

# mobile robotics, linking the assembly process 4.0

automated guided vehicles (AGV) and human robot collaboration (HRC)  
移动机器人在工业4.0组装过程中的应用——AGV及人机协作

## 企业愿景:

### Enterprise Vision:

专业的AGV和自动化系统方案提供者。

Specialist for customer-specific system solutions of AGV and automation devices.



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## 宁波舜宇贝尔自动化有限公司

Ningbo Sunny Bär Automation Co., Ltd.

# 公司介绍

## Company Profile

宁波舜宇贝尔自动化有限公司成立于2017年4月，公司定位为一家集设计研发、技术服务、自动化系统集成于一体的高新技术企业，为客户提供AGV（Automated Guided Vehicle）应用方案、基于AGV应用的自动化柔性智能制造生产线、非标集成应用为主的自动化公司。

We are partner for  
the production  
of the future

我们是未来生产的合作伙伴

### Assembly technology

装配技术



- ▶ manual, semi- und fully-automated assembly systems
- ▶ 手动、半自动及全自动装配系统
- ▶ Lean production
- ▶ 精益生产
- ▶ Scalable grade of automatisisation
- ▶ 弹性自动化
- ▶ Poka-Yoke, Kaizen,....
- ▶ 防错，改善...

### Robot technology

机器人技术



- ▶ Integration of all well-known trademarks
- ▶ 集合所有驰名商标
- ▶ Sensitive robots
- ▶ 灵敏型机器人
- ▶ Customized grippers
- ▶ 夹具定制
- ▶ Cell controls
- ▶ 单元控制
- ▶ Pallet handling systems
- ▶ 托盘装卸系统

### AGV's

AGV系列



- ▶ Contrax FTS (Contrax AGVs)
- ▶ innovative/agile assembly and logistic concepts
- ▶ 创新/柔性化装配和物流方案
- ▶ Energy management with powercaps
- ▶ 采用可更换电池进行能源管理
- ▶ Autonomous navigation
- ▶ 自主导航
- ▶ Master controls
- ▶ 主控

# Mobile robots in various fields and applications 移动机器人在各领域中的应用



Military 军事



Logistics 物流



Production conveying techniques  
产品输送技术



Mobility 机动性



Household assistance  
家庭援助



Package delivery / drones  
包裹派送/无人机



Diving robots  
潜水机器人

# modern automobile production

## 现代化汽车生产

realization and application  
of changeable assembly lines.

柔性装配线的实现及应用

quick infeed and removal of customized and special types and models

快速送料和移除定制的特殊类型和型号

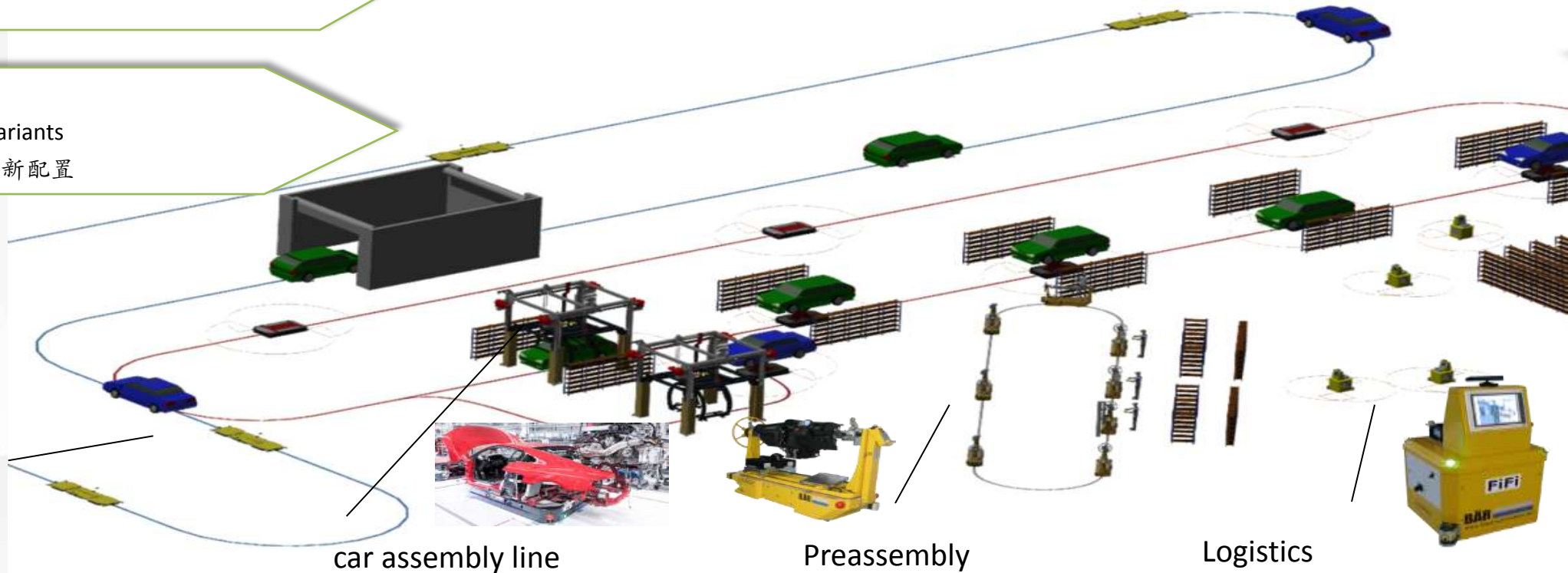
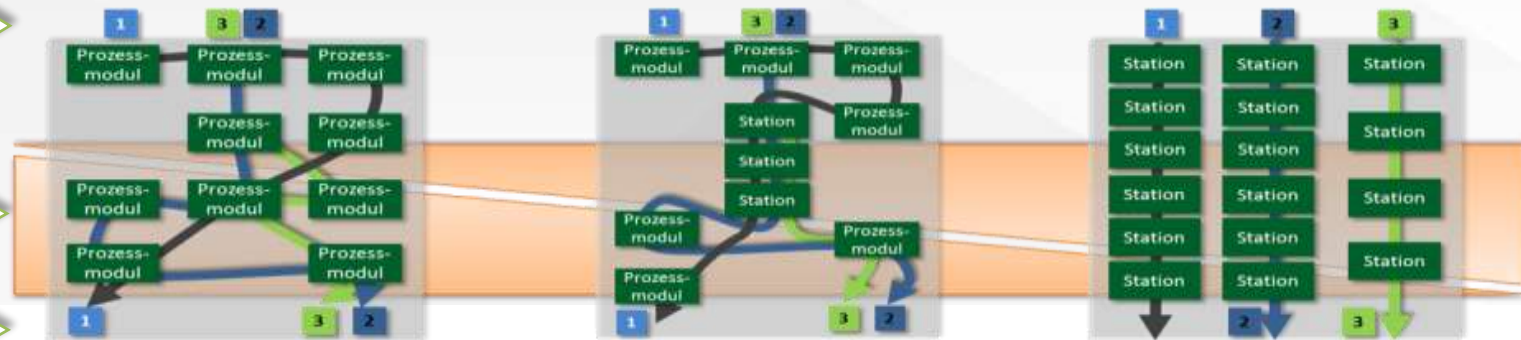
cycle time variations / management of a broader product variety

周期变化/更广泛的产品种类管理

fast reconfiguration at changes

of production processes and product variants

在生产过程变化和 product 变型中快速重新配置



EOL conveying techniques  
EOL输送技术

car assembly line  
汽车装配线

Preassembly  
预装

Logistics  
物流

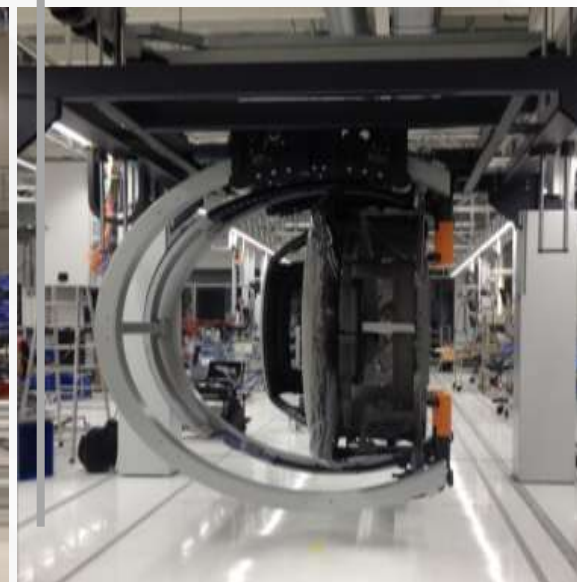
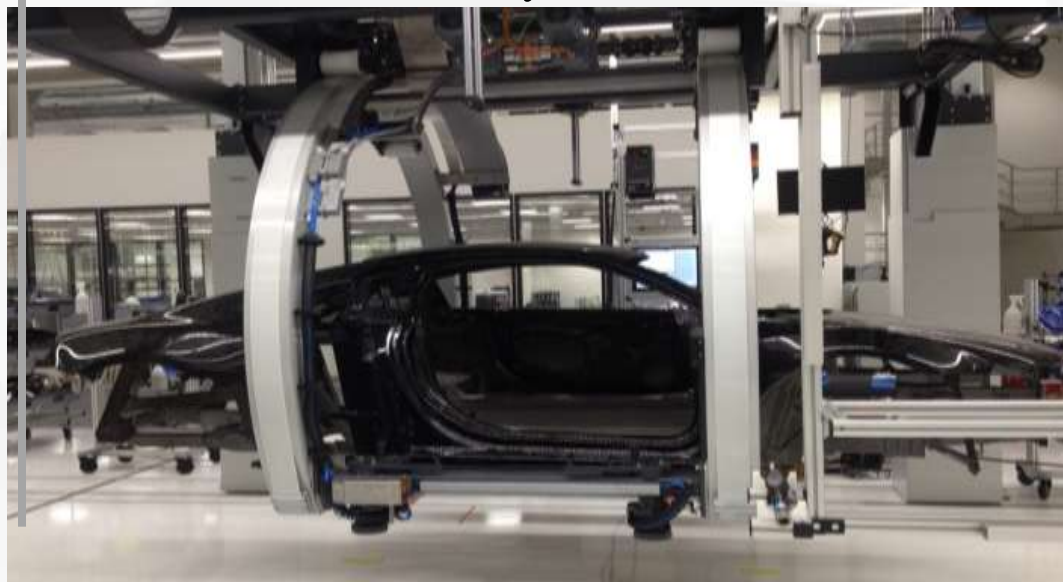
# 基于AGV自主导航系统的柔性汽车总装线-- Audi R8

Audi R8 – Flexible Automotive Assembly Line based on AGV autonomous Navigation



# 基于AGV自主导航系统的柔性汽车总装线-- Audi R8

## Audi R8 – Flexible Automotive Assembly Line based on AGV autonomous



### 技术参数 Technical parameters :

AGV数量 Quantity of AGV: 65

- ◆ 载重 Load weight: 3000 kg;
- ◆ 提升高度 Lifting height: 1200 mm;
- ◆ 车体尺寸 AGV Dimension: 2300mm\*1400mm\*300mm;
- ◆ 驱动方式 Mode of driving: 万向驱动 Omnidirectional driving;
- ◆ 导航 Navigation: 基于地图的自动导航系统, 采用SLAM算法 Autonomous Navigation with SLAM;
- ◆ 精准定位 Precise position: 采用RFID作为精准定位控制, 保证±3mm的到位精度 Precise Positioning control through RFID, positioning accuracy of ±3mm;
- ◆ 优点 Advantage: 导航地图可以依据路线布局、车型及承载结构和交货数量灵活可变 Layout-, Variant- und Production flexible;
- ◆ 供电方式 Power supply: 在线充电 Online charging;
- ◆ 电源管理 Power Management: 超级电容作为主供电, 小型铅酸电池或锂电池备用 Boostcap (main), small lead acid battery or lithium battery (alternate);
- ◆ 顶升机构 Lifting Structure: 剪刀升顶升, 德国贝尔自主专利设计 Scissors Lift (Design Patent of Bär Automation GmbH);



# 新能源汽车电池合装AGV

## New Energy Vehicle Battery Assembly



### 技术参数 Technical parameters:

- ◆ 载重 Load weight: 3000 kg;
- ◆ 提升高度 Lifting height: 1560 mm;
- ◆ 车体尺寸 AGV Dimension: 2300mm\*1100mm\*600mm;
- ◆ 驱动方式 Mode of driving: 差速驱动 Differential drive;
- ◆ 导航 Navigation: 光学色带导航 Optical tracking with ribbon;
- ◆ 精准定位 Precise position: 采用RFID作为精准定位控制，保证±3mm的到位精度  
Precise Positioning control through RFID, positioning accuracy of ±3mm;
- ◆ 供电方式 Power supply: 在线充电 Online charging;
- ◆ 电源管理 Power Management: 超级电容作为主供电，小型铅酸电池或锂电池备用  
Boostcap (main), small lead acid battery or lithium battery (alternate);
- ◆ 顶升机构 Lifting Structure: 剪刀升顶升，Paco机构（客户指定） Scissors Lift (Paco, customer-specified);

# ARENA 2036汽车装配展示项目



## 德国智能制造ARENA2036

(Active Research Environment for the Next Generation of Automobiles) 意为“为新一代汽车构建积极的研究环境”。  
“2036”则剑指汽车工业诞辰150周年时的2036年。

### German Intelligent Manufacturing ARENA 2036

ARENA means Active Research Environment for the Next Generation of Automobiles, “2036” is the year of 150 anniversary of the birth of automobile industry.



主要包括三个方面的战略目标：

Our ambitious vision is composed of the following three strategic goals:

1. “产品2036”，即实现材料轻质化与多功能融合。

Product 2036: light and with functional integration – redefining the borders of lightweight design based on multifunctionality and new materials.

2. “生产2036”，即实现高效与个性化的生产，在“可变性的工厂”中实现生产的可持续性。这里“可变性的工厂”属于未来工厂的一种类型，即根据不同的生产需要进行模块化的调整，通常有适应能力强、兼容性强、生产方式灵活等特点。

Production 2036: highly efficient and versatile – sustainable production in a versatile factory.

3. “研究2036”，即提出新的研究模式，以支持创新设计和技术变革，目的是在汽车轻量化制造和生产技术创新领域建立研究与开发的桥梁。

ARENA 2036: a novel research environment working to shape the transformation of technology.



# ARENA 2036汽车装配展示项目



德国贝尔自动化有限公司项目经理Philip Kirmse先生全程参与此项目，为项目的推进奠定了良好的基础。  
Project Manager Philip Kirmse from Bär Automation GmbH has participated in the whole process of this project, which has laid a good foundation for the promotion of it.

Univerdity 大学	Research Center&institutes 科研机构	Companies 企业			
University of Stuttgart 斯图加特大学	DLR 德国纺织品与纤维研究所	Bär Automation 贝尔自动化	Bosch 罗伯特博世	BASF 巴斯夫	
	FKFS 德国宇航研究中心	Daimler 戴姆勒	DYNAmore 迪纳摩	Faro 法如	Festo 菲斯托
	Fraunhofer Institute 费劳恩霍夫研究所	Hewlett Packard 慧与	KUKA 库卡	Pilz 皮尔磁	Siemens 西门子

# 轮胎毛坯件运输AGV

## Tire Workblank Transport AGV



### 技术参数 Technical parameters:

AGV数量 Quantity of AGV: 12

驱动方式 Mode of driving: 差速驱动 Differential drive

导航 Navigation: 光学导航/带传感器融合的自主导航

Optical tracking /autonomous navigation with sensor fusion

运载方式 Load handling device: 轮胎毛坯件的固定工件架 Work piece holder for Tire Workblank

货物类型/重量 Goods to be conveyed/weight: 轮胎毛坯件 Tire Workblank/50kg

通讯 Communication: 车间无线网络 Workshop W-LAN profinet

车体尺寸 AGV Dimension: 1000mm\*600mm (Ø x高) (Ø xH)

自重 Empty weight: 360kg

其他 Additional: 利用反射标记, 主控制站路径选择 Using reflector markers.

Master Control Station controls the path selection.

▶ Video

AGV automated guided vehicle  
a highly flexible production tool  
AGV—高度柔性化的生产工具



→ from using „mechanical detection bars “ towards a „gesture controlled“  
independently navigating device and partner in daily logistic and  
transportation tasks.

从“机械检测杆”到“手势控制”

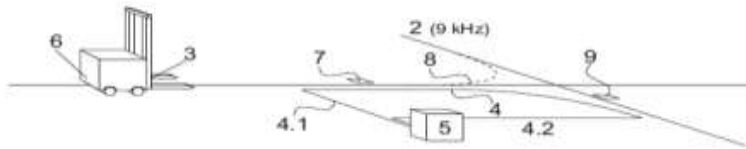
独立导航设备及其合作伙伴在日常物流和运输任务中的应用

# mobility – state of the art in the technology

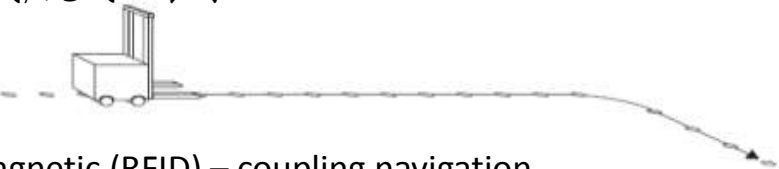
## 移动性 - 技术领域的尖端科技

### general navigation concepts 一般导航概念

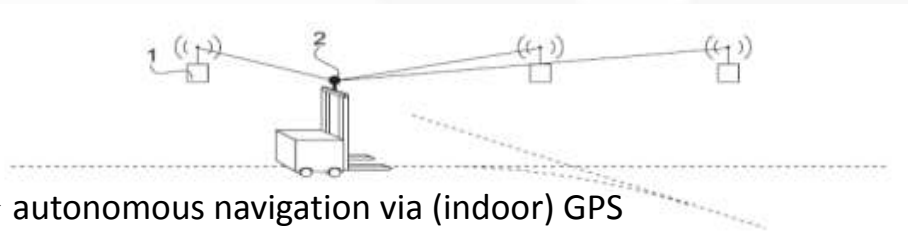
- different systems with advantages and disadvantages are in use.
- 使用中的不同系统既有优点也有缺点。
- extensive efforts are needed during a change of technology and when the systems reaches its limits.
- 在技术变革且系统达到极限时，仍需做大量工作。
- sometimes unflexible and only changable with extensive efforts
- 有时不灵活，只有进行大量工作后才会变得柔性化



- guiding wires / optical or magnetic tracking
- 导线/光或磁跟踪



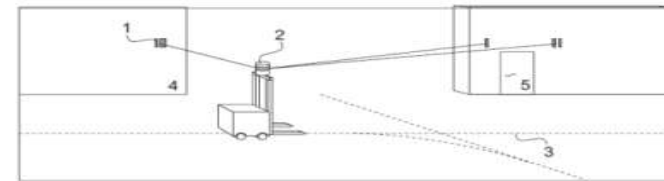
- magnetic (RFID) – coupling navigation
- 磁 (RFID) — 耦合导航



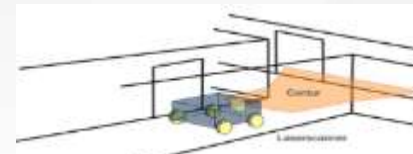
- autonomous navigation via (indoor) GPS
- 通过 (室内) GPS进行自主导航



- magnetic cluster navigation
- 磁性集群导航

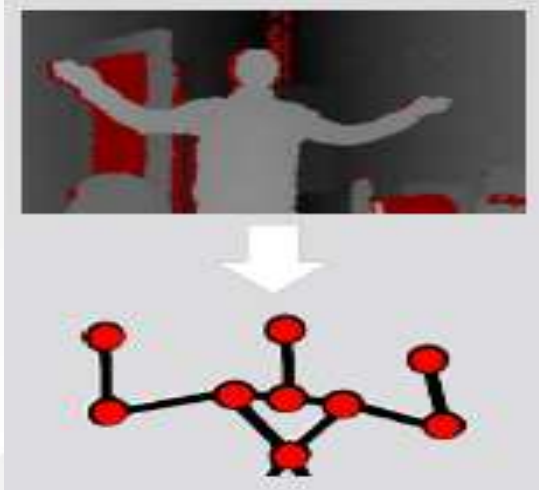


- autonomous navigation with additional laser scanners and reflector beacons.
- 附带激光扫描仪和反射器信标的自主导航。



- autonomous navigation using existing landmarks
- 使用现有地标进行自主导航

# Gesture controlled collaborative AGV 手势控制的协作AGV



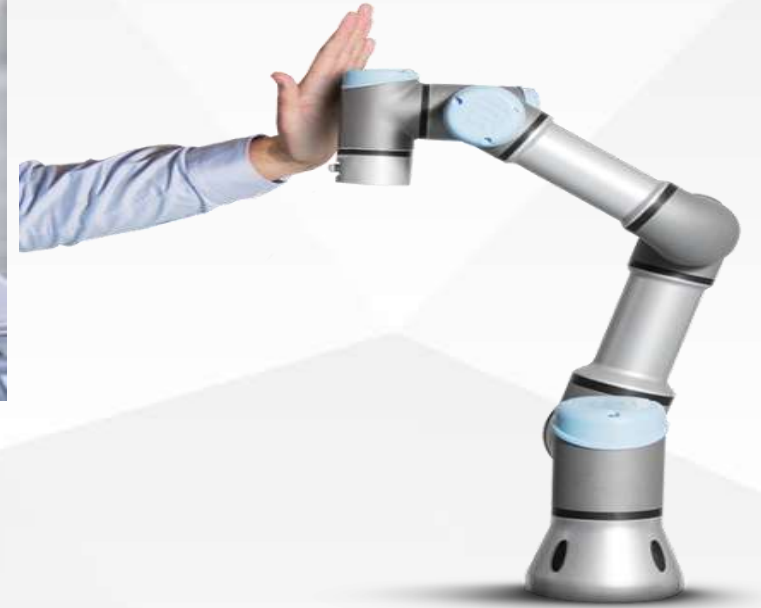
FIFI:

- ▶ shunting mode 调车模式
- ▶ following mode 跟随模式
- ▶ lined up following mode 排列跟随模式
- ▶ cluster mode 集群模式

in cooperation with

# Human Robot Collaboration - HRC

## 人机协作



# AGV automated guided vehicles

- modular design and manufacture through standardized and combinable packages / kits.
- 通过标准化、可组合的包装/套件进行模块化设计和制造。
- patented energy supply system, using double layered super capacitors (boost cap technology)
- 专利能源供应系统，采用双层超级电容（boost cap技术）
- application oriented designs and realizations (integration of robots / logistic applications)
- 面向应用的设计和实现（机器人/物流应用的集成）
- intelligent head control (open TCS) with dynamic communications and dispatching of the AGV's.
- AGV动态通信和调度的智能主控（开放式TCS）。

## drive system 驱动方式

**center point swivel drive**  
(forward directional)  
中心点旋转驱动（正向）

**differential drive**  
(forwards- and backwards direction)  
差速驱动（前后方向）

**motor driven steering devices**  
(omnidirectional movement)  
电机驱动转向装置（全向运动）

## Navigation 导航

Leitdraht

**magnetic Patterns**  
磁模式

**magnetic Tapes**  
磁带

**optical tracks**  
光学磁轨

**autonomous navigation(SLAM)**  
自主导航(SLAM)

## Examples 案例

**differential drive**  
(forwards- and backwards)  
差速驱动（前后）

**optical track**  
光学磁轨

**autonomous nav. with SLAM**  
自主导航(SLAM)

**boost cap technology**  
超级电容技术

**robot integration**  
(different types of robots can be used)  
机器人集成  
(可以使用不同类型的机器人)



## ConTrax mobile robot 4.0

the production assistant of the future

ConTrax移动机器人4.0—未来的生产助理



- modular platform with HRC applications and mobile robots.  
带有HRC应用和移动机器人的模块化平台。
- designed for common light weight robots  
专为普通轻型机器人设计
- (e.g. UniversalRobots, KUKA IIWA, Bosch APAS)  
(例如UniversalRobots, KUKA IIWA, Bosch APAS)
- omnidirectional movement with a new designed steering drive system.  
运用全新的转向驱动系统进行全方位运动
- applicable in various industry sectors 适用于各行各业
- scalable safety concept 可扩展的安全概念
- Modern, long life battery concept, based on lithiumtitanat batteries up to 7 h usage.  
现代化使用寿命较长的电池概念，基于锂钛电池，使用时间可达7小时。
- inductive quick recharge capabilities快速感应充电功能





# Outlook:

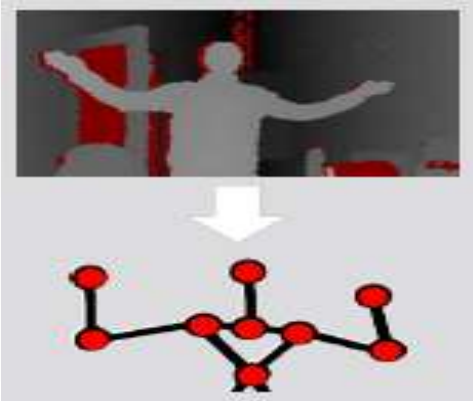
skill based, intuitive programming and control.

前景：基于技能，直观的编程和控制



## Programming concepts 编程概念:

- ▶ pre-programmed skills and routines for configuration of the device  
用于配置设备的预编程技能和例程
- ▶ intuitive operations via App's 通过App的直观操作
- ▶ teaching by gesture or guidance 通过手势或指导教学
- ▶ self learning through neuronal networks  
通过神经网络自我学习
- ▶ open programming techniques, using RoboticOperatingSystem (ROS) for example  
开放的编程技术，使用Robotic操作系统 (ROS)



我们的新产品研发还在不断继续  
Our new product development continues

**CONTRAX**<sup>®</sup>  
ROBOTIC SYSTEM



2011



2015



2016



2017.....

**SUNNY BÄR**  
舜宇贝尔

# 客户群

## Customers



Thank you for your attention !  
感谢您的关注!

Thank you !

Questions ?

地址(Add): 浙江省余姚市安山路199号  
No.199 AnShan Road, Yuyao, Zhejiang, China  
电话(Tel.): 0574-62552008-8008  
手机(Mobile): 13858215196  
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