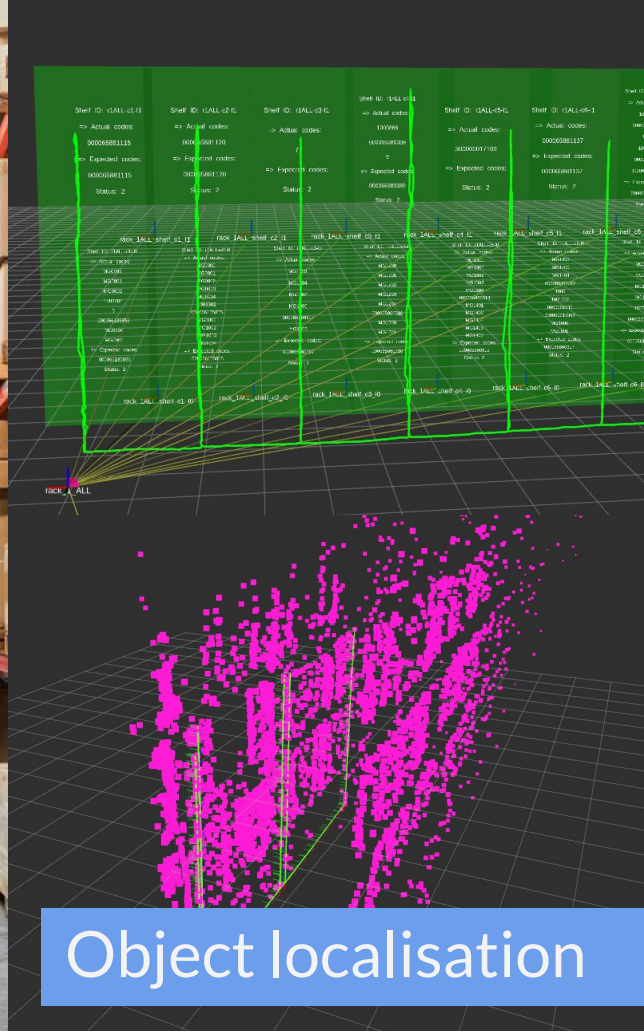
VPS+



3D reconstruction

intermodalics
from software to robots

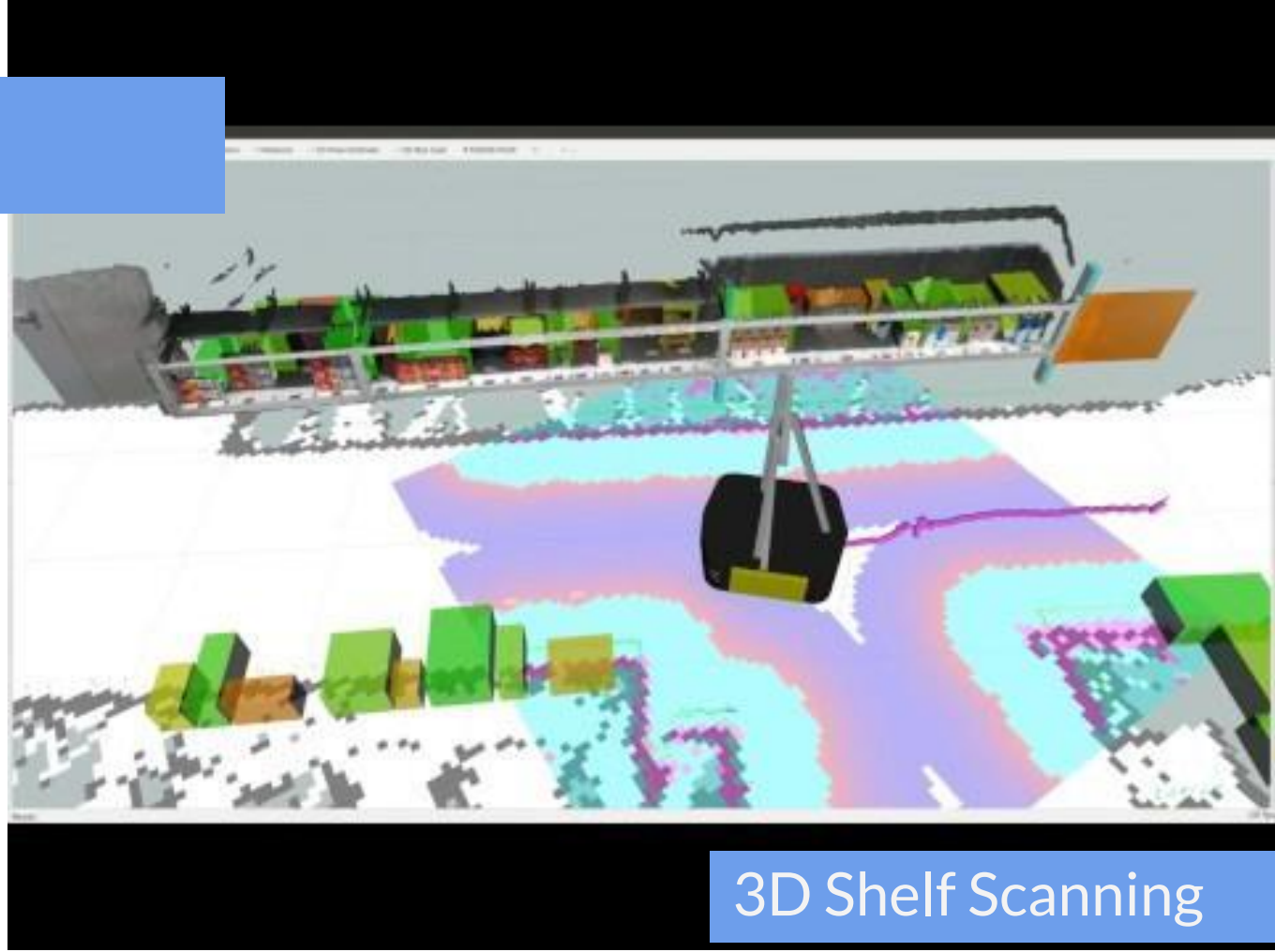
VPS+



Object localisation

intermodalics
from software to robots

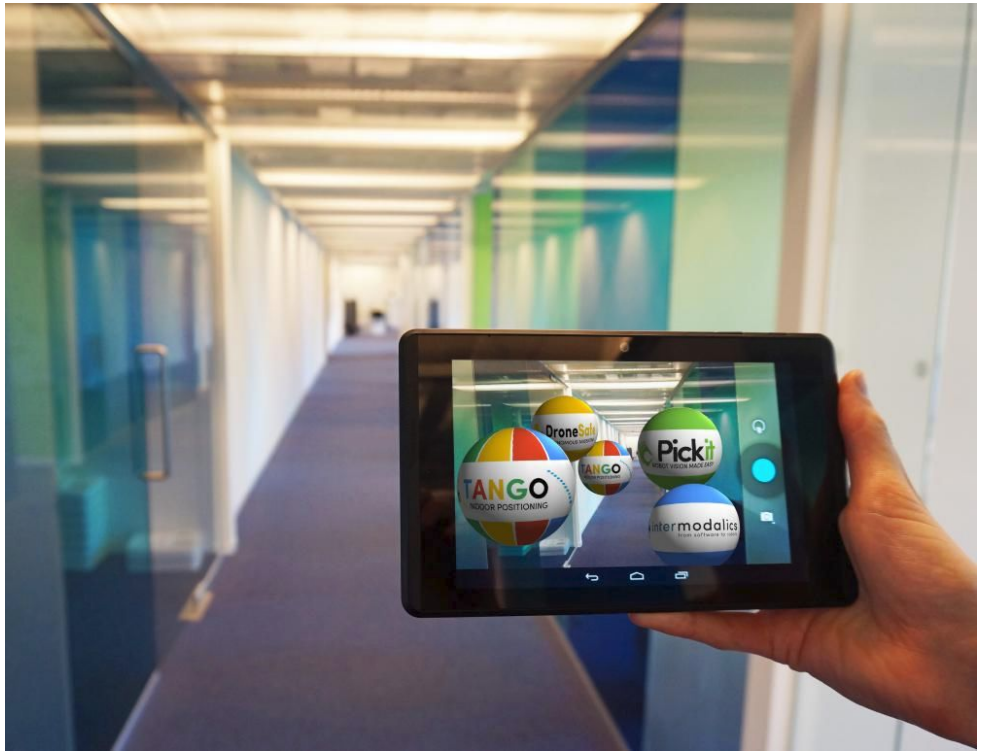
VPS+



3D Shelf Scanning

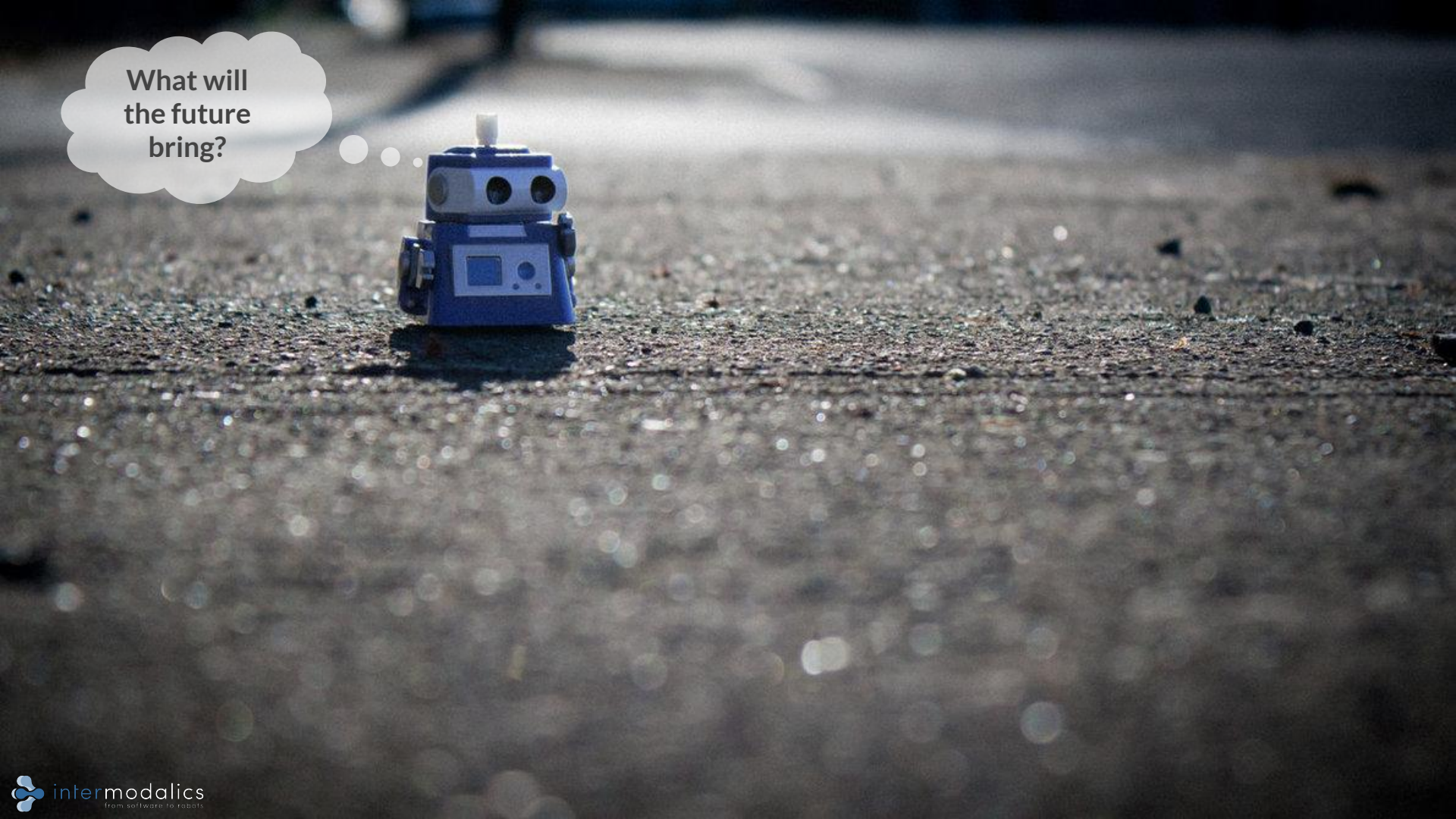
intermodalics
from software to robots

VPS+

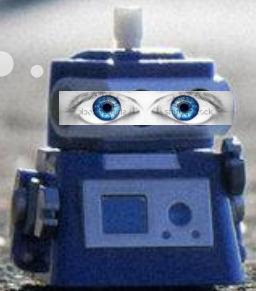


Credit: Magic Leap

VR / AR / MR


What will the future bring?

What will the future bring?



More than 500 million years ago, vision became the primary driving force of evolution's 'big bang', the Cambrian Explosion, which resulted in explosive speciation of the animal kingdom. 500 million years later, AI technology is at the verge of changing the landscape of how humans live, work, communicate,and shape our environment.
Prof. Fei-Fei Li - Stanford University

intermodalics
from software to robots

Let's meet!

What is your VPS plus?

Where could you use localization?

What are your experiences
with indoor localization?

Which RTLS did you consider or use?

www.intermodalics.eu

Dominick Vanthienen
dominick.vanthienen@intermodalics.eu