

# 2015 MATLAB 巡回研讨会

技术融合的时代

西安-10月29日

成都-11月03日



# 传感，计算，通信与控 制的变革性融合



# 3个关键点

1. **数据驱动决策和算法设计正在加速创新。**
2. **4种关键技术正在融合并改变工业，企业，就业和教育。**
3. **MATLAB & Simulink 正在推动算法创新，加速这种融合和变革。**

# Software update magically makes the Tesla Model S P85D even faster

Over-the-air update will knock 0.1 second off 0-60 time, says Musk

*Road & Track* 29 January 2015

## Tesla Motors' Over-the-Air Repairs Are the Way Forward

Tesla and GM have both issued fire-related recalls, but Tesla's fix doesn't require owners to bring their cars in.

*MIT Technology Review* 14 January 2014



*Tesla Model S*

## Elon Musk Says Tesla Cars Will Soon Be Able to Steer and Parallel Park Themselves

*Entrepreneur* 3 August 2015

# China's answer to the Tesla Model S: The Youxia X

*Mashable 27 July 2015*



## Tesla faces competition in China from 'Knight Rider'

*Silicon Valley Business Journal 29 July 2015*

## Sri Lanka is considering Google's Project Loon for country-wide internet coverage (updated) The Verge 29 July 2015



## Facebook unveils drone for beaming internet access from the sky



*New Scientist 5 August 2015*

## Amazon proposes drones-only airspace to facilitate high-speed delivery

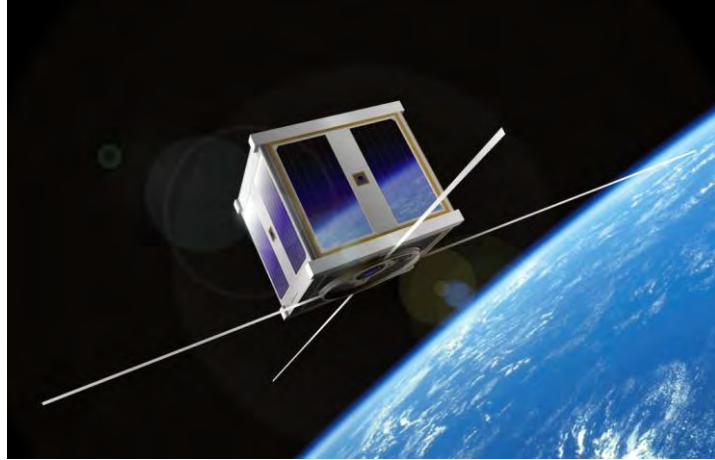
The retail giant's proposal carves out airspace from 200ft-400ft exclusively for autonomous drones, with a further 100ft above it declared a no-fly zone



*The Guardian 28 July 2015*

## Small CubeSat Provides Big Space Experience

*Space Daily 26 December 2014*



## SpaceX Enters Satellite Business

*Defense Business 23 January 2015*



## NASA Opens New CubeSat Opportunities for Low-Cost Space Exploration

*PR Newswire 10 August 2015*

## Book a Spot Online to Put Your Satellite Into Space

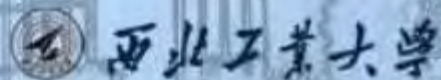
New Zealand's Rocket Lab wants you to be able to launch your satellite into orbit as easily as you buy a plane ticket.

*Popular Mechanics 10 August 2015*

# QB50 in China

- **Northwestern Polytechnical University (Asia Coordinator)**

- Beijing University of Aeronautics and Astronautics
- Harbin Institute of Technology,
- Nanjing University of Aeronautics and Astronautics,
- National University of Defense Technology,
- Peking University,
- Shanghai Jiao Tong University,
- Zhejiang University,
- University of Macau ,
- National Cheng Kung University.





# Apple Eyed BMW i3 As A Design For Electric Car: Report

Forbes 29 July 2015

## An Apple car? Computer firm hires automotive engineers

Reports suggest Apple employees are designing and building a car

The Guardian 13 February 2015



## Apple brings innovation and competition to auto industry, Ford says

Cult of Mac 28 July 2015

## Google testing drones that could provide Internet access to remote lands

Google plans tests in New Mexico using solar-powered unmanned aircraft.

## SpaceX launch illustrates NASA's growing use of private companies

## Cubesats explained and why you should build one

## AMAZON UNVEILS FUTURISTIC PLAN: DELIVERY BY DRONE

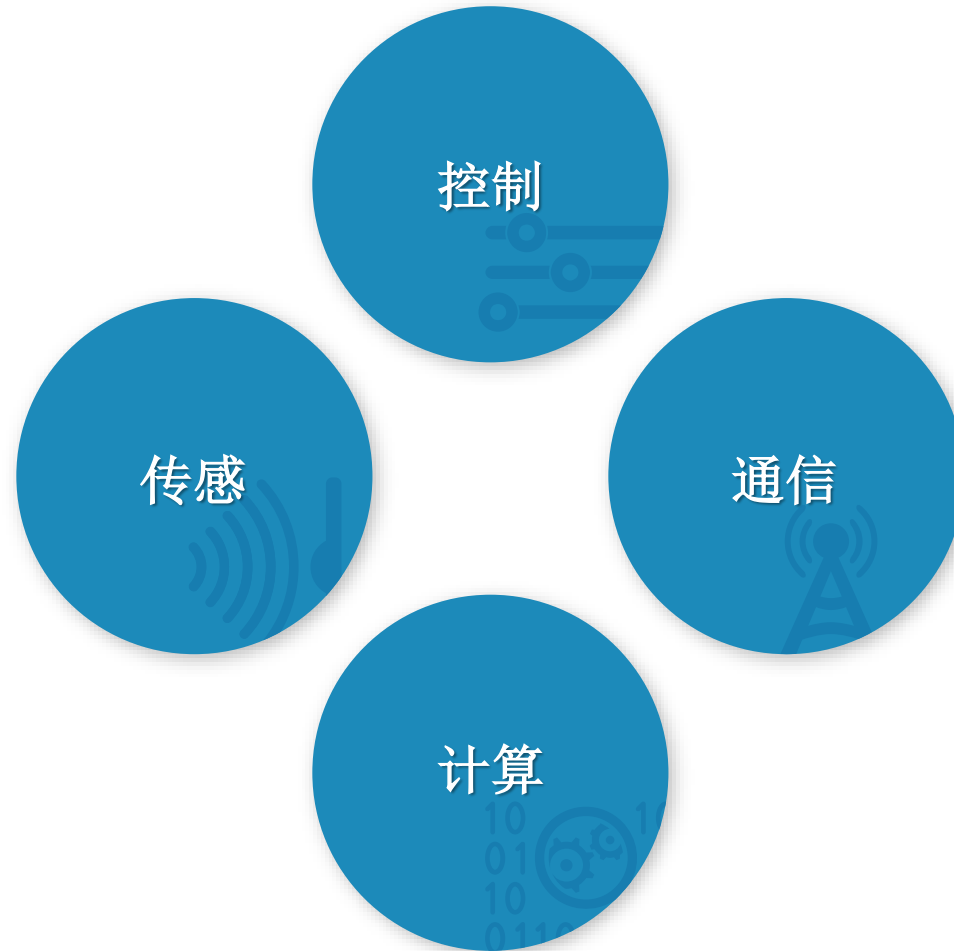
## Tesla Motors' Over-the-Air Repairs Are the Way Forward

## An Apple car? Computer firm hires automotive engineers

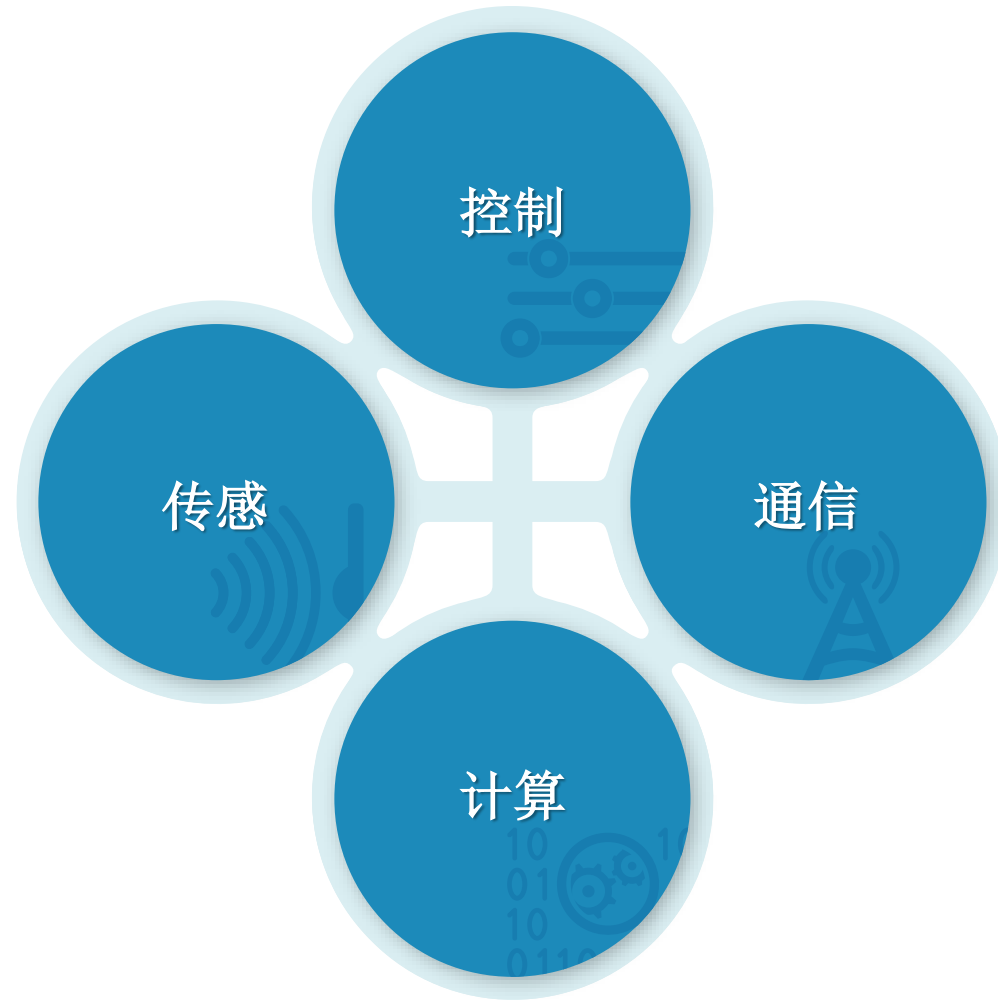
Reports suggest Apple employees are designing and building a car

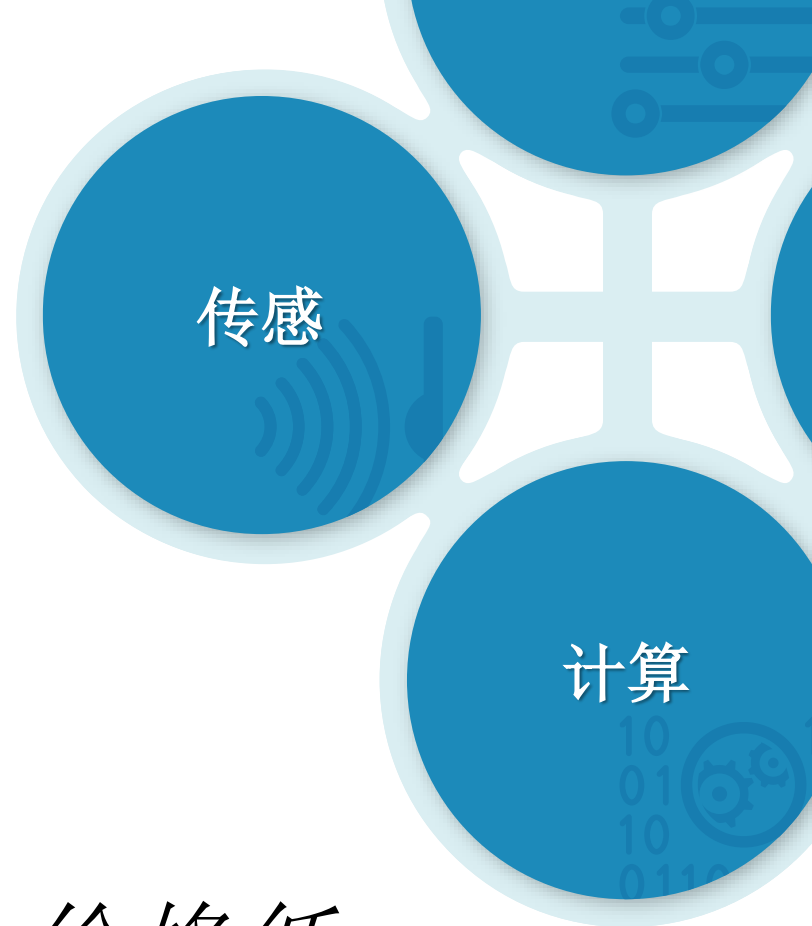
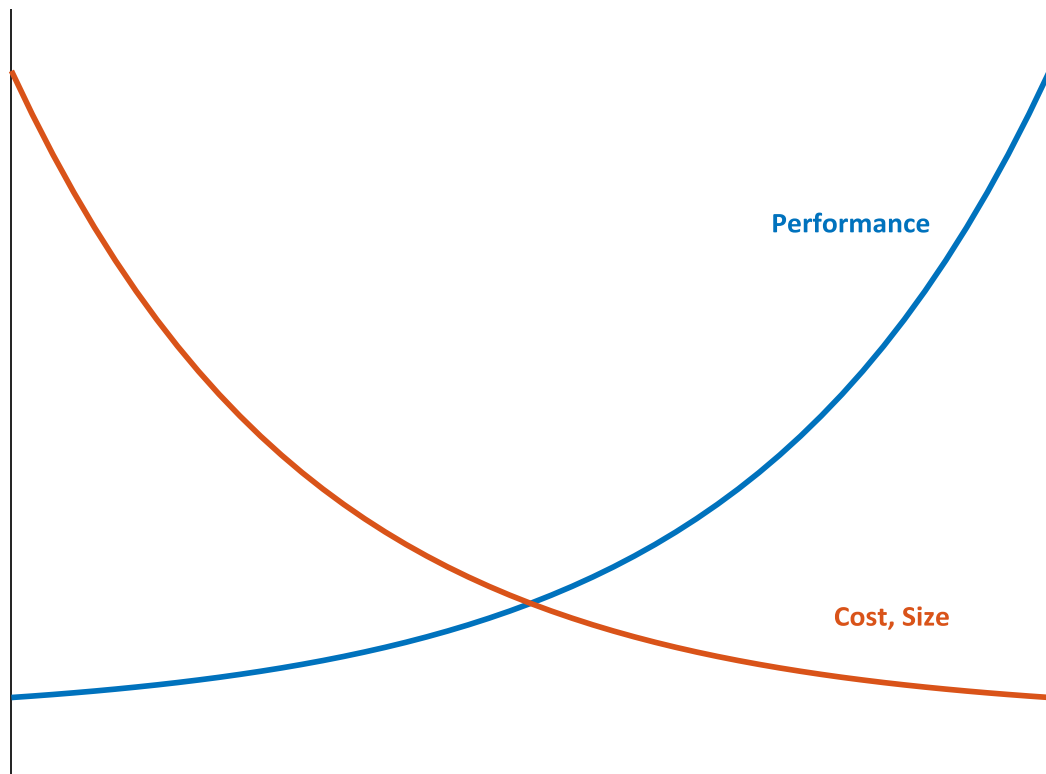
## FACEBOOK LAYS OUT ITS ROADMAP FOR CREATING INTERNET-CONNECTED DRONES

# 4种技术



# 4种技术





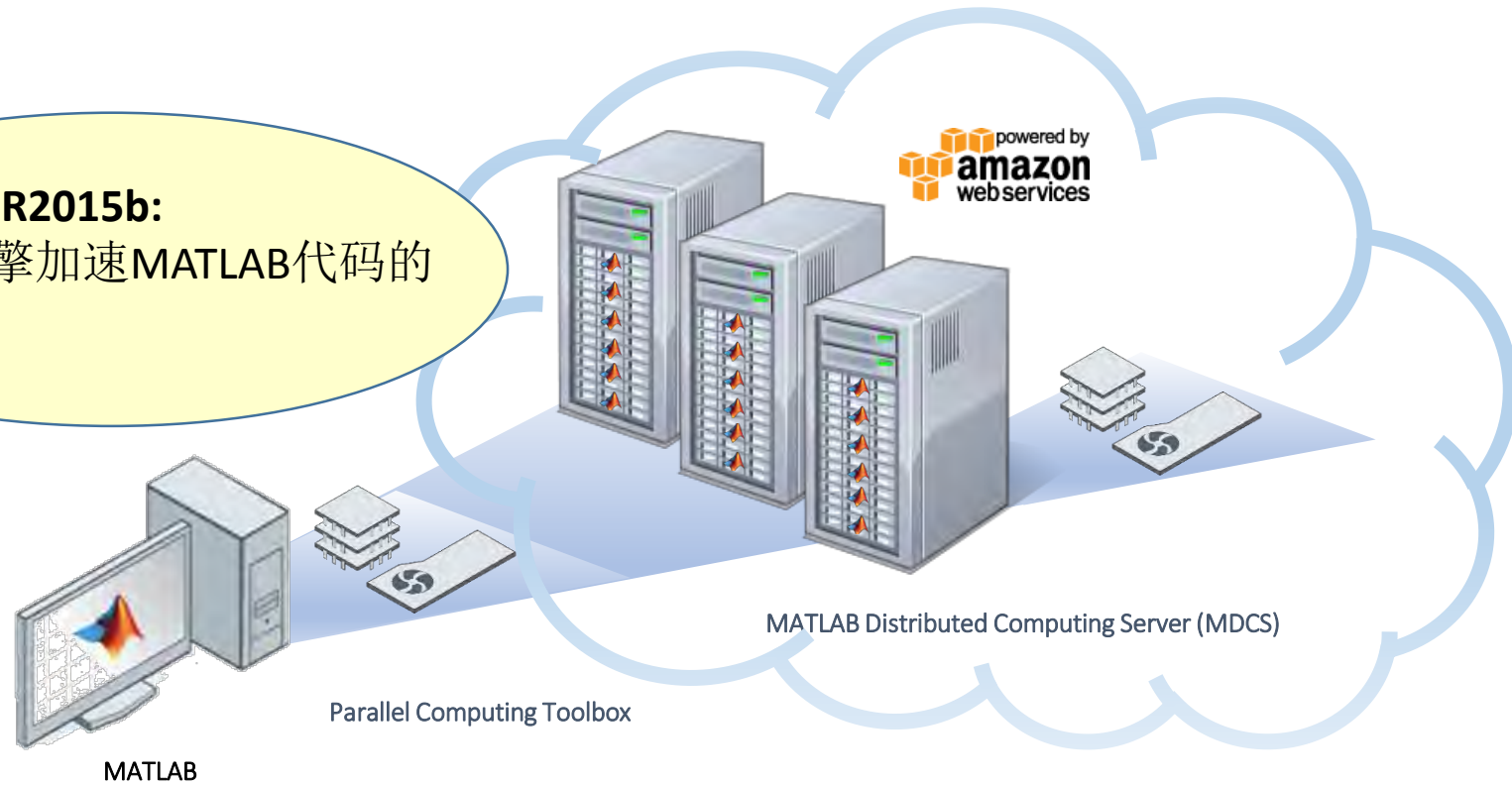
功能强大的, 价格低廉的传感器和摄像头

智能手机含有**15**甚至更多的传感器!

# 无限的计算能力

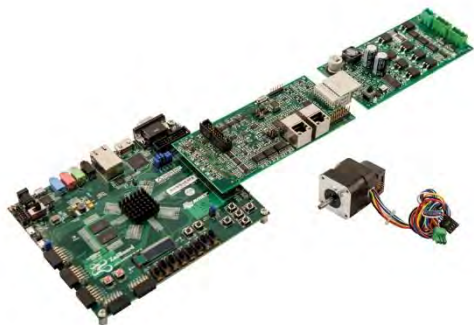
计算

**NEW in R2015b:**  
新的引擎加速MATLAB代码的运行



计算

# 多种计算选择



FPGA



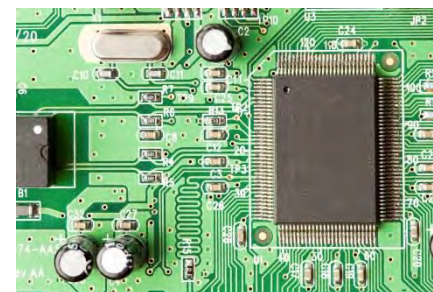
Custom ASIC



Microcontroller



Programmable SOC



Microprocessor

# 4G 及未来

通信



Figure 3: Evolution from 2G to 5G, Source: TU Dresden 2013a





猎户座宇宙飞船  
12, 5, 2014  
成功发射(无人驾驶)

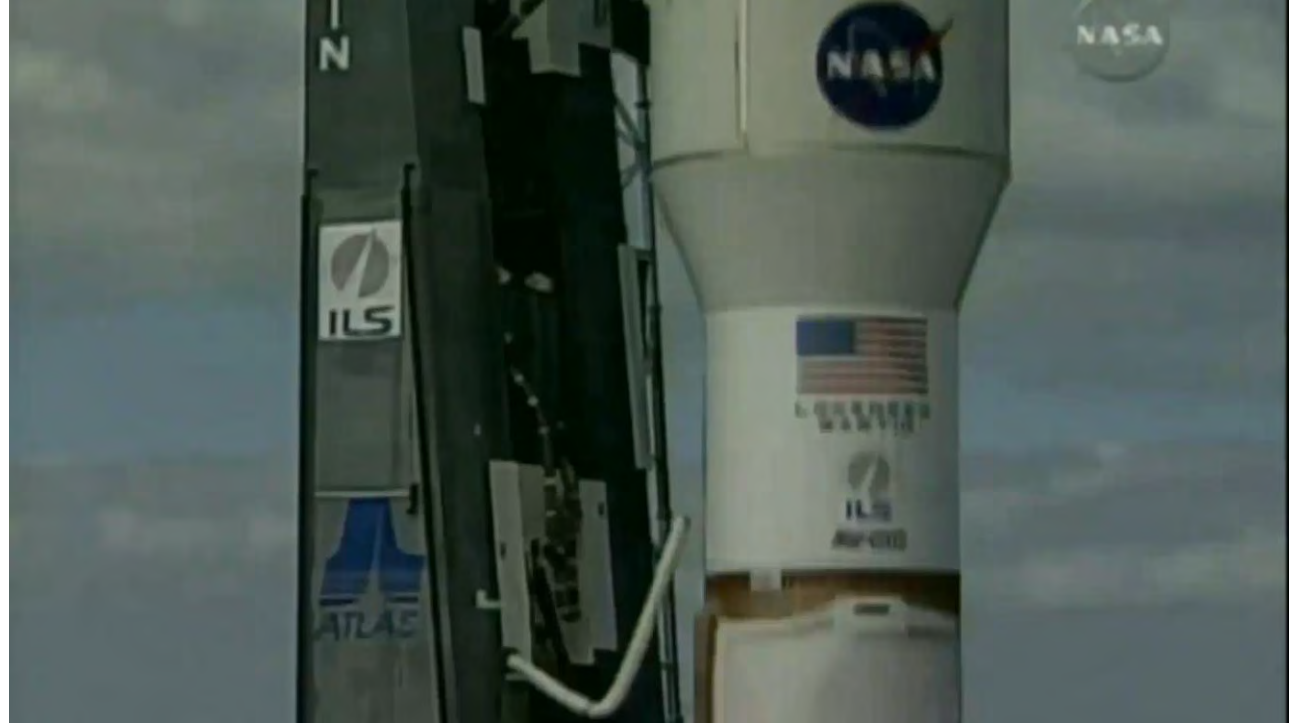
“我们从发射到着  
陆使用GPS和惯  
性传感器进行导  
航，**全部使用自  
动生成的代码**  
”

Mark Jackson,  
Orion project engineer,  
Draper Labs

# 基于模型设计

控制

Work



“导航和控制算法  
是通过**Simulink**  
自动生成的**C代  
码。”**

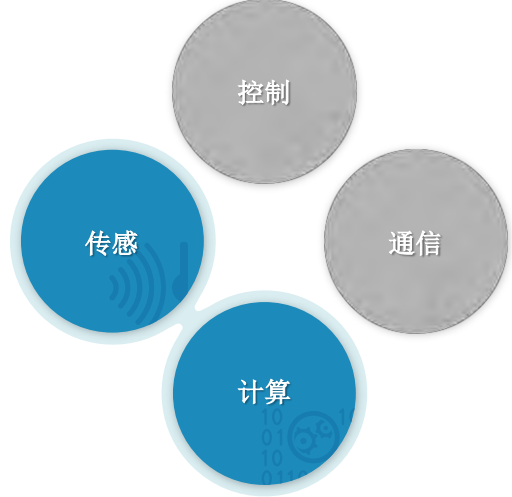
Christopher Krupiarz,  
New Horizons Flight Software,  
Johns Hopkins APL  
*On Reddit, July 2015*

新视野号  
飞近冥王星  
1月 2006 – 7月14, 2015 ...

控制

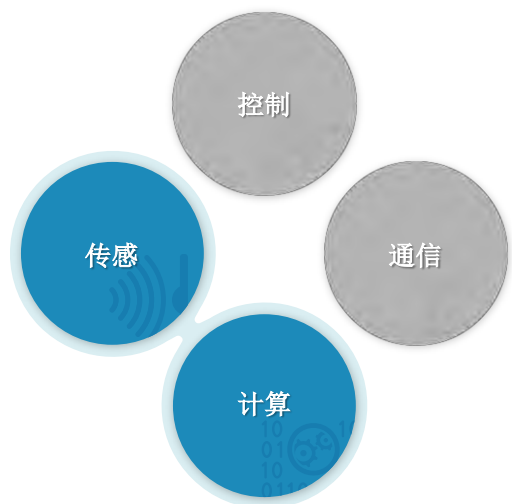
基于模型设计

Works



# 汽车实时处理**视频**

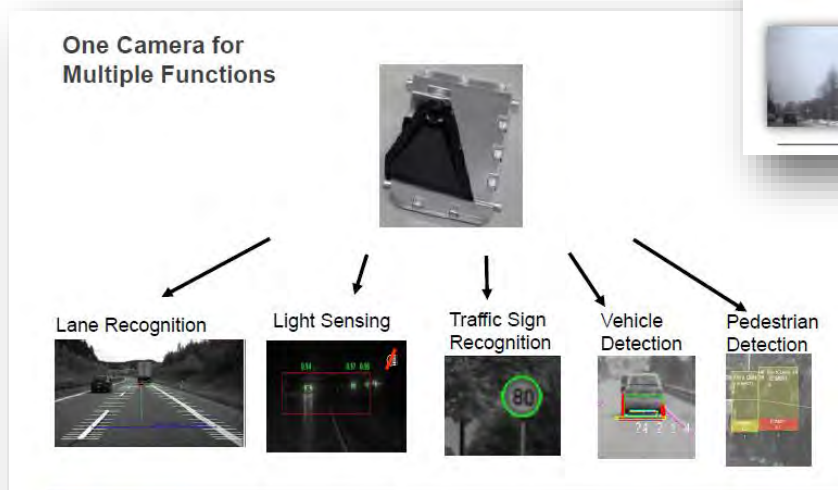
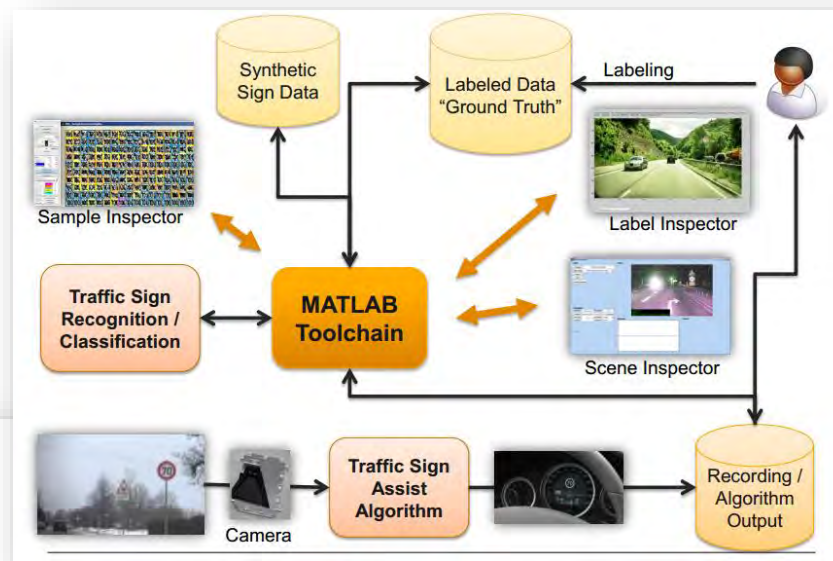




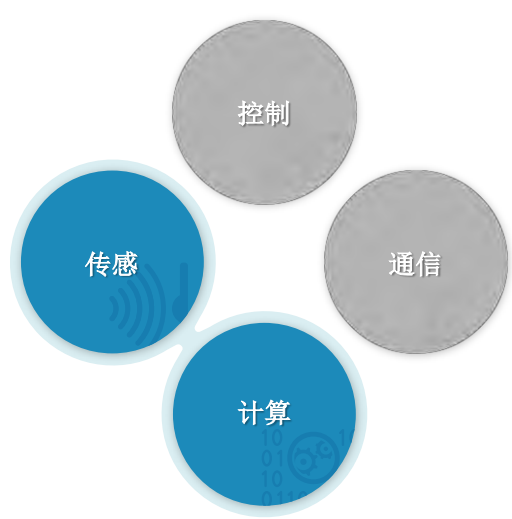
“在日常工作中，MATLAB被用来进行辅助驾驶功能的开发和评估”

“对具有良好MATLAB编程能力的工程师有大量需求”

“Traffic sign recognition in driver assistance systems- MATLAB at Continental”  
 Dr Alexander Behrens, Continental, MATLAB Expo, July 2014, Munich, Germany.



**NEW in R2015a:**  
 用于机器学习的分类学习 App



“与手写代码相比，基于模型设计**缩短了约2年的开发时间。**”

– Reutech

## **FPGA**搭建多功能雷达



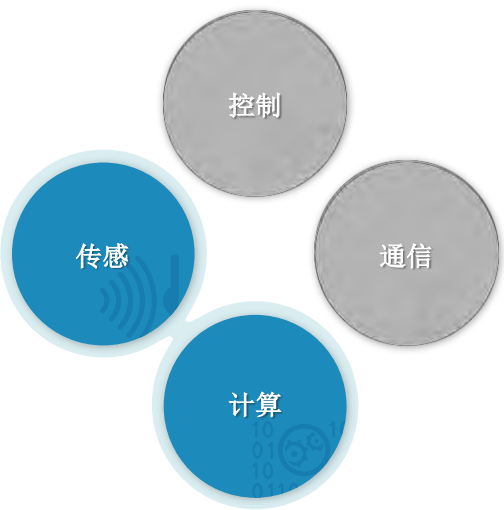
*The Reutech  
RSR 210N  
multipurpose 2D  
radar system.*

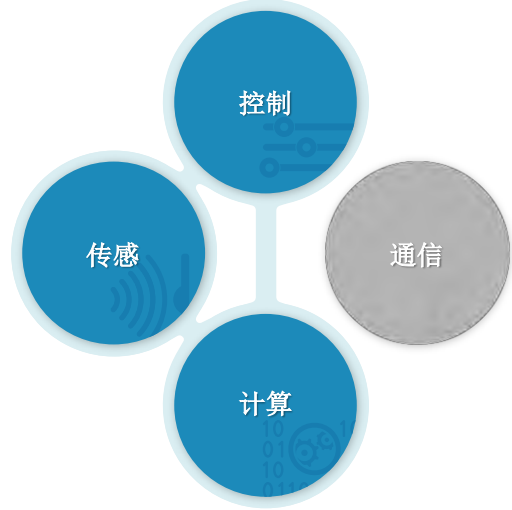
### **基于模型设计**方法:

单元模型在Simulink上集成

用于FPGA 实现的HDL Coder

Fixed-Point Designer用于转换浮点设计

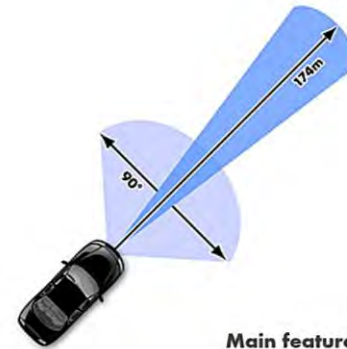




# 通过视频和雷达 控制汽车

“Design, Analyze, and Implement Radar Sensors’ Alignment Algorithm with MATLAB” -  
Ling Ma, Delphi, MathWorks Automotive  
Conference, May 2014, Michigan, USA.

## Delphi Electronically Scanning Radar



Three main properties of radar targets:

- Range
- Range rate
- Azimuth



Main features:

- Adaptive Cruise Control
- Collision Mitigation
- Rear and Side Detection System

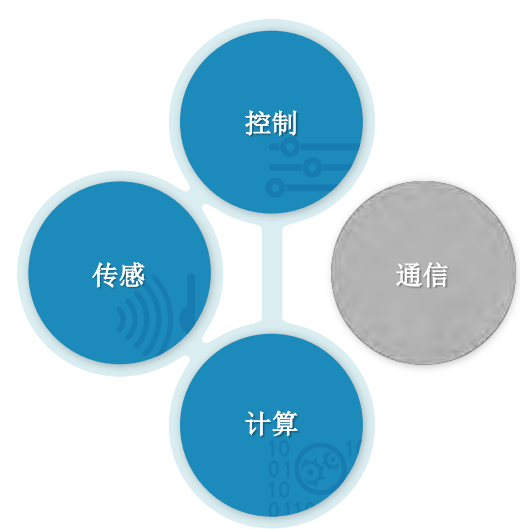
©2014 Delphi

DELPHI

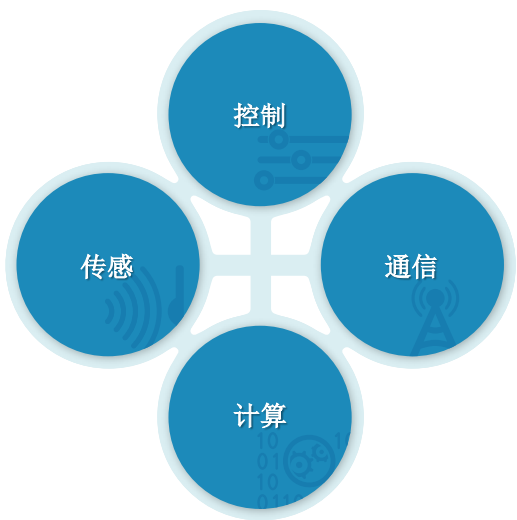
## Coder Code Performance

### Conclusions:

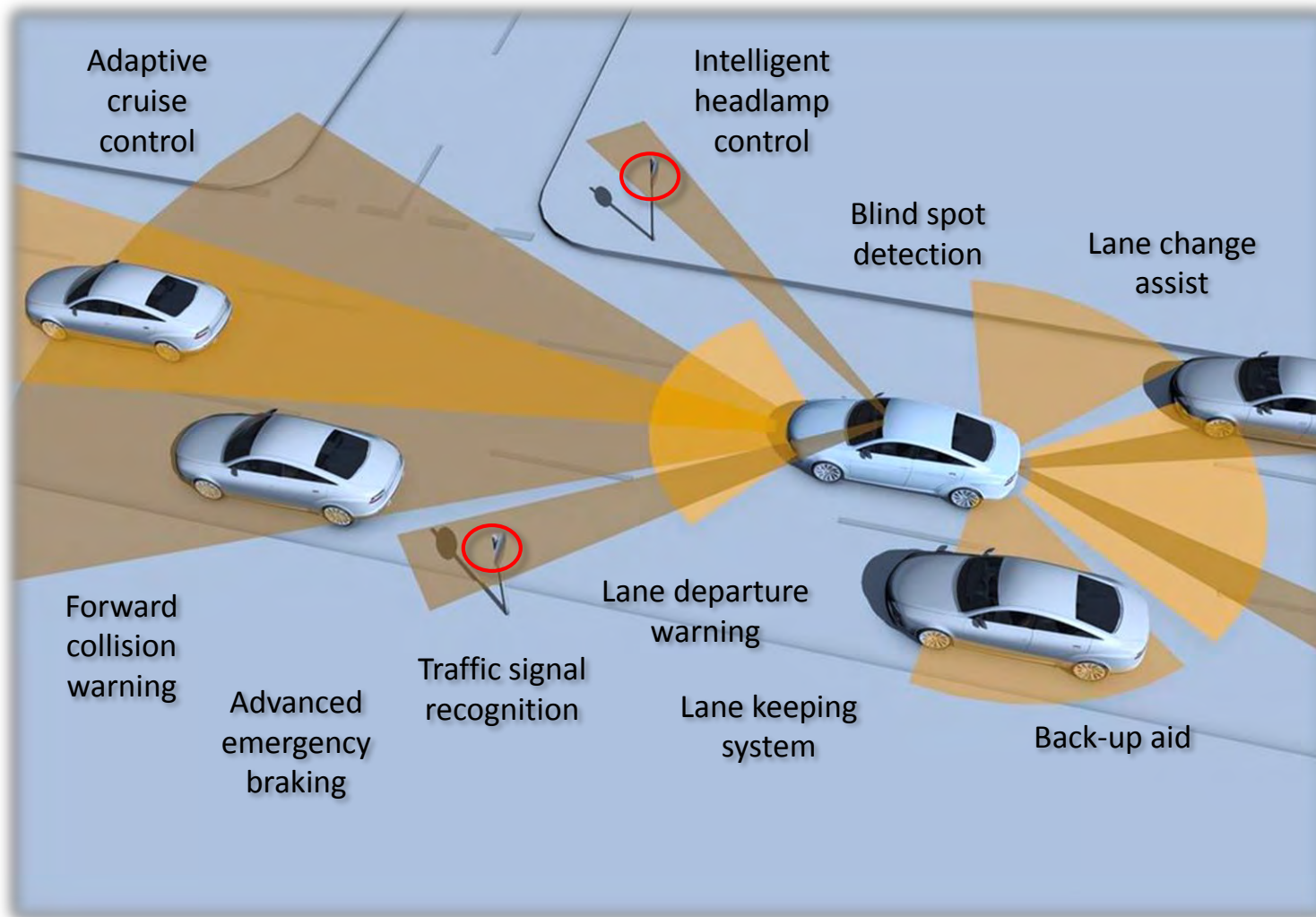
- ✓ Reliable. Coder code has been used in production code for half a year and no bug is found;
- ✓ Efficient. This improved alignment algorithm with coder code can run as fast as previous old algorithm with hand code.
- ✓ Easy to integrate.



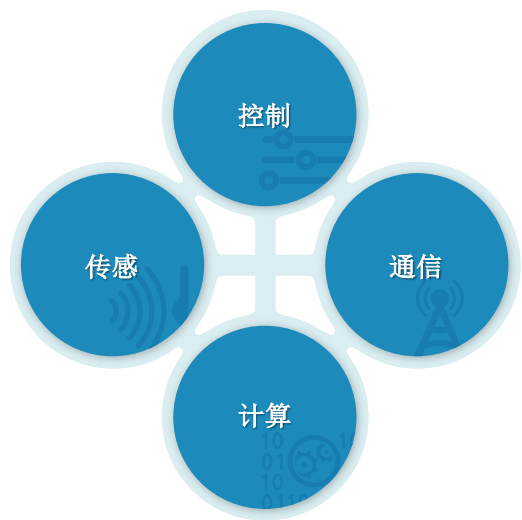




# 高级驾驶员辅助系统



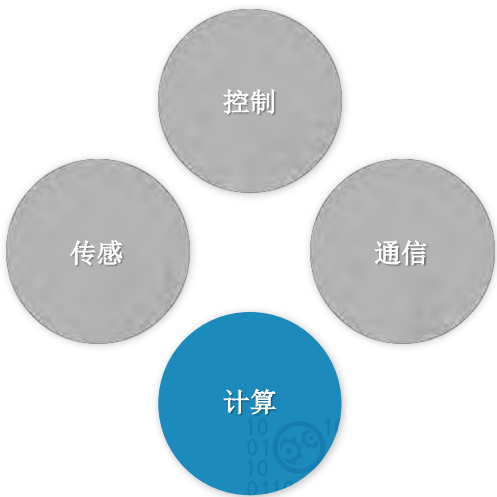
from **“Advanced Driver Assistance Systems Market”**  
Continental AG, KSAE  
2011



当这些融合时，  
就会发生变革



# 数据密集型分析



机器学习来检查客户流失

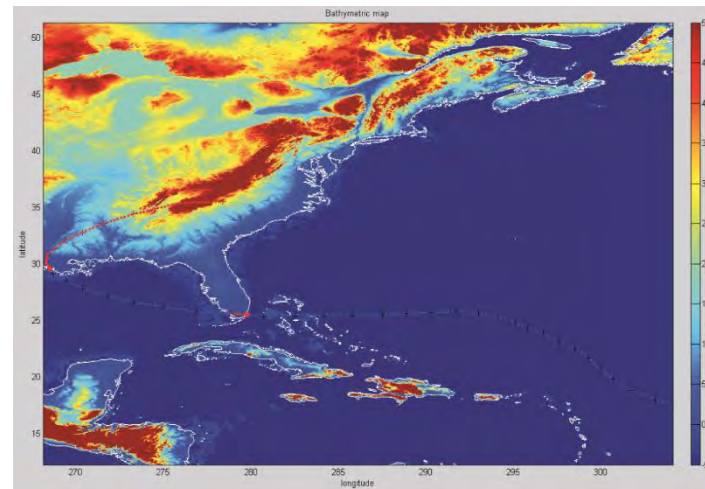


“MATLAB将清理，可视化并分析多于500 千兆字节的数据变得非常简单，不需要其它软件和插件”

“无论我们的客户属于什么行业，  
无论什么类型的数据—文本，声音，  
图像，视频-他们要求我们分析，  
MATLAB能让我们更快地提供清楚  
的结果。”

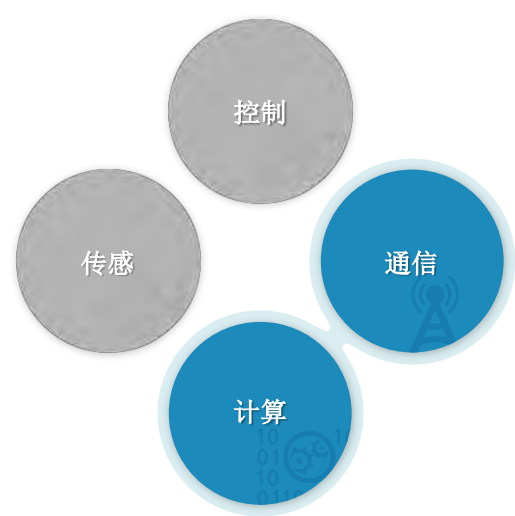
– Cognizant

地物模型来预测水土流失



“MATLAB处理大量数据，提取高度复杂图表特征... 并且提供将数据导入导出到其它应用的接口，例如 GIS, Excel, 或者文本文档。”

– SwissRE



## 快速可靠地传输卫星数据

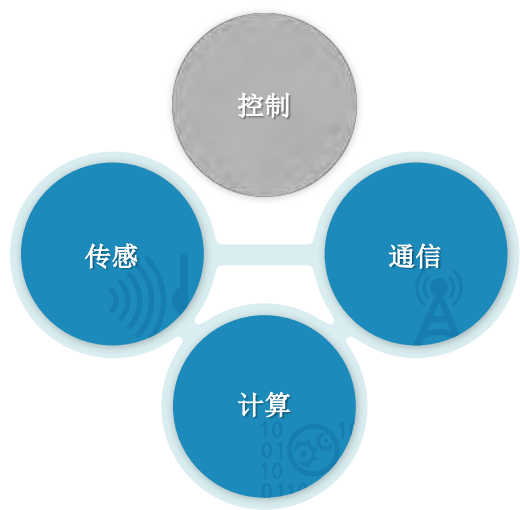
“我们搭建了能力在1200 Mbps的通信系统。”

“使用Simulink, 在第一时间我能够看到噪声影响并了解失真是如何影响链路的。”

“如果没有这些仿真, 我将无法向管理层展示系统可以正常工作。”

– Digital Globe

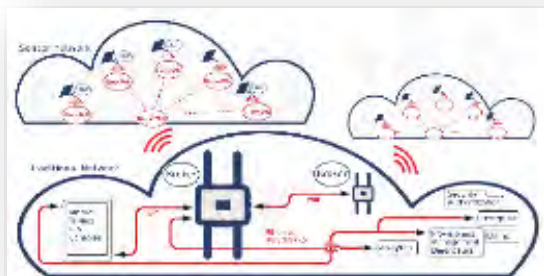




# 物联网带来的大数据



车队分析



传感器分析



车辆状况监测



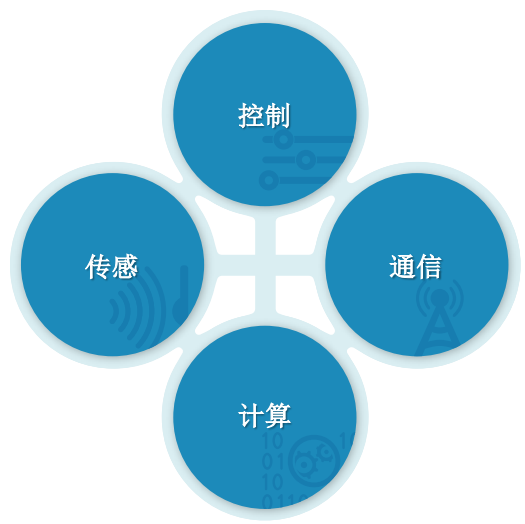
资产数据分析



金融贸易



医疗预测分析



# 智能应急响应系统



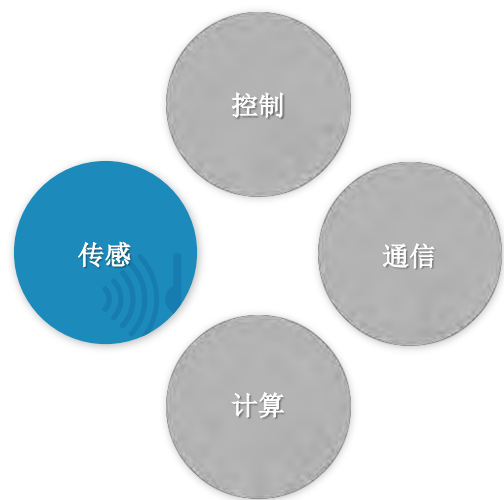
# DJI (大疆) 遥控飞机 为云南地震救灾提供帮助



*Phantom 2 Vision+*



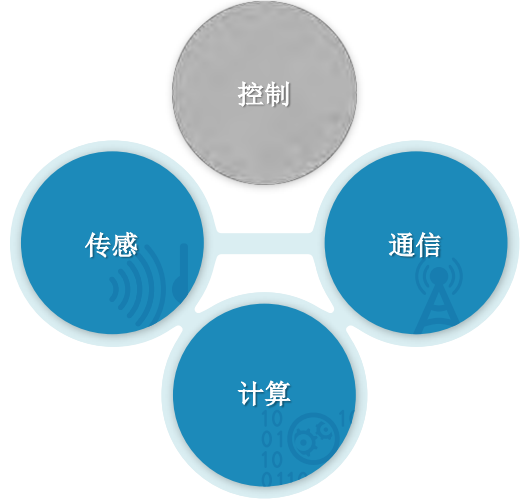
*Spreading Wings S900*



当这些**融合**时，  
就会发生**变革**







# 基于云分析的 手机医疗 App

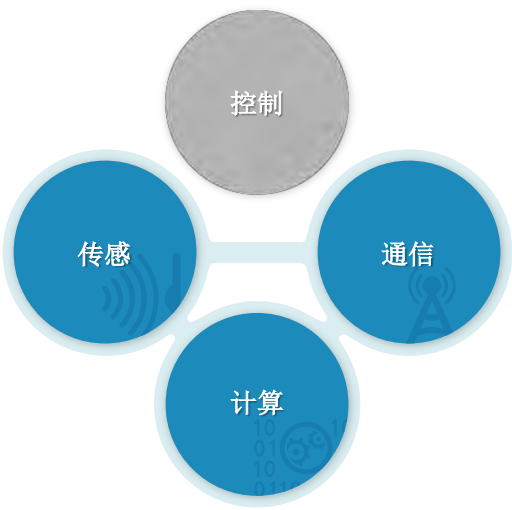


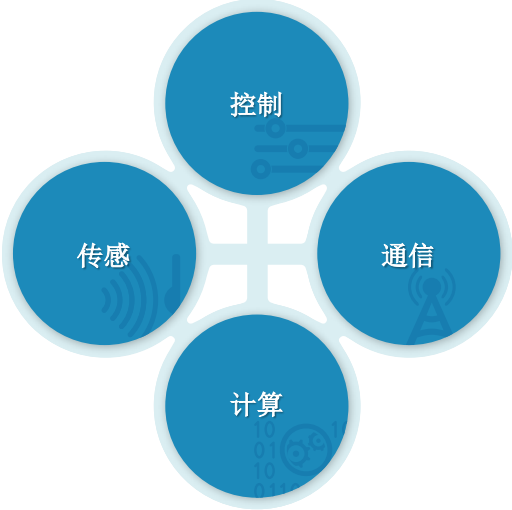
*The AirSonea device connects to an asthma patient's smartphone and communicates with wheeze analysis algorithms on iSonea's server.*

“MATLAB 使我们能够快速地开发，调试和测试声音处理算法，**MATLAB Coder** 简化了这些算法的 C 代码实现。

没有任何其它我们可用的环境和编程语言能够在相同的时间内达到类似的效果。”

- iSonea





# 思维控制的假体

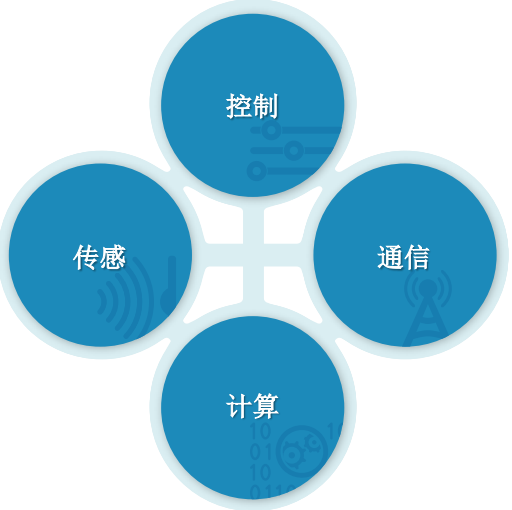


# 你将如何设计这些多域系统?

传感

通信

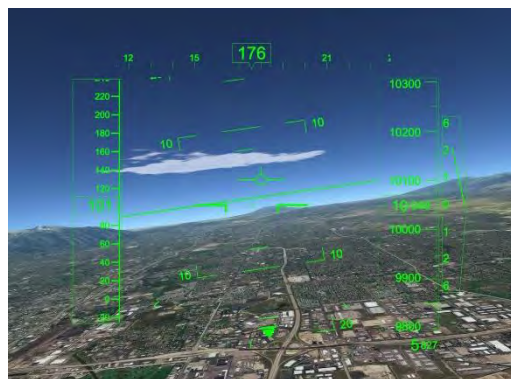
计算



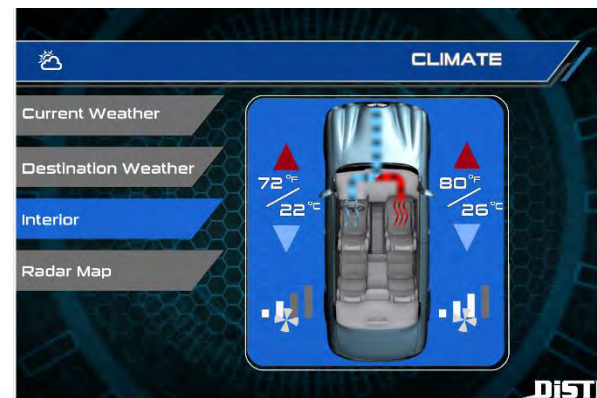
# 人机界面(HMI) 已经变革



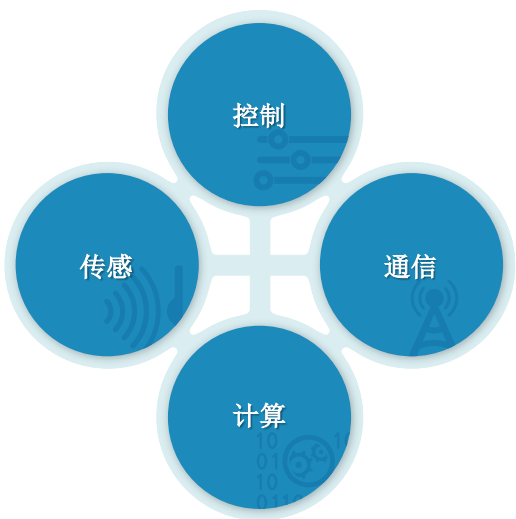
仪表盘



平视显示器



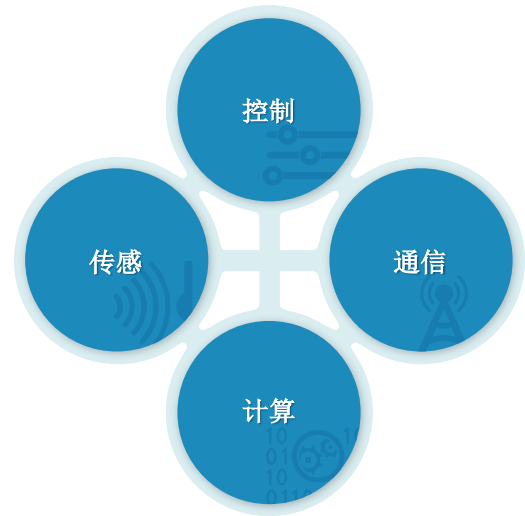
中控台



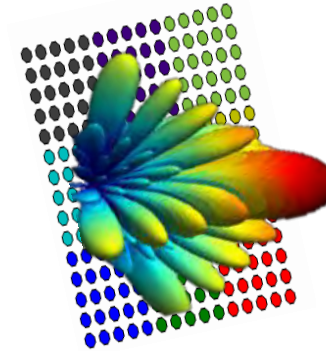
# 基于模型设计用于HMI开发

用MATLAB, Simulink和Stateflow进行完整地设计建模和测试





# 用于通信和传感器处理的设计工具

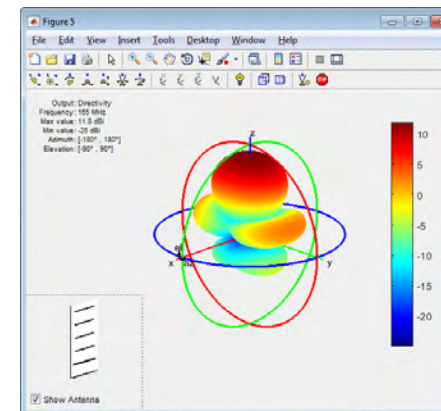
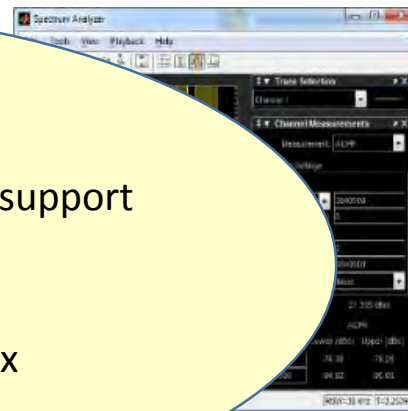


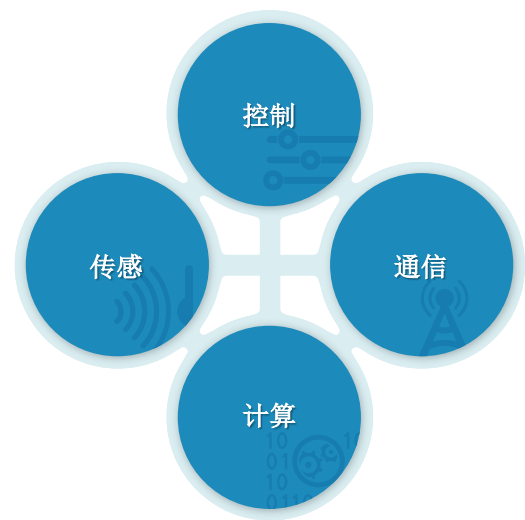
## **NEW** in R2015a

Antenna Toolbox  
Zynq - Software-Defined Radio support

## **NEW releases** in R2015a

Communications System Toolbox  
LTE System Toolbox  
Phased Array System Toolbox





# 先进通信系统设计和测试

## **Alcatel-Lucent (China)**

为 LTE-Advanced 基站设计和验证算法

## **Ericsson (Sweden)**

为新一代无线网络开发基于 FPGA 的无线电测试平台





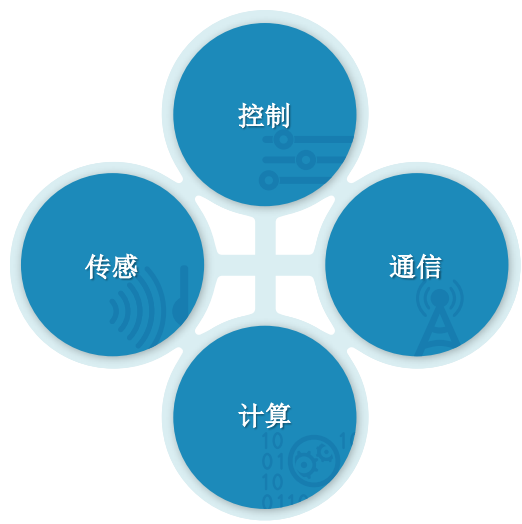
我们将如何测试  
和验证它们?

控制

传感

通信

计算



# 用于安全性和可靠性的认证标准...

**ARP-4754**



**DO-254**



**DO-178**



Eurocopter France  
Air Conditioning

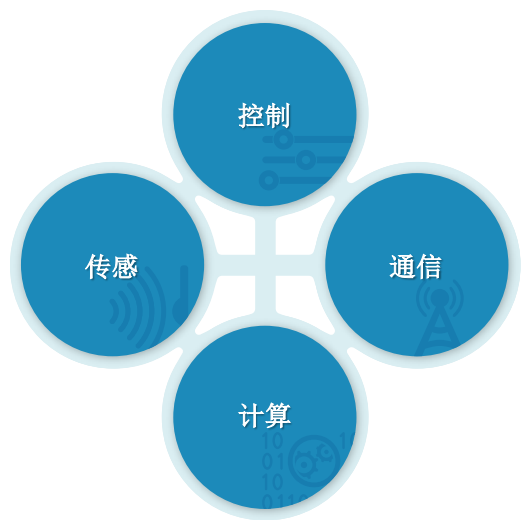
Airbus UK and France  
Fuel Management Systems

**DO-178**



EADS USA and France  
Motor Drive Unit

BAE USA and UK  
Flight Control Systems



# 用于安全性和可靠性的认证标准...

## DO-178

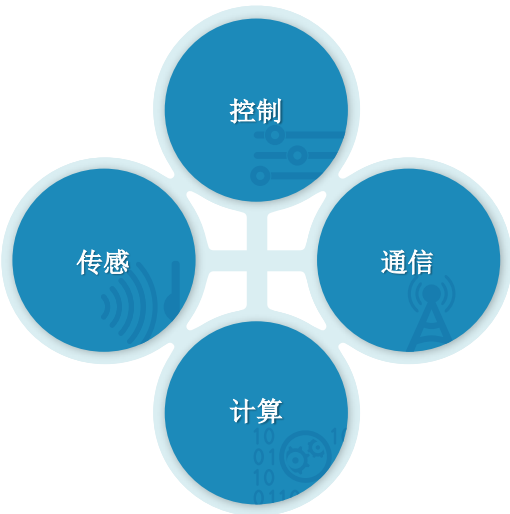


Eurocopter France  
Air Conditioning

**Simulink**中进行系统设计

**Simulink Verification and Validation**  
进行规范检查

**Embedded Coder** 为软件验证生成C  
代码



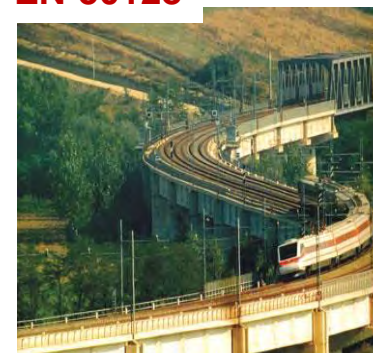
# ... 出现在各行各业

## ISO 26262



GM USA  
Hybrid Powertrain

## EN-50128



Alstom France  
Propulsion Control Systems

## IEC 62304



Weinmann Medical DE  
Transport ventilator

## IEC 61508



Alstom Grid UK  
HDVC Power Systems

## IEC-60880



MTU Germany  
Nuclear Emergency Generators

# 学生应如何为 变革性地融合 做准备？

计算

通信

# 传感，计算，通信和控制，学生项目-在行动



**NEW** in R2015a

Robotics System Toolbox

# 传感，计算，通信和控制，学生项目-在行动

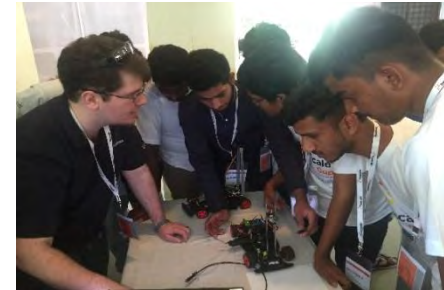


# 传感, 计算, 通信和控制, 学生项目 -在行动

**NEW** in R2015b:

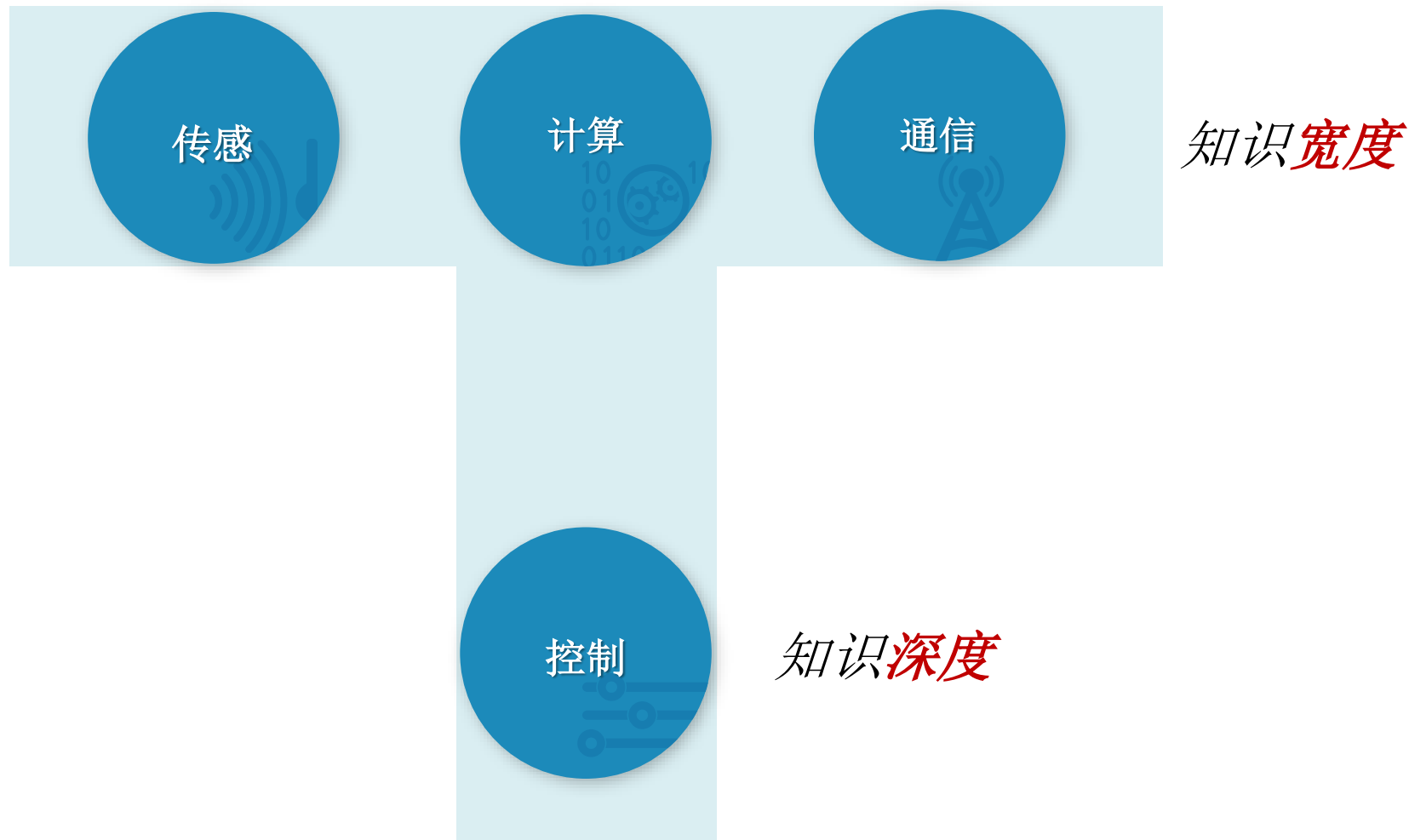
MATLAB support for iOS sensors

Simulink support for Raspberry Pi 2



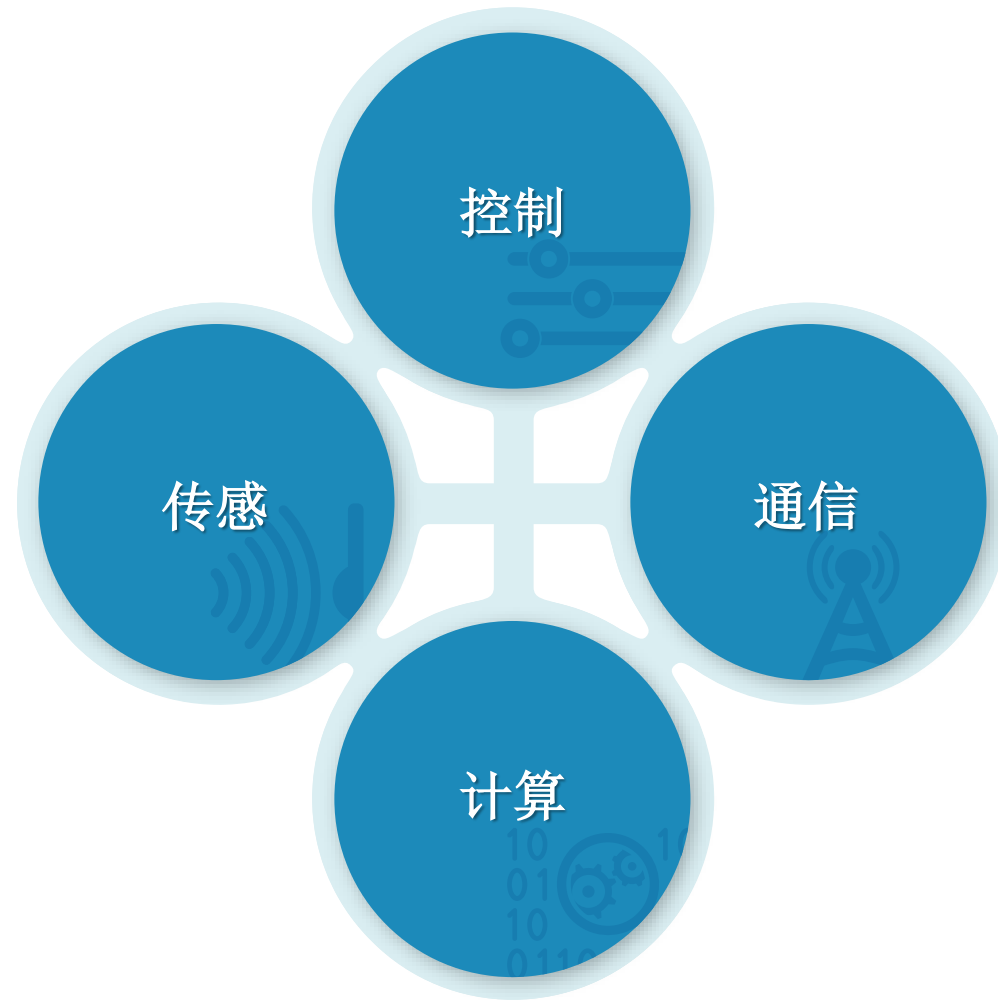


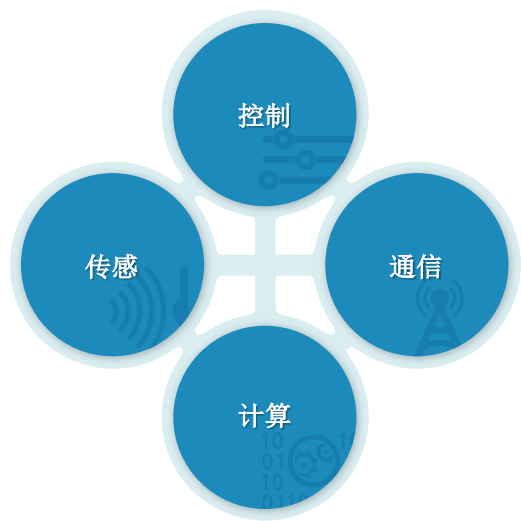
# 什-型-类-程-师-工-程-师-?...



...通过基于项目学习塑造.

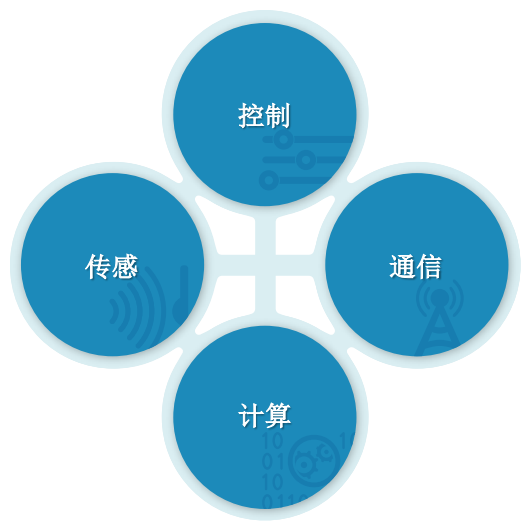
# 4种技术





# 3个关键点

1. **数据驱动决策和算法设计**正在加速创新。
2. **4种关键技术**正在融合并改变工业，企业，就业和教育。
3. **MATLAB & Simulink** 正在推动**算法创新**，加速这种融合和变革。



# 接下来

- 参加演讲和展出
- 与其他人交流—MathWorks, 其它公司和学术界
- 相互学习, 互相分享不同行业和应用领域的最佳实践
- 使用这些工具和方法改变你们的应用和行业!

# 传感，计算，通信与控制 的变革性融合

