

House of the (present) future

Home design for a generation, architects optional

Our studio will apply new and innovative computing technologies to a growing problem of deep significance, both in the US as well as the site of our travel, Japan. Changing demographics have led to an imbalance between a disproportionately aging and infirm population and too few young workers to support needed social structures such as the healthcare system. In Japan this crisis is particularly acute, with a quarter of its citizens reaching retirement age, already the highest in the world but expected to increase dramatically in the next decade.

This context will take us to research laboratories that are developing robotic exoskeletons, mind-reading devices that can record your dreams, and internet-of-things developers who make smart wheelchairs and streets that talk.

At the heart of these efforts to address the population crisis is an implicit belief in rapid technological development to create a more humane world rather than the dystopian scenarios usually associated with technology and robotics. We will immerse ourselves in the emerging domain of bio-medical technologies - encouraging a process of experimentation, re-wiring and creative play to enrich our design process.

From advanced techniques such as scripting and data mining to disruptive technologies such as rapid-prototyping, computer vision, low power sensor networks and robotics we will create new and innovative outcomes and a new typology - combining the home, the health clinic and the research lab.



A Note on Studio Technology

We will be using Processing, OpenFrameworks and other open-source programming tools to interface with devices and to explore data intensive means of visualization and space making.

No programming experience is required. The studio will begin with several workshops that will be targeted to each student's level.

Programming is an extension of thought, and the programming we teach is specifically designed to aid creative work. Human extension is fundamental to our thinking about what the built environment is. We use scripting to model problems, to gather, understand and distill data and to explore and enumerate thousands of potential outcomes. However, no amount of code substitutes for a designers curiosity or ability to imagine a world that doesn't yet exist, and we privilege that above all else to motivate a studio project.

Studio Program

A house for the physically and cognitively impaired. The house is to be designed in coordination with the ATR Brain-Machine-Interface Smart Home initiative.

The house is a laboratory for new technologies, particularly enhanced mobility and healthcare technologies, specifically targeted to the large aged population that will be the first beneficiaries of these innovations.

The house must serve as an interface for outpatient hospital care, visiting medical practitioners and extended family interactions. The house should incorporate novel Human Computer Interface technology to actively engage in the health and well-being of its occupant.

The demonstration home is to be sited at the Japan Advanced Telecommunications Research (ATR) main-campus in Kansei Science City, Kyoto Japan.

Collaborators and Presenters

Continuing the theme of "Brain Hacking" initiated by the GSAPP Cloud Lab in 2011, the studio will connect with cutting edge neuroscience and human-computer-interaction (HCI) researchers from across the globe. Discussions, presentations and technology demonstrations will expand our awareness of emerging technologies as well as promote cross-disciplinary discussion on exponential technological change.

Brain Information Communication Research Laboratory Group

*Adv. Telecommunication Research Institute
Kawanabe Motoaki, Ph.D.*

Department of Neuroinformatics

*Adv Telecommunication Research Institute
Yukiyasu Kamitani, Ph.D.
"Dream Recording with BCI"*

Studio-X Tokyo

Daisuke Hirose, ARCHICOMPLEX

Ubiquitous Networking Laboratory

*Tokyo Japan
Ken Sakamura, Ph.D.*

Laboratory for Intelligent Imaging and Neural Computing (LIINC)

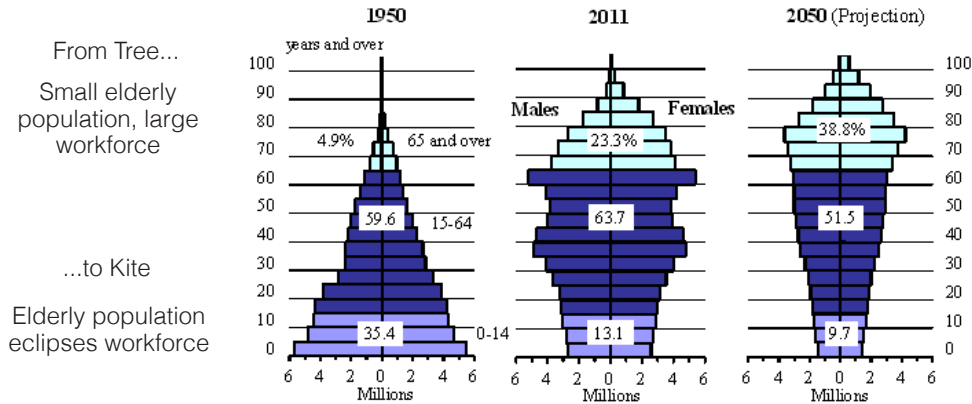
*Columbia University Bio-Medical Engineering
Paul Sajda Ph.D. and David Jangraw*

The studio will engage the impending demographic crisis in Japan and other developed world countries. Particularly we will examine the qualities and quantities of:

Life and Death

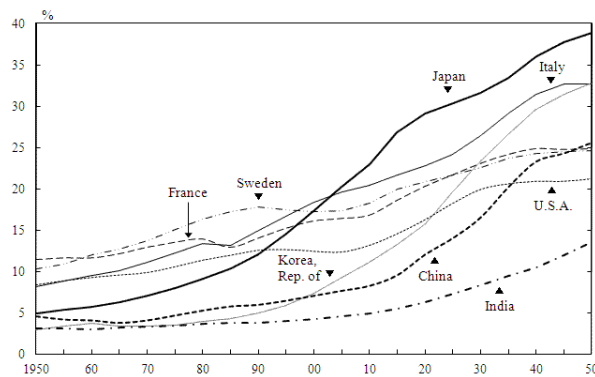
at a macro-scale in Japan

Demographics and Macroeconomic Shifts

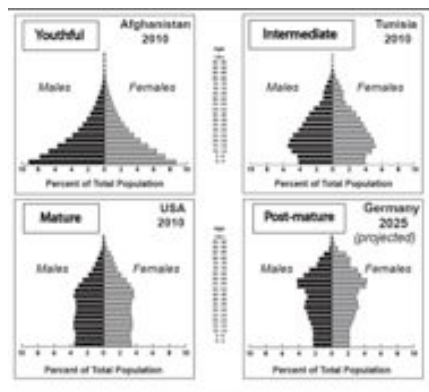


The demographic shift of the last 50 years, experienced acutely by Japan, but shared across many developed countries:

Figure 2.4
Proportion of Elderly Population by Country (Aged 65 years and over)



Source: Statistics Bureau, MIC; Ministry of Health, Labour and Welfare; United Nations.



A typical population scenario and a unique response.

2009 - Japan initiates the “Home-use Robot Practical Application Project” designed to introduce crucial products to the marketplace.

It included funding for: (1) **a robot that can be used both as a wheel chair and bed**, (2) a cleaning robot that can be used during daytime hours, (3) a security robot that can be used during day-time hours, (4) **a wearable robot suit that assists daily activities** and (5) a two-wheeled rideable robot.*



**From Panasonic Corp, Fuji Heavy Industries (FHI) Ltd, Sohgo Security Services Co Ltd, Cyberdyne Inc and Toyota Motor Corp, respectively.*

Medical environments are filling up with other forms of intelligence, including...

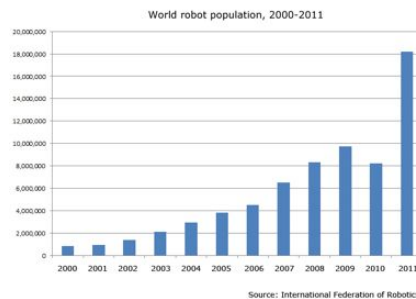
Artificial Life

An Emerging Demographic

An automated solution for every need...

...mobility, diet, health screenings, communications, even socialization.

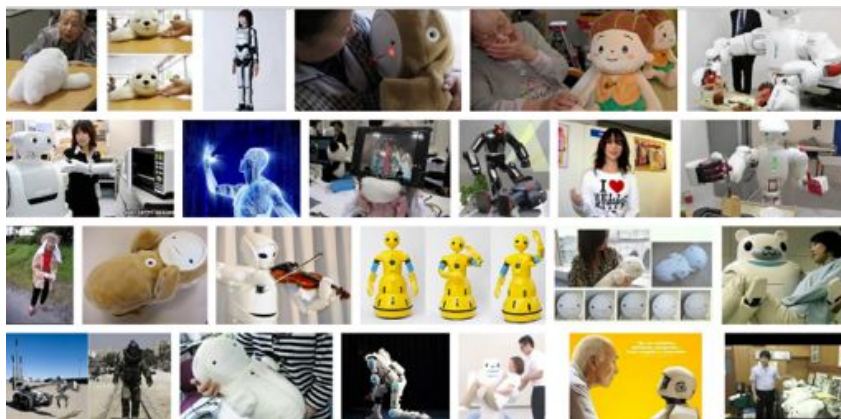
World Robot Population, 2000-2011



15.6 million units of service robots for personal use to be sold between 2012 and 2015

<http://www.ifr.org/service-robots/statistics/>

A sampling from Google showing the many service robots that are being developed to care for the elderly



Designer of the Future?

AGNES the empathy suit

from the MIT Agelab



A suit named AGNES, an acronym for the Age Gain Now Empathy System, is designed to help young engineers understand the physical limitations of older people.

EARPLUGS:
Reduce hearing.

NECK COLLAR:
Limits joint mobility and extension of the spine.

WRIST GUARDS:
Reduce the flexion and extension of the wrists.

GLOVES:
A double layer of rubber gloves to reduce the tactile sensation through the fingers and restrict the movement of the hand.



THE HELMET:
An anchor point for the bungee points that attach to the hip.

GOGGLES:
Mimic the natural yellowing of the eye lenses.

BUNGEE CORDS:
Run from helmet to hip, restricting movement. The tension they create makes spinal extension difficult, meant to mimic curvature of the spine. They also help to reduce the rotation of the spine.

BELT:
Used to anchor the bungee cords and elastic band from hip to wrist.

ELASTIC BAND:
Runs from hip to wrist to reduce shoulder mobility and cause fatigue.

GSAPP student at the
Laboratory for Intelligent
Imaging and Neural
Computing



Empathetic hardware
includes EEG feedback
devices and other bio-
medical monitors.

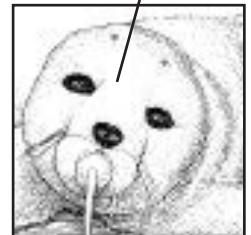
Medical Care of the Future?

Paro, a social
robot to fight
dementia.

Bacteria
resistant fur



Robotic
Interface



**It's Not a Stuffed
Animal, It's a
\$6,000 Medical
Device**

Paro the Robo-Seal
Aims to Comfort Elderly,
but Is It Ethical?

Wall Street Journal,
June 2010



は都市近くに建つ住宅を想定しているが、当然そう広い敷地はとれない
空間は、そのような厳格的な環境の中で人と植物を守る動的な緩衝地帯と
と建物はゆるやかにつながっており、たとえば台所の一部は庭の中にあ
り根元まで侵入している。

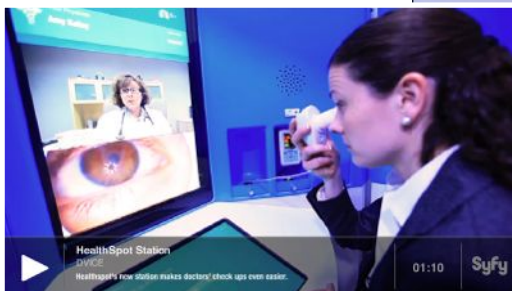
Tron House 1.0

House of the Future?

Tron House 2.0, built by Ken Sakamura's Ubiquitous Network Laboratory in Tokyo, Japan. The house is a demonstration home for the "internet of things"



Ken Sakamura
the "Bill Gates of Japan"



ATR International
Campus Entrance
Kansei Science City
Japan



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ATR



...Designed Here?

Japan's Advanced Telecommunications Research
"ATR"

"We constantly pursue research and development to achieve com-
fortable and exciting human life in the future"

- ATR Mission Statement http://www.atr.co.jp/about/atr_e.html