

Here

Consumer Robots in Healthcare are ~~C~~oming

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CHIEF TECHNOLOGY OFFICER, ZYROBOTICS

Who am I?



Ayanna Howard

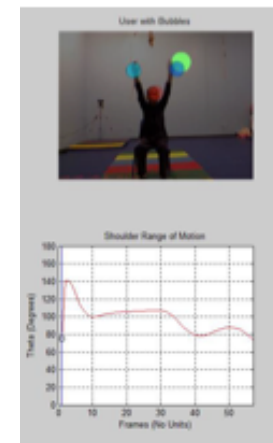
Assistive Robotics,
Machine Learning,
Human Interaction,
Field/Space Robotics

- Senior Robotics Research at NASA/JPL ~ 10yrs
- Professor at Georgia Tech.
- BS from Brown University, PhD EE from USC, MBA from Drucker
- Founder/CTO of startup company (Zyrobotics)



Current Research:

- Serious games and therapy devices for children with motor impairments
- Socially interactive robot therapy coaches
- Science Exploration in glacial environments
- Human-robot diver interaction for undersea exploration





Grass Root Consumer Robot Phenomenon

- Robot Hacker Culture
- Ingenuity and Execution surpassing that of commercial companies
- Robotic Startups and VCs abound
- Reminiscent of Hacker subculture at the dawn of the Personal Computer
- Enabled by Converging Technologies: Processing, Software, Sensors, Power Electronics

Robotics Evolution



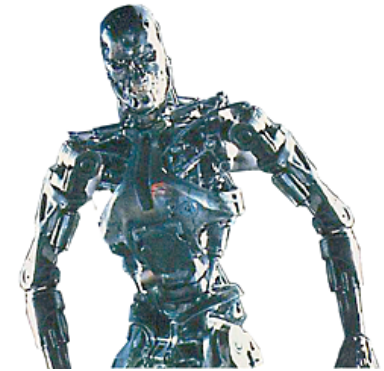
Yesterday



Now



Almost There



Getting There

Mobility	Wheels			+Manipulation
Sensors	None	Camera, Radar, Whisker, Sound		All
Communication	Receive Only	Low level Data Send/Receive	High-Level Data Send/Receive	Multi-modal - Speech, Gestures, etc.
Intelligence	None	Basic	Environment recognition & navigation	Cognition Learning
Enabling Technologies	R/C Radio	PC, WiFi, Webcam	AI Software	Artificial Muscle 1000x computing
Killer Application	Entertainment Contests	Telepresence, Security	Personal Assistant Military	Consumer?? - TBD

Industrial, Service and Personal Robotics



**Industrial
Robots**

- Mature, established market
- Existing dedicated conferences, publications, portals and analyst groups
- Market growth slowing, and limited by:
 - Structured environments (factory floor)
 - High price and high entry fees



Service Robots

“A robot which operates semi or fully autonomously to perform services useful to the well being of humans and equipment, excluding manufacturing operations.”



**Personal
Robots**

“A domestic service robot which educates, entertains or assists in the home.”

Consumer Robotics (Sample Submarkets)



Education



Vacuum Cleaners



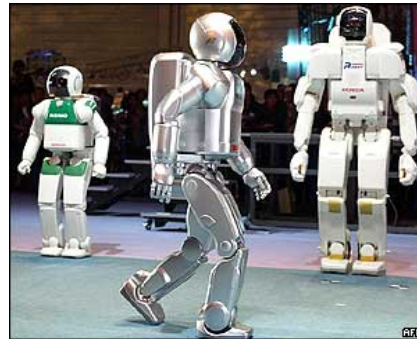
Personal Assistance



Lawn Mowers



Entertainment



Elder Assistance



Toys

The Stars are Aligned

- Robotics Market will continue to see significant growth
- Academic/Research is helping to drive robotic boom
- Large target market
 - 100's User Groups
 - 100's Academic Institutions
 - 100's Governmental Bodies (National and International)
 - Both B2B and consumer markets
- Large vendor market
 - Consumer (Sony, Honda, Lego, Hasbro, Epson, etc.)
 - Dedicated robotics vendors:
 - Military/Aeronautics/Security (Raytheon, United Technology, etc.)
 - Major IT vendors getting on board (Google, Microsoft, HP, IBM, etc.)

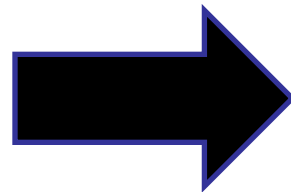


Consumer Robotics in Healthcare

- Robotics used to increase, maintain, or improve the functional capabilities of people with (or without) disabilities



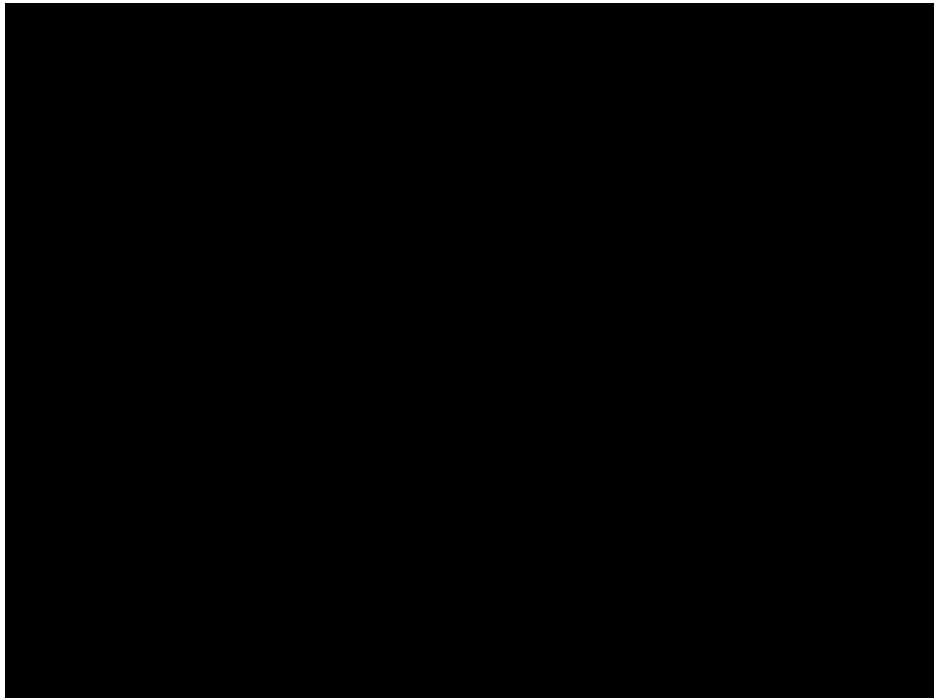
Factory
Away from People
Predictable Surroundings



Homes, Healthcare Facilities, ...
Working with People
Unpredictable Surroundings

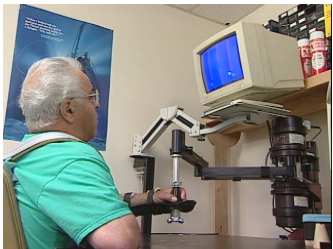
Facts about Health

Disability = State of being functionally limited in the type or amount of activities that a person would normally be expected to perform



Disability Statistics in the US

- 18% or 51.2 million people live with some level of disability.
- 32.5 million (12% of the population) experience a severe disability.
 - Estimated 250,000 - 400,000 Americans affected by spinal cord injury (SCI) [National Spinal Cord Injury Association. *Spinal Cord Injury Statistics*]
 - 5.3 million Americans are living today with a Traumatic Brain Injury-related disability, with leading cause from vehicle crashes, firearm use, and falls [National Center for Injury Prevention and Control. *Traumatic Brain Injury*]



[Americans with Disabilities Report]

Rehabilitation Robotics

- Application of robotic technology in service to individuals with disabilities
 - Aims: Independence, Safety, Quality of Life
 - Challenges
 - Technical: Operating in human environments
 - Social: Being accepted by human users
 - Types of Systems
 - Robotic systems for hospitals (e.g. HelpMates)
 - Manipulators in rehabilitative therapies
 - Smart Wheelchairs (w/wout manipulators)
 - Virtual environments for training
 - Advanced prosthesis and orthosis



Rehab – Early Successes



MIT
Manus



ARM Guide



MIME



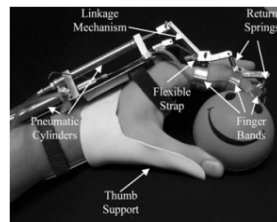
GENTLE/s



ADLER



Rutgers Master
II-ND



Carnegie
Mellon Hand
Device



CyberGrasp



Today's Successes



Assistive Technology

- Any technology used to increase, maintain, or improve the functional capabilities of people with (or without) disabilities
- Personal Robotics
 - “A domestic service robot which educates, entertains or assists in the home.”



Elder Assistance



Personal Assistance



Toys

@Home, Work, Play

- Two 'killer applications' (i.e. addresses current real-life needs)
 - Home Care for the elderly
 - "I have felt for years that the first 'killer application' of personal robots will be companionship, especially for the elderly."
 - Child education, development, and rehabilitation

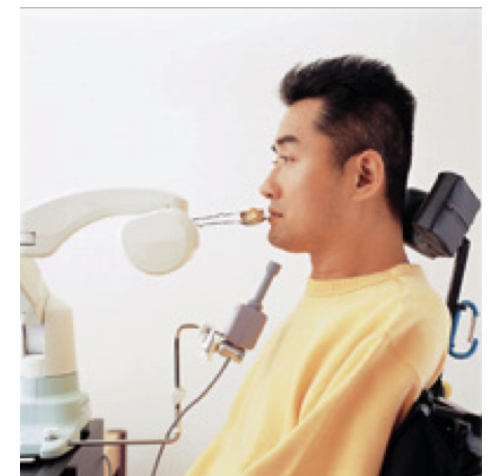


Types of Assistive Tasks

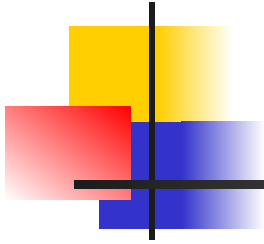
- Activities of Daily Living (ADLs)
 - Feeding, toileting, dressing, and hygiene
 - Manipulation near the user's body
- Instrumental Activities of Daily Living
 - Housework, food preparation, shopping, ...
 - Manipulation of objects in the environment
- Enhanced Activities of Daily Living
 - Hobbies, social activities, ...



Handy1 robot
(Rehab Robotics)



MySpoon eating-assistant
(SECON Co.)



6.4 MILLION
CHILDREN WHO NEED
THERAPY

\$1.6 BILLION
PEDIATRIC REHABILITATION
INDUSTRY



The Problem



LIMITED CLINIC
VISITS

HOME
NON-COMPLIANCE

Robot Therapy System

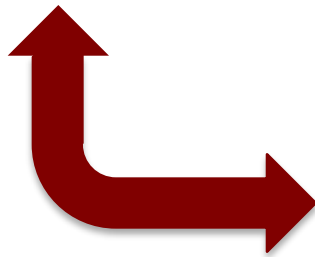


Gamified Apps

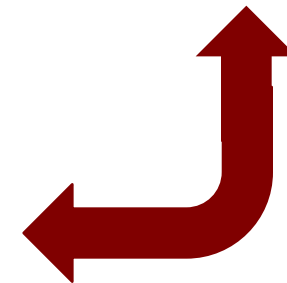
Cloud Connected
← Portal →



Zumo Learning System



ZYRO Robot Coach



Robot Therapy System



Gamified Apps

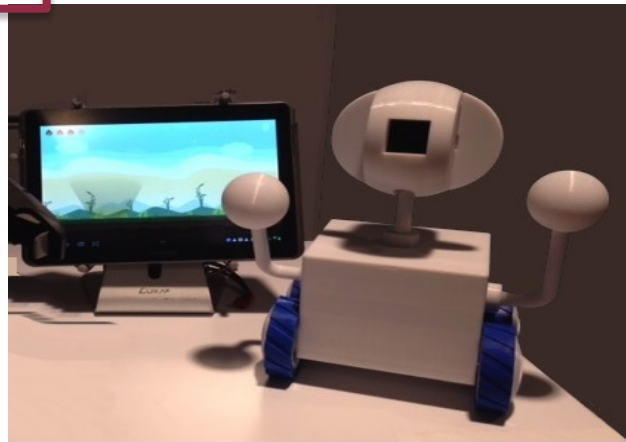
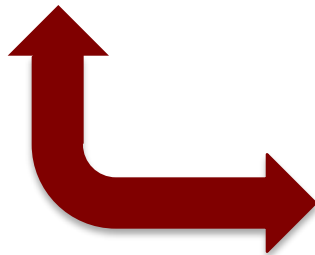
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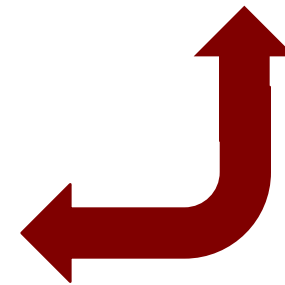
Portal



Zumo Learning System



ZYRO Robot Coach



Gamified Apps



Robot Therapy System

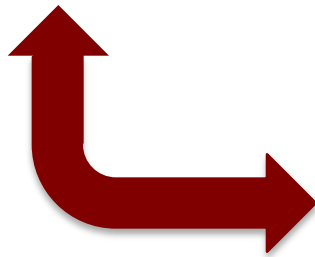


Gamified Apps

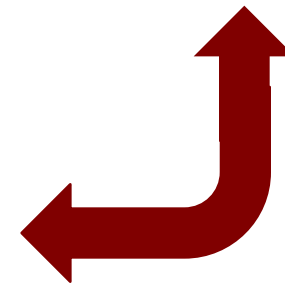
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Zumo Learning System



ZYRO Robot Coach





Zumo Learning System



Robot Therapy System



Gamified Apps

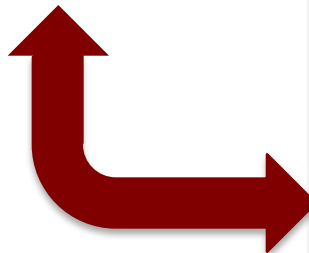
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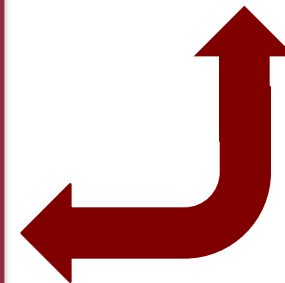
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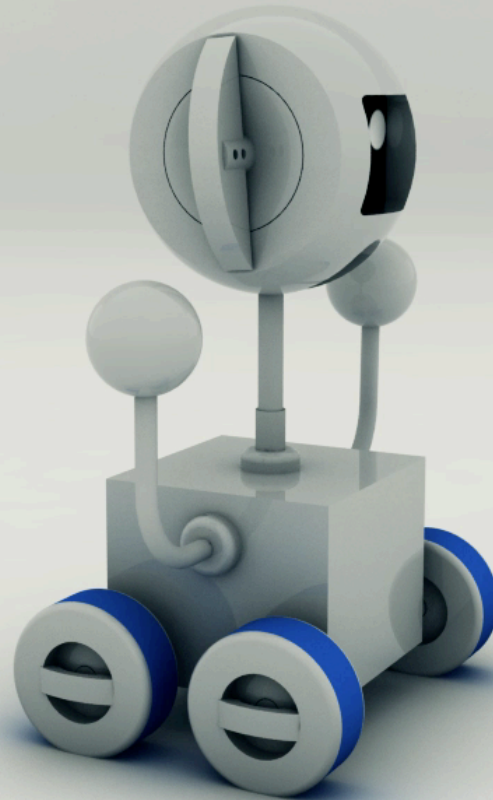
Zumo Learning System



ZYRO Robot Coach



ZYRO Robot Coach



Healthcare ...

Robots - Because humans deserve better.

Since 1950, inventions have revolutionised the way we live. Radio, Telephones, Television, Computers, Washing Machines - we've come a long way. Whats the next big thing? Robots. Of course.

