



CCC Robotics Roadmap: From Internet to Robotics

Henrik I Christensen
KUKA Chair of Robotics, Georgia Tech



Rensselaer

Carnegie Mellon

JOHNS HOPKINS
UNIVERSITY



May 21, 2009

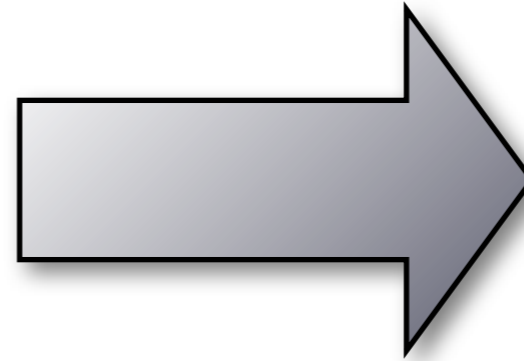
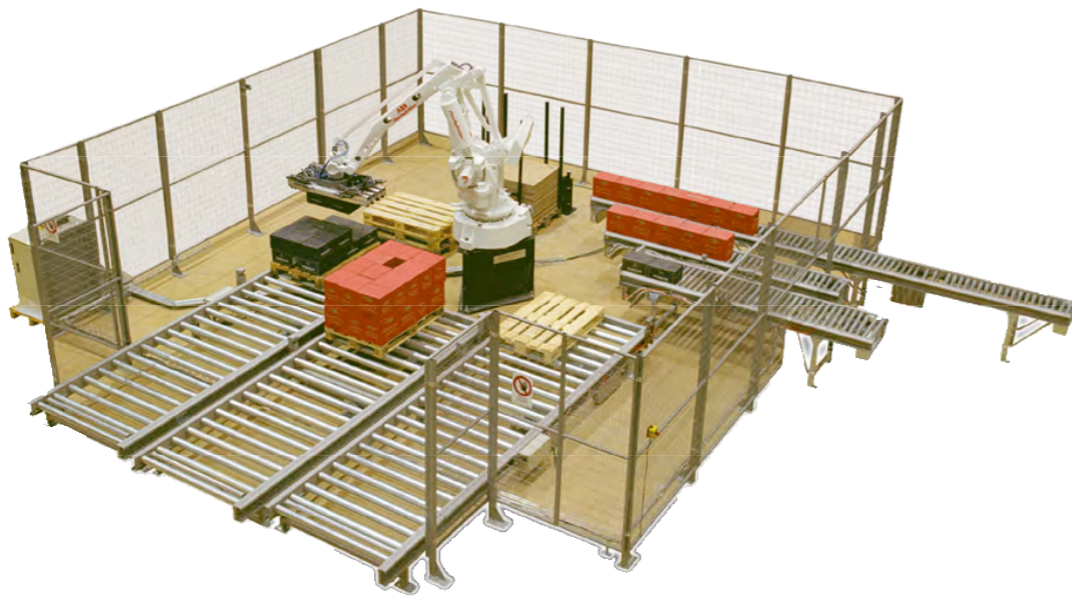


Introduction

- Robotics is a transformative technology
- Objective to define a roadmap for commercial use of robotics in the US
- Robots empower the american workforce



Robotics?



May 21, 2009





Objective

- Map out key socio-economic opportunities
- Identify major obstacles to progress
- Identify strategies to overcome obstacles
- Outline a 5, 10 and 15 yr roadmap to progress



4 Key Areas



- **Manufacturing & Logistics**
 - Organized by Rensselaer Polytechnic Institute, Univ. of Pennsylvania, UC Berkeley, Georgia Tech
- **Medical & Healthcare**
 - Organized by Johns Hopkins Univ., Univ. of Southern California & Georgia Tech
- **Service Applications**
 - Organized by Univ. of Massachusetts, The Tech Collaborative, Georgia Tech
- **Emerging Technologies**
 - Organized by Carnegie Mellon, Univ. of Utah, Georgia Tech



Open Process

1. Open Call for Participation
 2. Selected Workshop Participation
40% Industry/60% Academia
 3. Draft Report
 4. Community Feedback
 5. Final Report
- Involvement of a broad set of companies and institutions across US

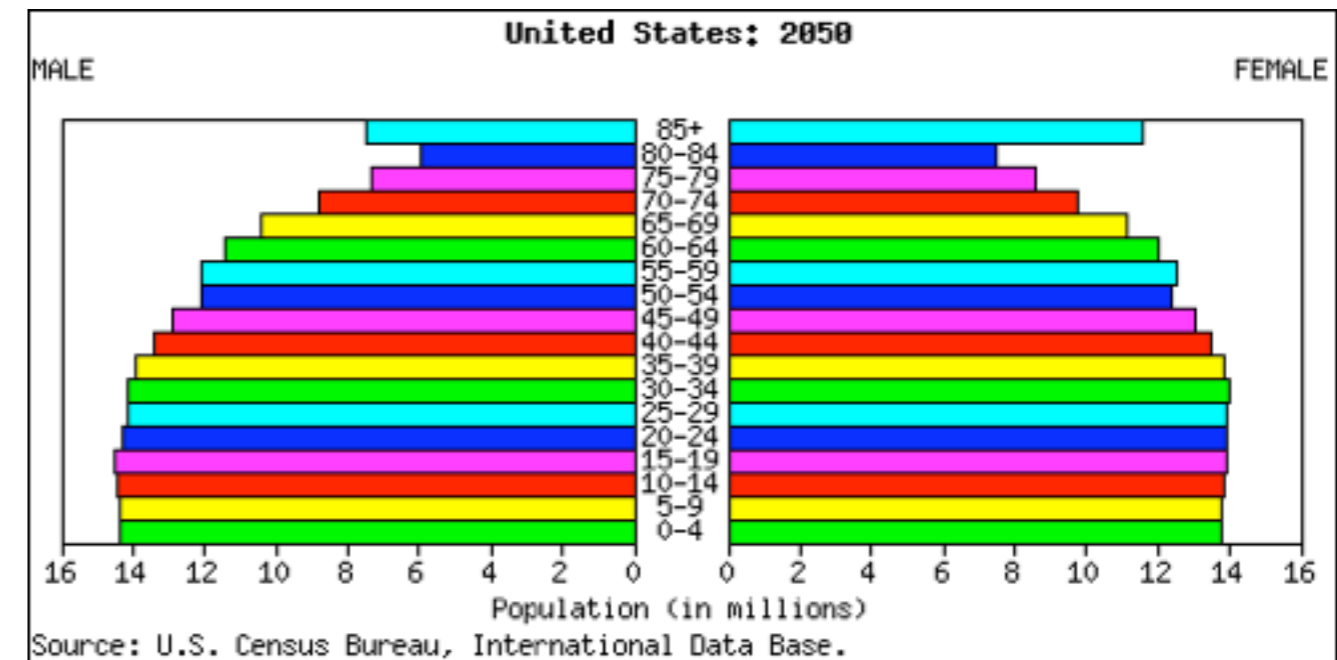
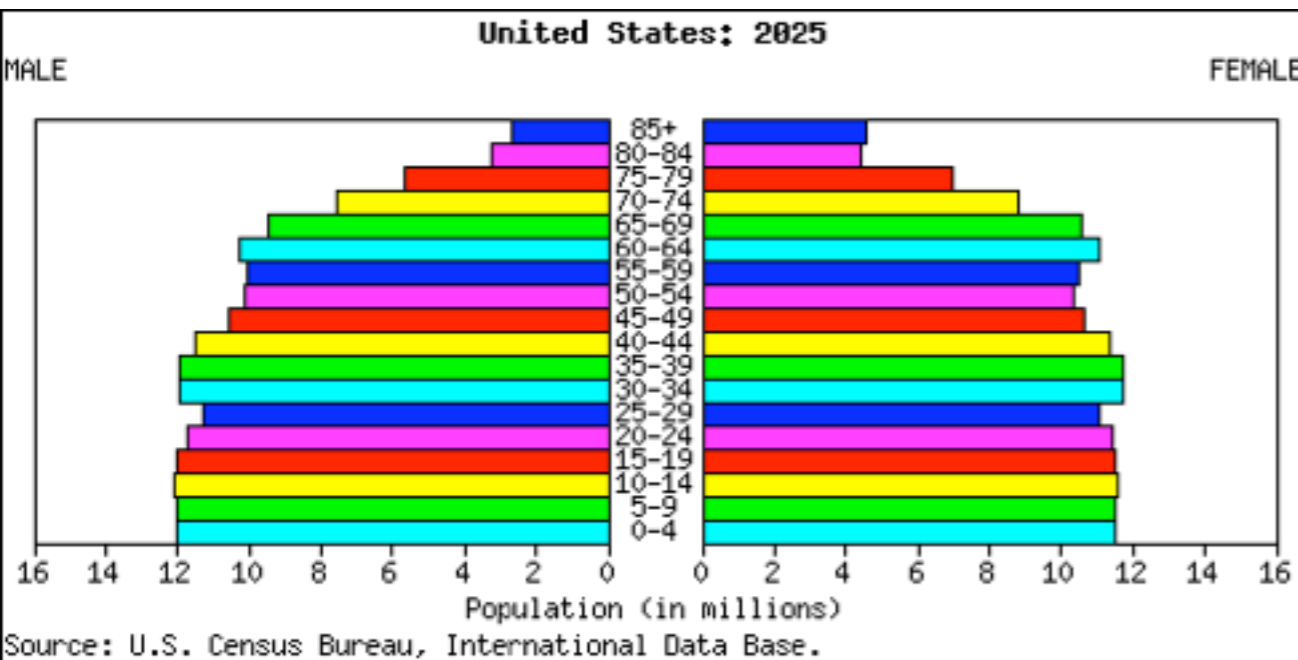
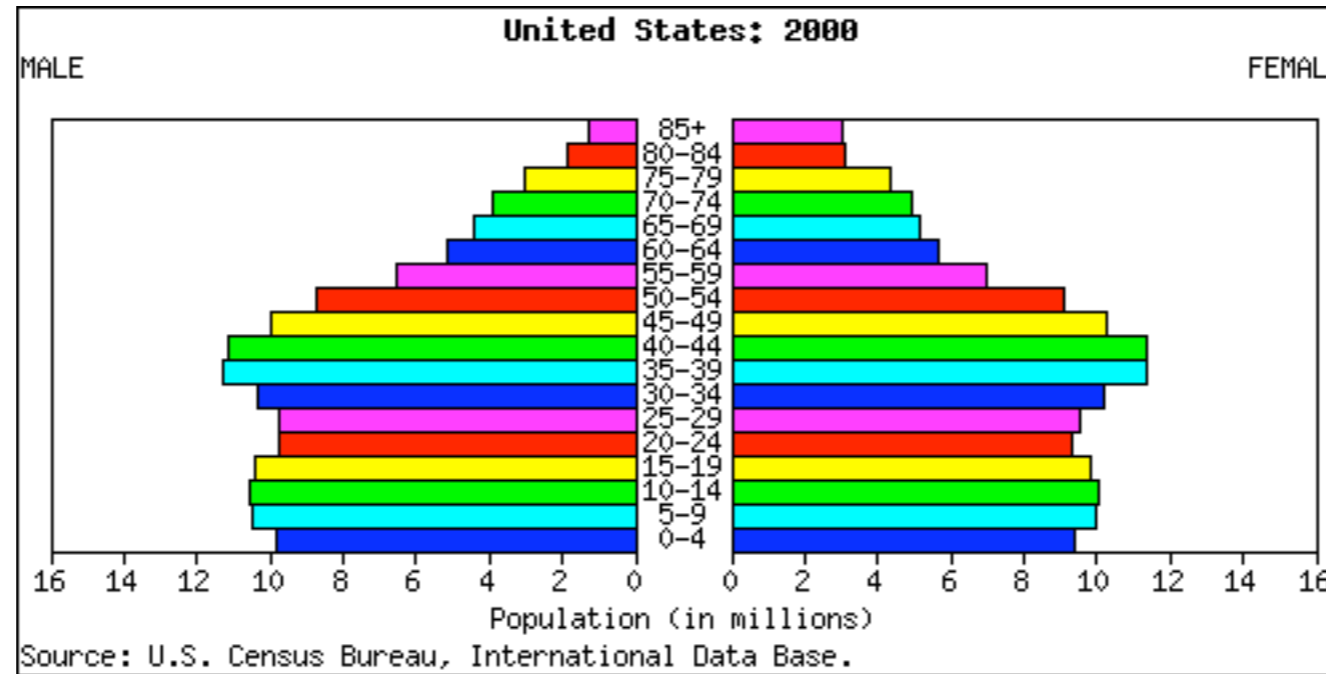


Main Results

- Manufacturing & Logistics
- Medical Robotics
- Healthcare Applications
- Professional Service Applications
- Domestic Services
- Emerging Technologies



Population Statistics



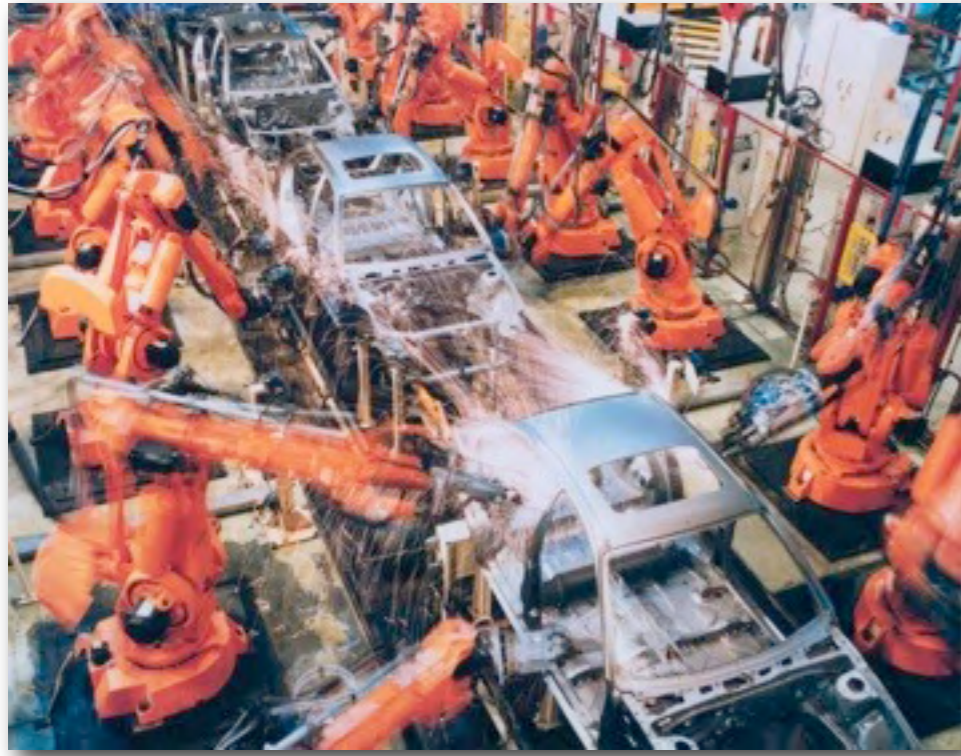
Important consideration for the future

May 21, 2009





Manufacturing



- ~11% of GDP (significant overall impact)
- Focus has been on large scale manufacturing
- Bring manufacturing home
- Empower small and medium sized companies
- Simplified use, added flexibility & versatility



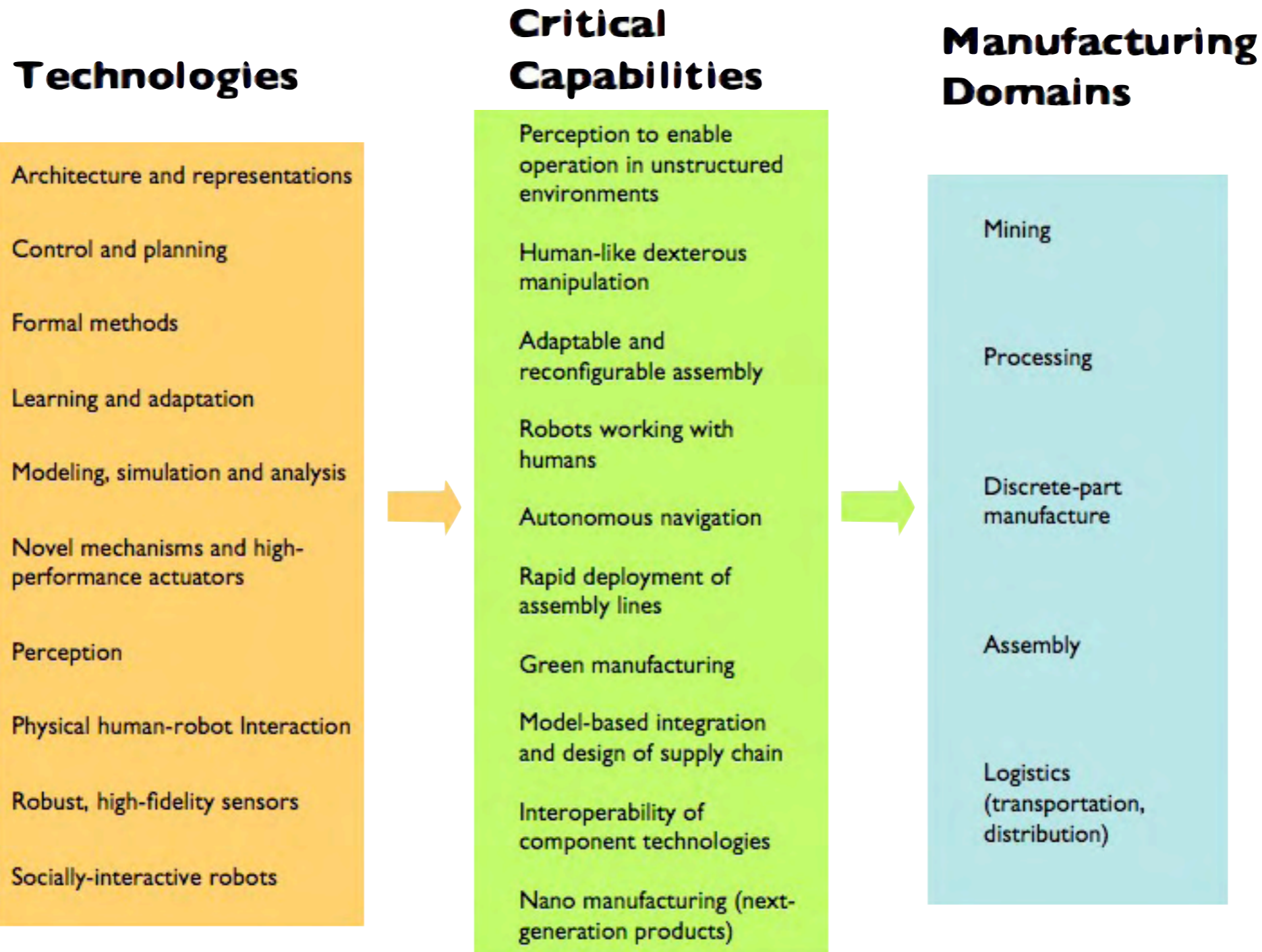
Logistics

- All consumer goods are on a truck at least once!
- < 15% of process has been automated
- The transport cost could be reduced by 20-30% or ~5% of final cost and energy
- Flexible palletizing. Ease of programming, small series delivery tasks, ...





Mapping \$ to Science





Medical Robotics

- Aging of society is seriously challenging the healthcare system
- Medical robotics facilitate faster, better and cheaper intervention
- Early results demonstrated for prostate and cardiac procedures.
- Need to develop and transition technologies from bench to bedside
- Where electronic patient record meets intervention





Healthcare Robotics

- Baby boomers/wounded veterans require services/quality of life
- Significant benefits to home-care services
- Freedom and personalized assistance
- New generation of flexible systems, ease of use, tied to home services





Professional Services



- Empower Field Applications
- Automate Farms, Forestry, Mining....
- Significant opportunities for automation





Domestic Services



- Assist people in homes
- Automate chores
- Add time for leisure
- Enhance independence for elderly and disabled



Education



- Developing the workforce
- Engaging students in STEM
- Educational outreach



May 21, 2009





International investments

- European Union
 - Cognitive Systems & Robotics (600M€)
- Korea
 - 21st Century Frontier Program (1.25B\$)
- Japan
 - Service Robotics (100M\$)
- USA
 - The industry was born here, but ...



Summary

- Robotics is a transformative technology
- Major opportunities to facilitate economic growth
 - Bring manufacturing home
 - Medical procedures cheaper, faster, better
 - Enhanced quality of life
 - Cheaper, greener, ... production
 - Enables energy independence
 - Leverages new R&D technology such as nano ...
- A roadmap for how to grow new opportunities



Speakers

- **Manufacturing:**
 - Rodney Brooks, Founder Heartland Robotics
- **Medical Robotics:**
 - Dan Jones, Director Ext. Affairs., Intuitive Surgical
- **Service Applications:**
 - Eric Close, CEO RedZone Robotics