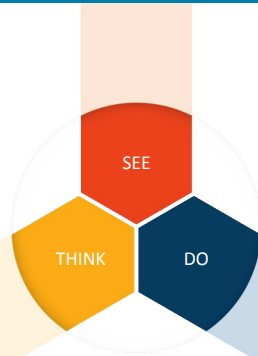


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What to expect for 2020?

US National Robotics Roadmap Update

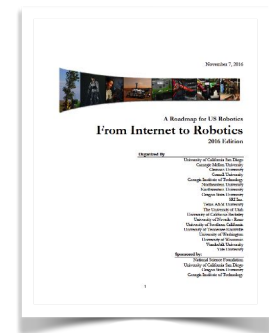
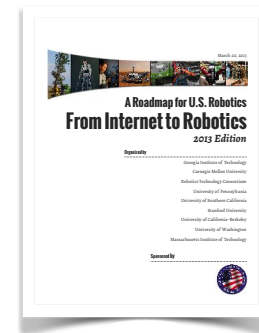
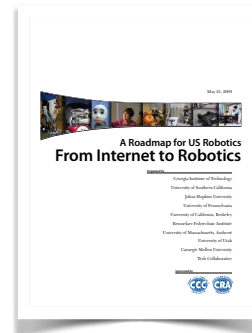
Henrik I. Christensen, Director
hichristensen@ucsd.edu



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Roadmapping



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Mega-Trends

- Individualization of Products
- Aging of Society
- Transformation in business models (B2B & B2C)

MANUFACTURING





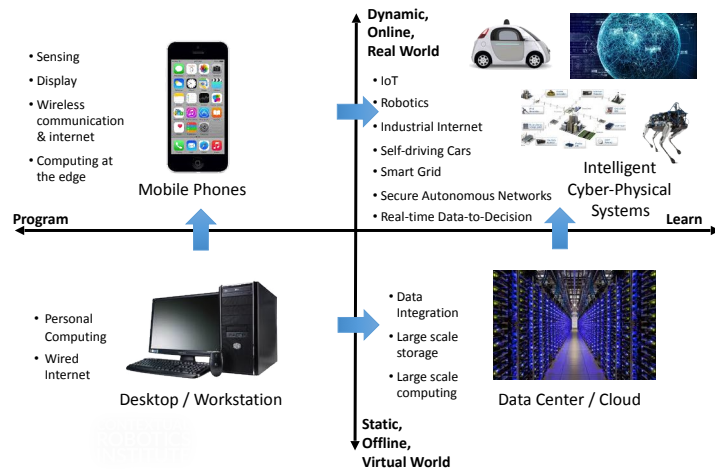
MEDICAL DIAGNOSTICS



CONTENT SELECTION



Technology Landscape



Speed and scale... yesterday

Supply side economies of scale

Examples



Implications for firms

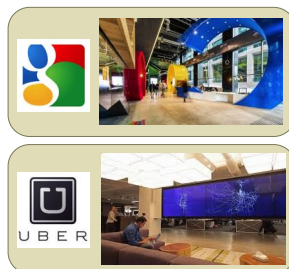
- Costs decline with higher volume of output
- Strong competitive advantages to building larger and larger production facilities

(C) Henrik I Christensen, 2015

Speed and scale ... today

Demand-side economies of scale

Examples



Implications for firms

- Value grows with growth of networks
- Strong competitive advantages to building out network ecosystem as quickly as possible

(C) Henrik I Christensen, 2015

New Rules for strategy

Rise of platforms requires a shift in corporate strategy

Conventional corporate strategy

Platform strategy

Focus on resource control

Resource orchestration

Focus on internal optimization

External interaction

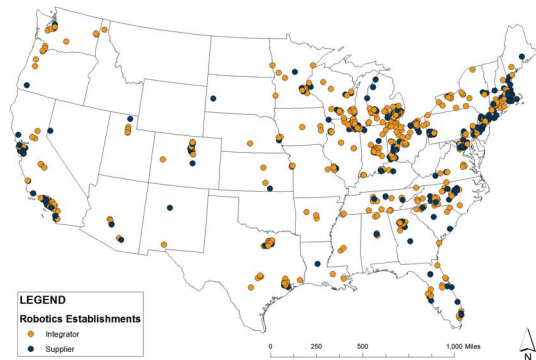
Focus on product value

Ecosystem value

Source: Marshall W. Van Alstyne, Geoffrey G. Parker and Sangnet Paul Choudhary, "Pipelines, Platforms, and the New Rules of Strategy," Harvard Business Review, April 2016.

90% of all manufacturing is SME

Robotics-Related Establishments in the United States by Type

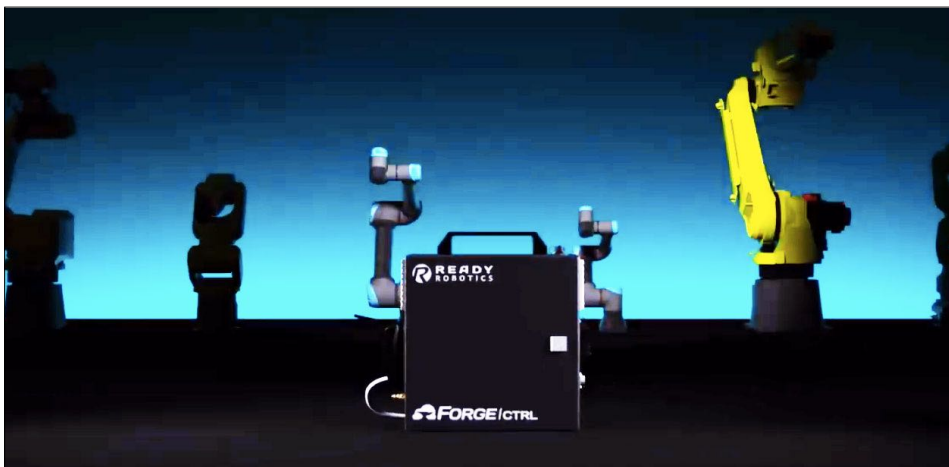
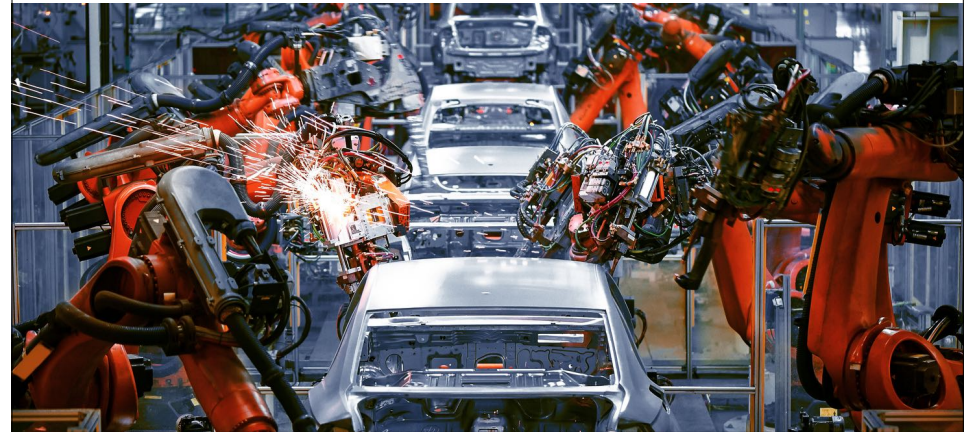


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Customized Manufacturing

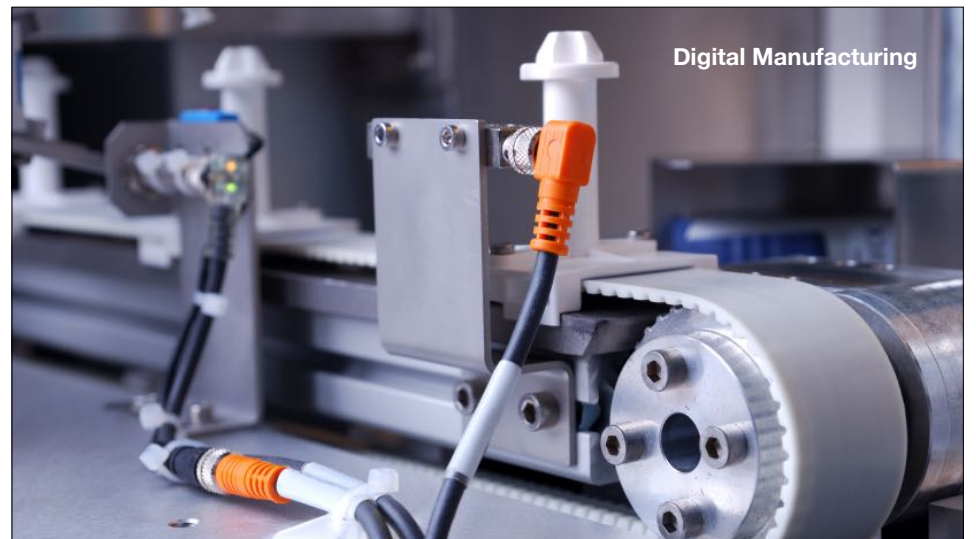


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Digital Manufacturing



Next Generation Interfaces



Future Healthcare?

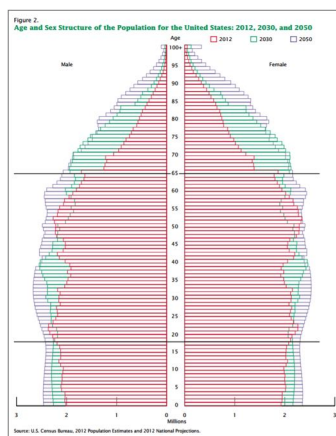


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Age Pyramid USA

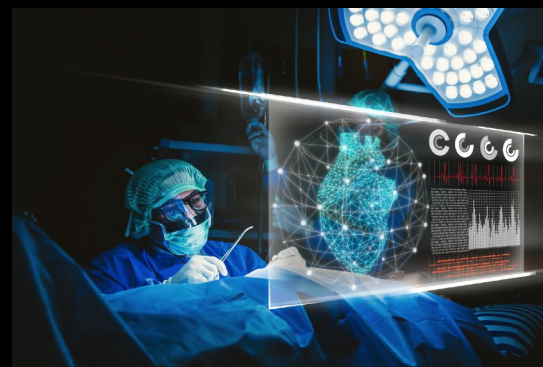


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Next generation surgery / intervention



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BIOMETRICS



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Next generation transportation



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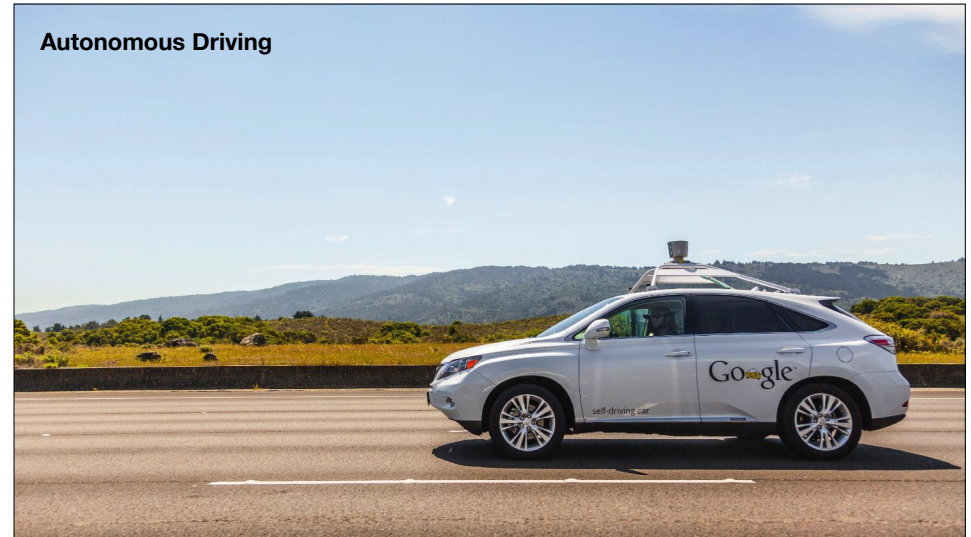
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AUTONOMOUS DRIVING



Autonomous Driving



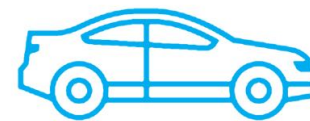
Are we in for a revolution?



1898

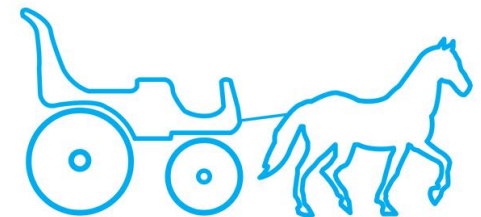


1915



11.8mph

Average speed in London 2016



17mph

Average speed in London 1916

Average Commute Speed in 2015



9.6mph



11.8mph



20.5mph

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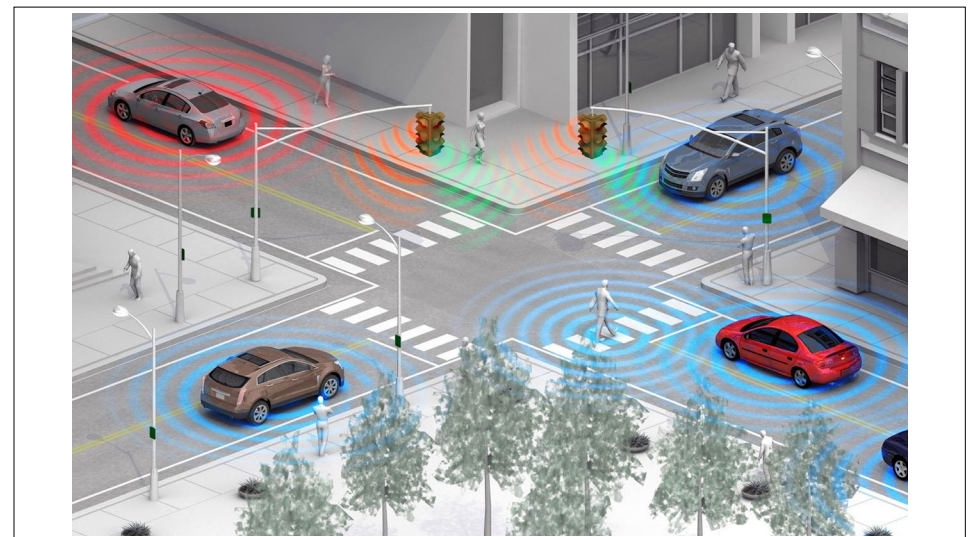
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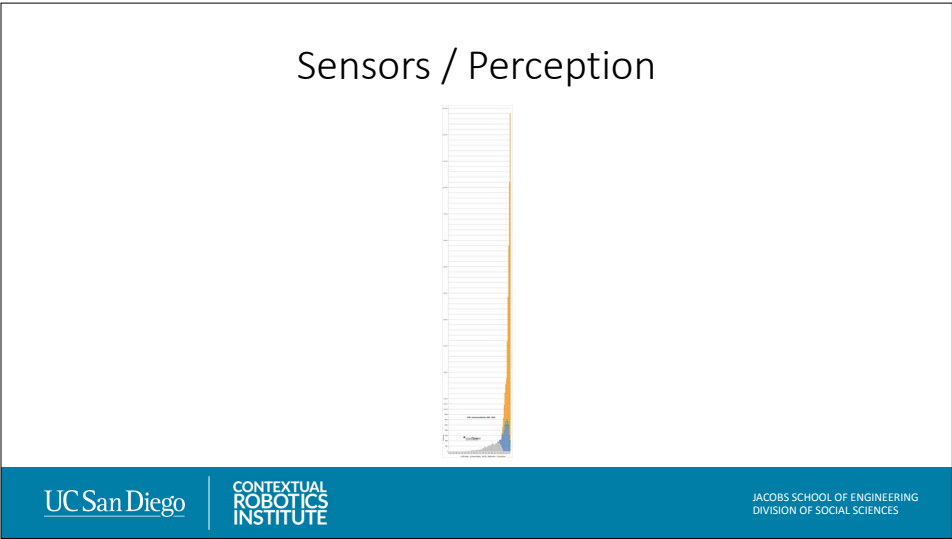
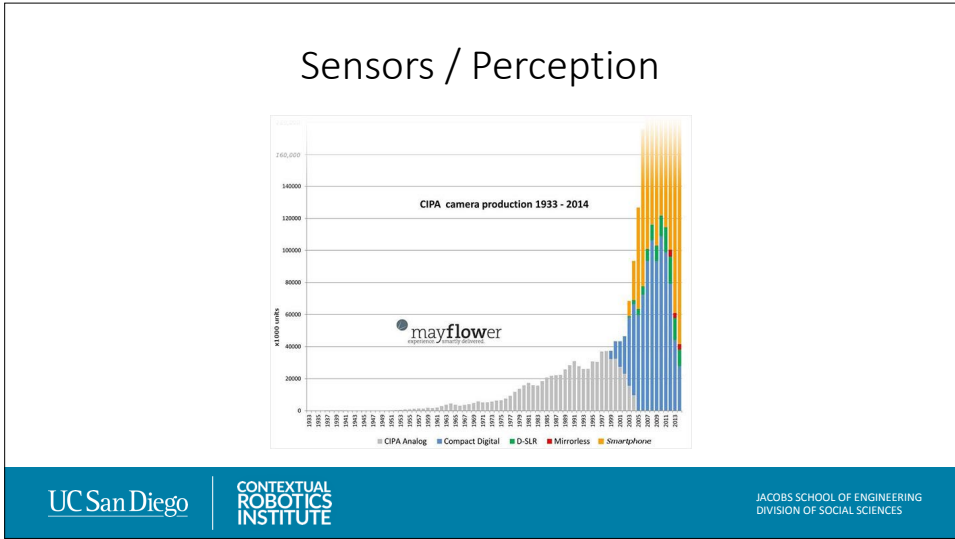
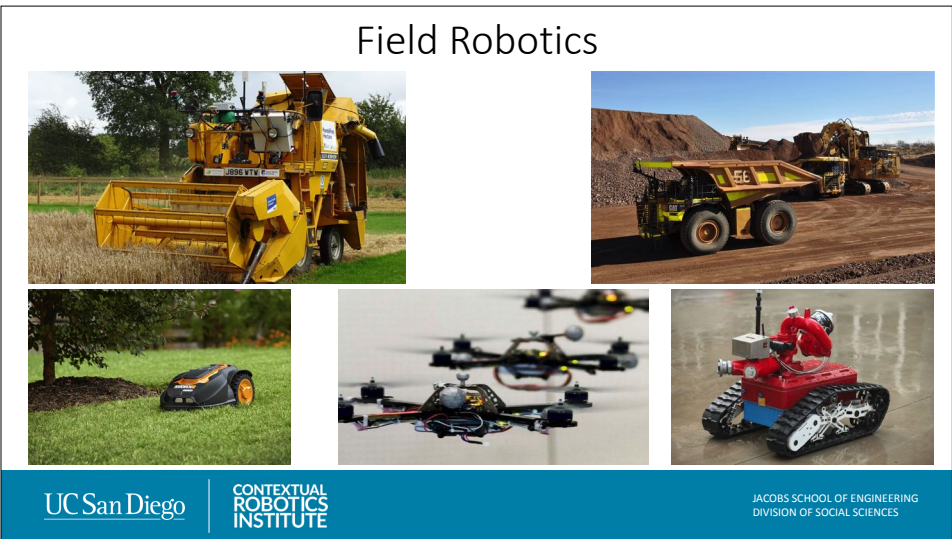
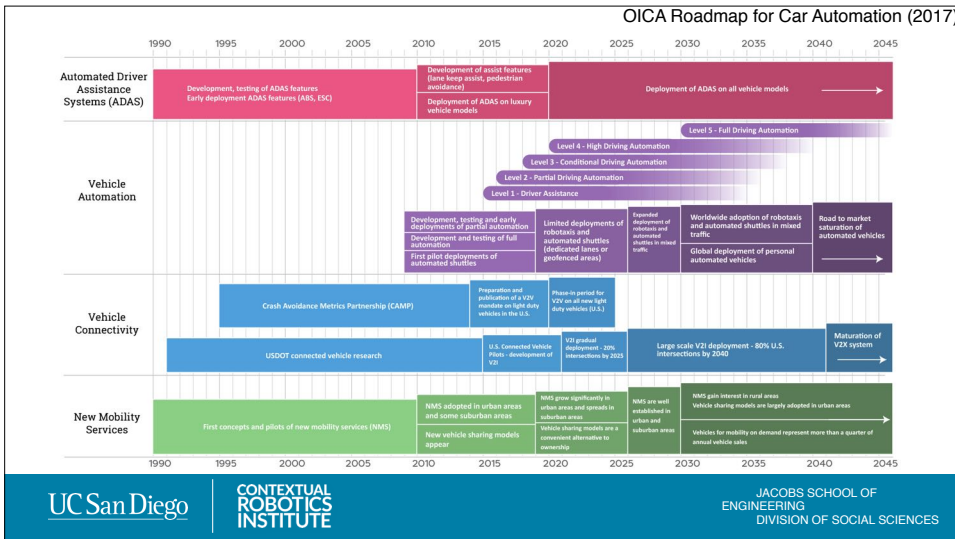
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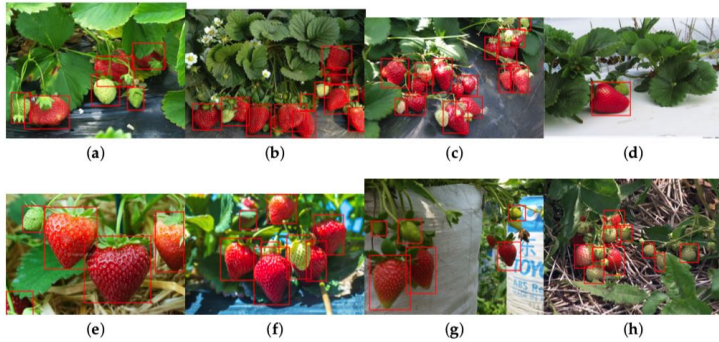
New communication:

- 5G
- Satellite Communication
- Mesh Networks

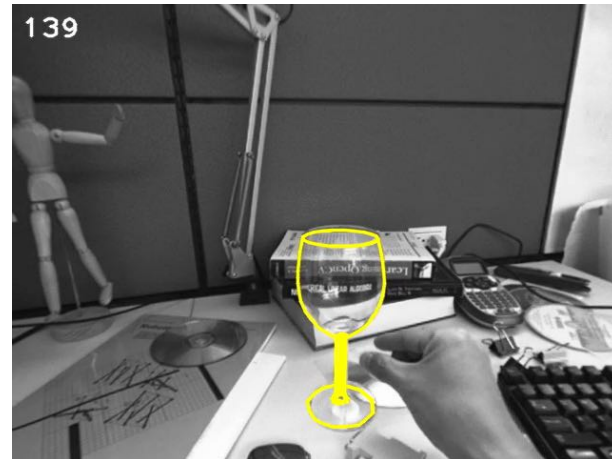




Detection of fruit

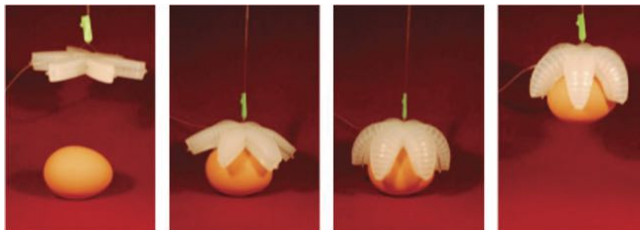


Src: DeepFruits



Handling flexible objects

- Major progress on deformable grippers

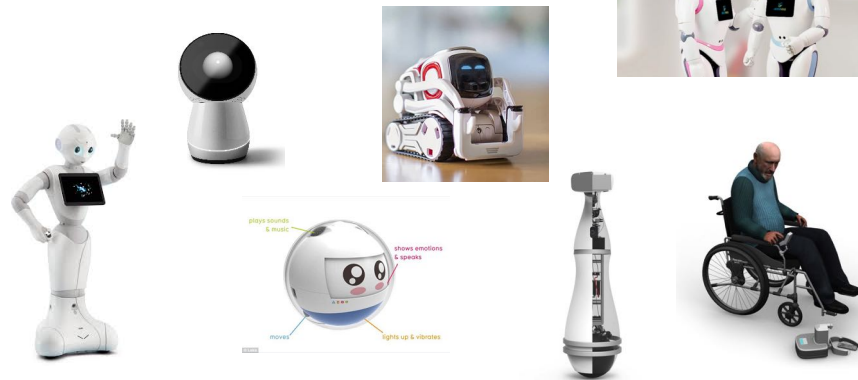


Fast, Robust and Easy to Clean

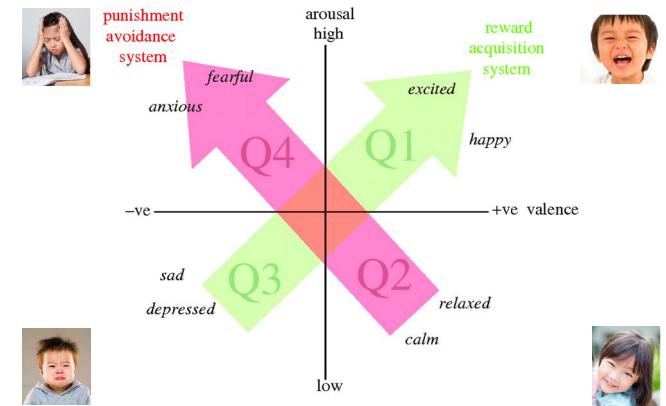
PERSONAL ASSISTANCE



Companion Robots



Affective states

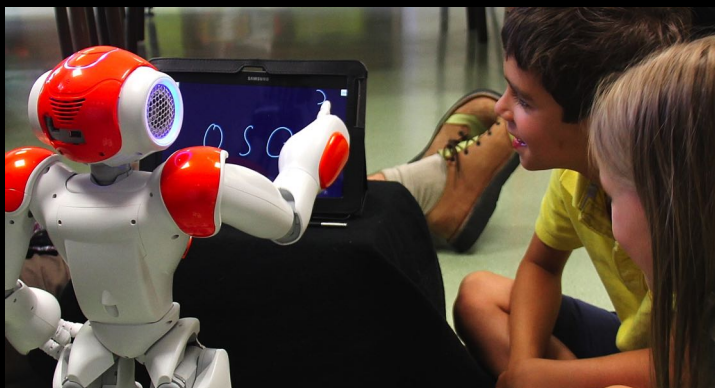


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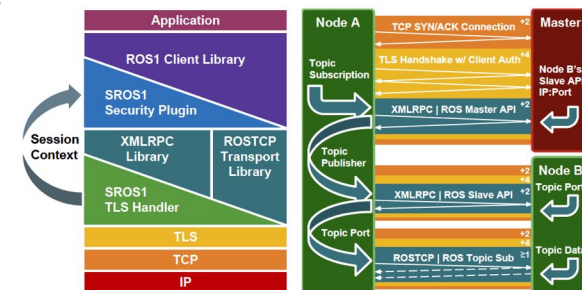
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EDUCATIONAL TUTORS



SW-Tools

• Secure ROS



(a) SROS library shims for ROS1 stack

(b) Topic subscription ladder diagram

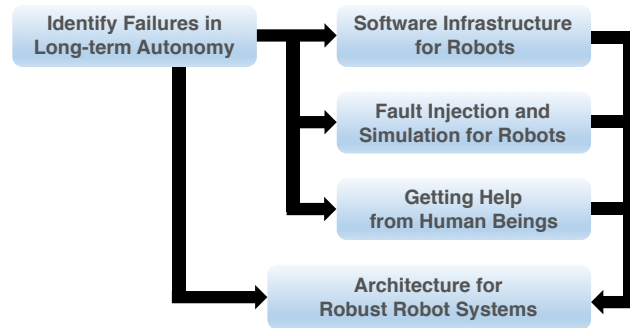
(White & Christensen, 2017)

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Long-term autonomy?



(Wang & Christensen, 2018)

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Roadmap Outline

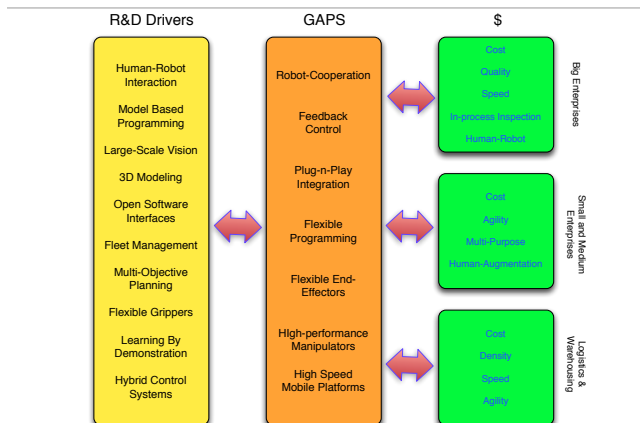
- Introduction
- Manufacturing & Logistics
- Service Robotics
- Healthcare Robotics
- Security & Defense
- Robot Science
- Societal, Ethical and Policy Implications

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A roadmap for moving forward



Proposed Timeline

Jun 2019	Call for white papers (1-2 pages)
Aug 2019	Invites to workshops
Sep 2019	East Coast Workshop (Venue TBD)
Oct 2019	Mid US Workshop (Venue TBD)
Nov 2019	West Coast Workshop (Venue TBD)
Dec 2019	Write-up of workshop reports
Jan 2020	Editorial Workshop - Synthesis (Venue San Diego)
Feb 2020	Request for comments from a community
Apr 2020	Revision of roadmap
Jun 2020	Final report design
Aug 2020	Roadmap published

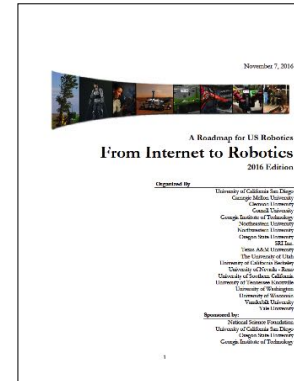
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Summary

- Industry in general is undergoing a major transportation
 - Mass Customization, Individual serving, B2C
- New technologies in communication (5G, SatCom, ...)
- AI / ML is permeating most aspects of robotics
- Business cases are maturing



Henrik I. Christensen

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Robust.AI

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(Founder & CEO)



Rodney Brooks
(Founder & CTO)



Mohamed R. Amer
(Founder & CSO)



Anthony Jules
(Founder & COO)



Henrik Christensen
(Founder)

We are hiring!

✉ contact@robust.ai