



DEPARTMENT OF  
**SOFTWARE TECHNOLOGY**

# Introduction to Empathic Computing

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# Empathy

## Empathy

“**Seeing** with the **Eyes** of another,  
**Listening** with the **Ears** of another,  
and **Feeling** with the **Heart** of another..”

*Alfred Adler*

## empathy noun

em·pa·thy | \ˈem-pə-thē  \

### Definition of *empathy*

- 1 : the action of understanding, being aware of, being sensitive to, and vicariously experiencing the feelings, thoughts, and experience of another of either the past or present without having the feelings, thoughts, and experience fully communicated in an objectively explicit manner

# Empathy vs Sympathy



## EMPATHY

- 1 Active
- 2 Understanding someone's feelings as if they were yours
- 3 Getting to the root of the problem, offering comfort

VS



## SYMPATHY

- 1 Passive
- 2 Feeling sorry for someone from your own point of view
- 3 Offering unsolicited advice and passing judgement

- **Empathy** is shown in how much compassion and understanding we can give to another.
- **Sympathy** is more of a feeling of pity for another.
- **Empathy** is our ability to understand how someone feels.
- **Sympathy** is our relief in not having the same problems.

# Empathic Computing

1. *Understanding*: Systems that can understand feelings and emotions.
2. *Experiencing*: Systems that put people into the recorded world of others.
3. *Sharing*: Systems that share the real time experience of others.

**Aim** of empathic computing is to develop software systems that allow people to share with others what they're seeing, hearing and feeling.

Empathic computing research uses **technology** to create deeper shared understanding or empathy between people.

# Empathic Computing

## Appliances That Make You Happy



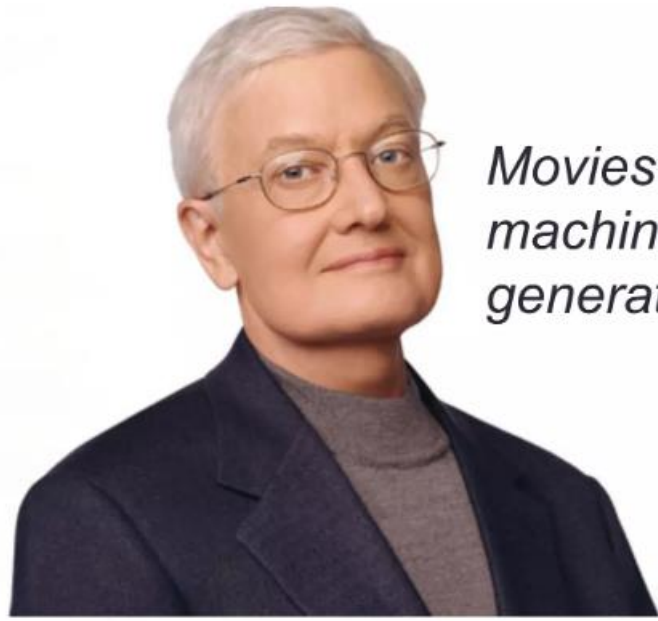
- Jun Rekimoto – University of Tokyo/Sony CSL
- Smile detection + smart appliances

Can we develop systems that allow us to share what we are **seeing**, **hearing** and **feeling** with others?





# Empathic Computing



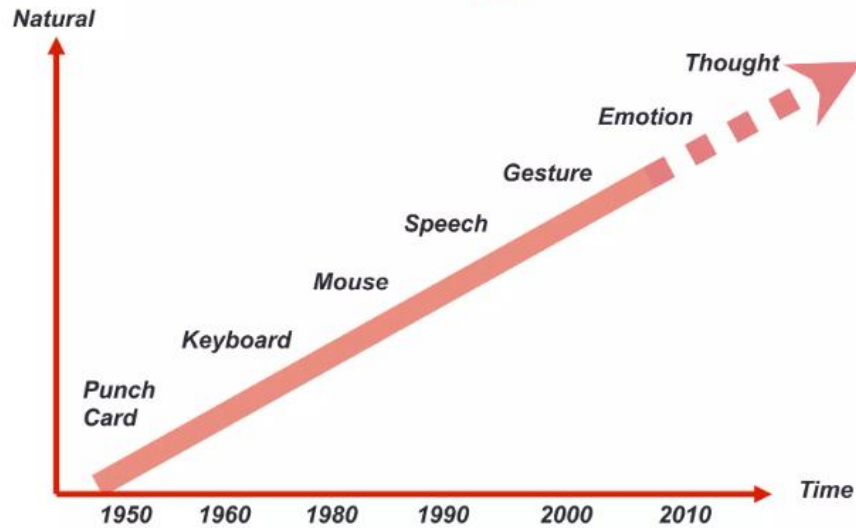
*Movies are like a  
machine that  
generates Empathy*

Roger Ebert

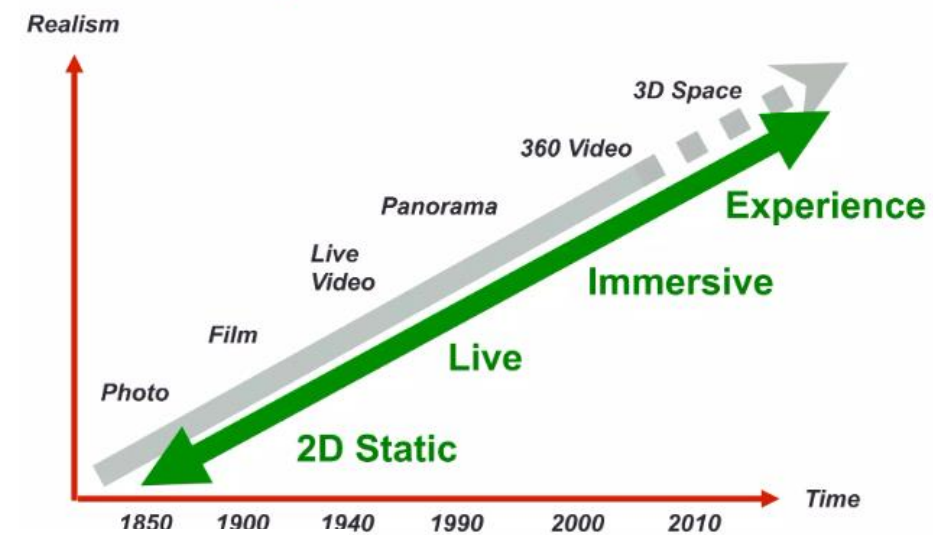


# Evolution of Interaction Technology

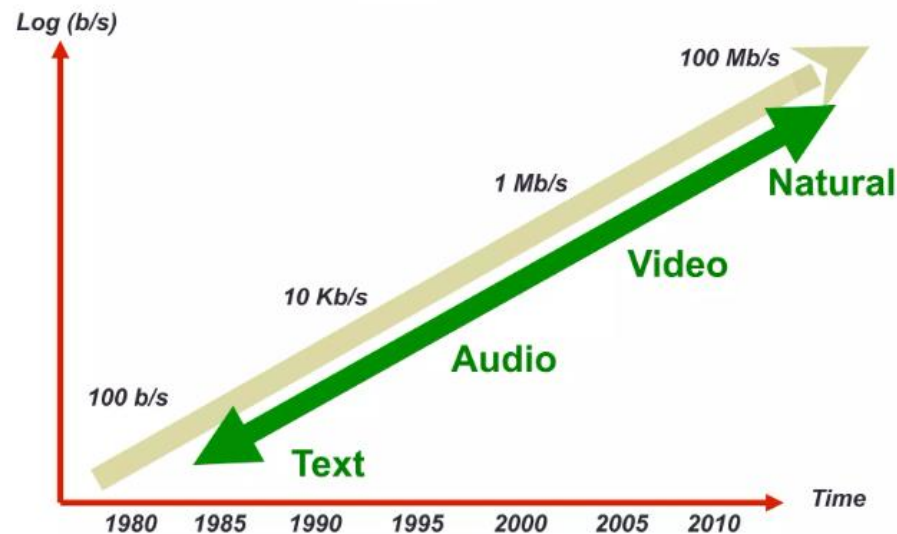
## Interaction Technology



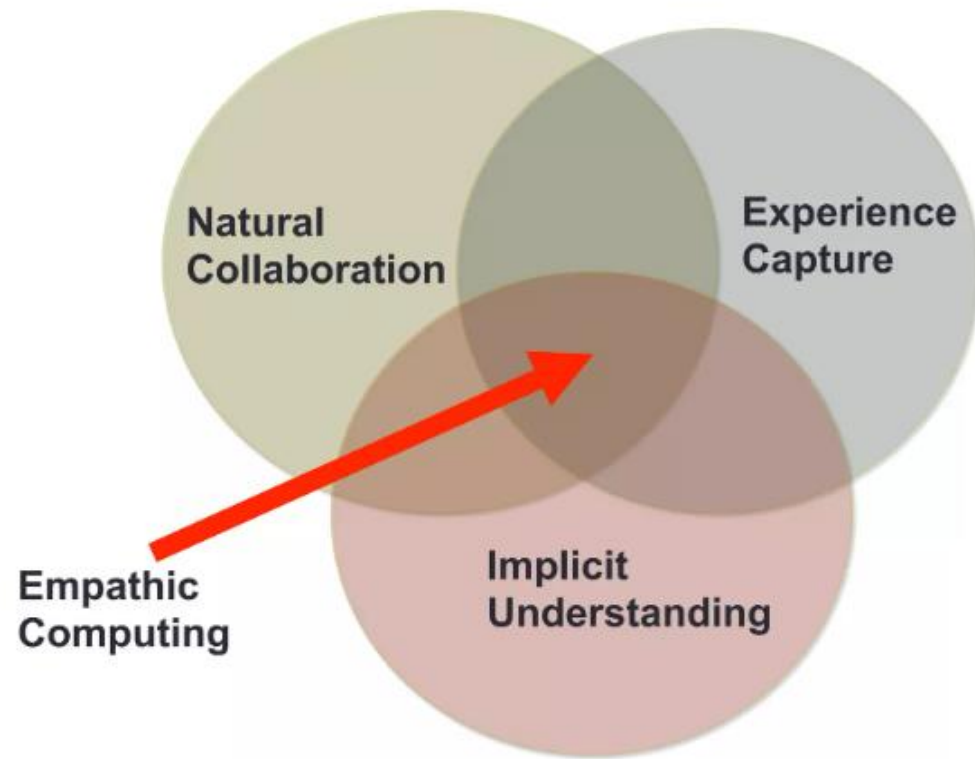
## Content Capture



## Networking Speeds



# Evolution of Interaction Technology



## Physiological Sensing



*Emotiv*

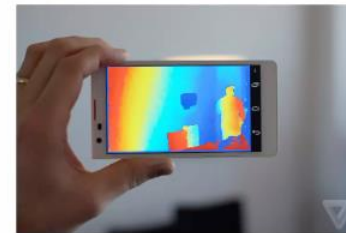


*Empatica*

## 3D Image/Space Capture



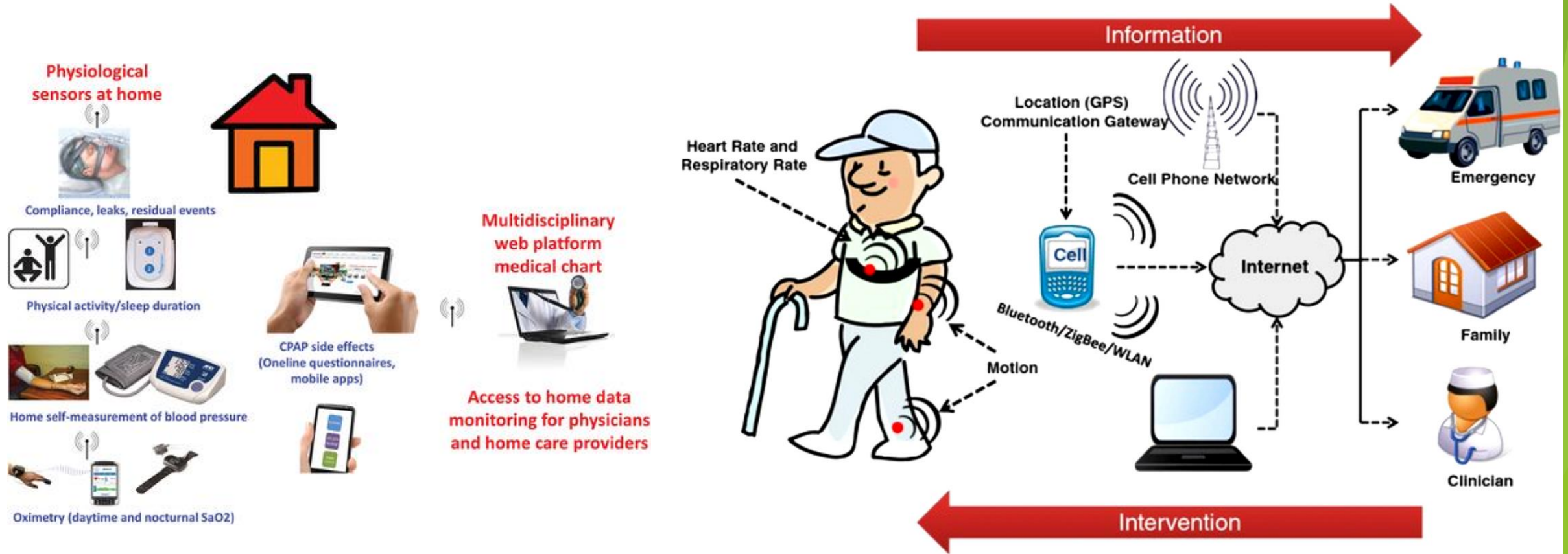
*Samsung Project Beyond*



*Google Project Tango*



# Evolution of Interaction Technology



Remote patient monitoring system using physiological sensors

# Empathic Computing Technology

## MagicBook (2001)



- First AR story book
- Transitional AR to VR experience

## AR Tennis (2005)



- First collaborative AR game on a mobile phone

## Mobile AR Advertising (2007)



- First mobile AR ad campaign (Saatchi & Saatchi)

## AR Business Today

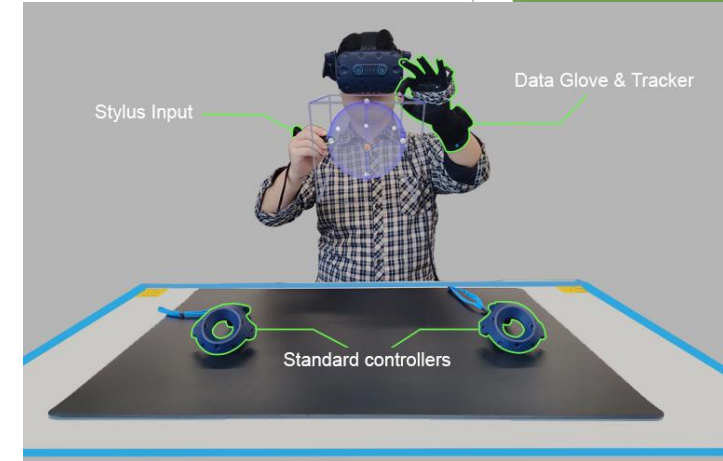


- Around \$600 Million USD in 2014 (>\$2B 2015)
- > 80% Games and Marketing applications

# Empathic Computing Technology

## Wearable AR for Empathic Interfaces

- **Wearable AR can:**
  - Be unobtrusive
  - Capture emotion
  - Share sights, and sounds
  - Support remote collaboration
  - Enhance interaction in the real world



<http://empathiccomputing.org/projects/>



# Empathic Computing Technology



**Augmented Reality** is the overlaying of digital objects (animals, products, maps, information bubbles, people...) into your real world.

**Virtual Reality** is an immersive viewing of a digital world that you can move through.



**Mixed Reality** is just Augmented Reality that you can interact with.

Microsoft Mesh is a new infrastructure that allows developers to make Mixed Reality work on most platforms and with more than just one person.

**Holoportation** puts a digital avatar of you in a space with others that you can fully interact with (using the Microsoft Mesh technology)



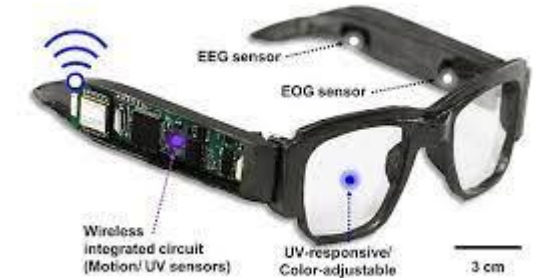
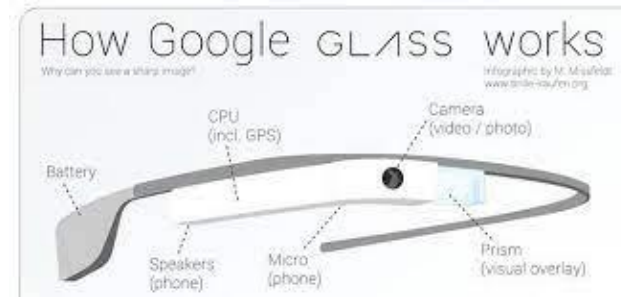


# Empathic Computing Technology

## Example: Google Glass

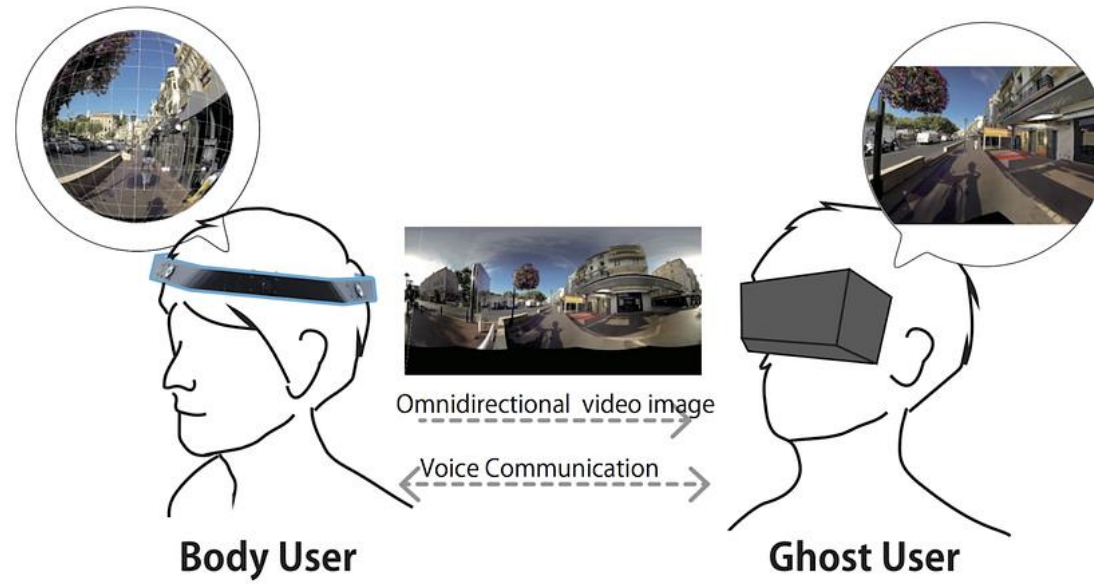


- Camera + Processing + Display + Connectivity
- Ego-Vision Collaboration (But with Fixed View)



<https://katieraspberry.wordpress.com/2013/08/23/google-glass-what-do-they-do/>

# Empathic Computing Technology



Two way video sharing to enable two people to feel like they are inside each other's bodies. In this case people wear head mounted displays with cameras on them and the video feed from each person's cameras are swapped and shown in the other person's HMD. This allows the user to explore places in real-time without being presence. This is also known as [Surrogate Tourism](#).

# Empathic Computing Technology

Appropriately balancing a videogame's difficulty is essential to provide players with a pleasant experience. In 2022, Korean scientists developed a novel approach for dynamic difficulty adjustment where the players' emotions are estimated using in-game data, and the difficulty level is tweaked accordingly to maximize player satisfaction. Their efforts could contribute to balancing the difficulty of games and making them more appealing to all types of players.

## Creating a Better Experience: Adjusting Videogame Difficulty Based on Player Emotions

In videogames, difficulty is a major factor that can make or break the player's experience



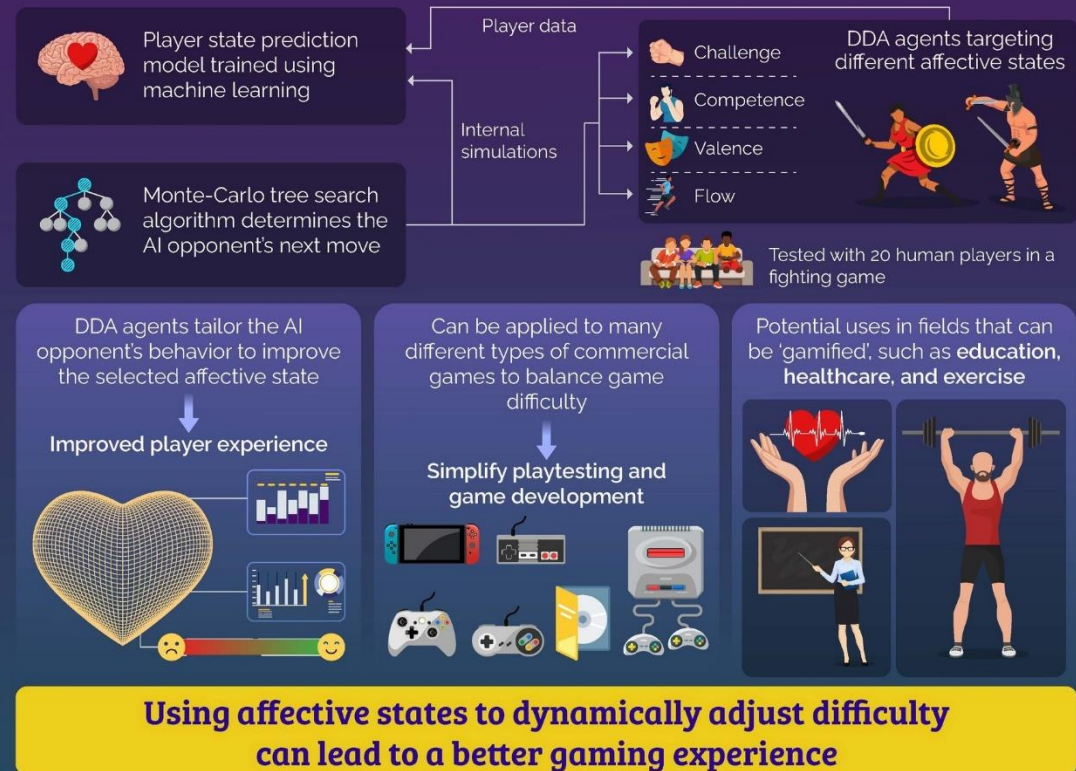
Researchers use dynamic difficulty adjustment (DDA) to change the difficulty according to the player's performance in real-time



Can adjusting DDA based on players' emotions (affective states) make for a better player experience?



## New DDA method based on players' satisfaction



Diversifying dynamic difficulty adjustment agent by integrating player state models into Monte-Carlo tree search  
Moon *et al.* (2022)  
Expert Systems With Applications | 10.1016/j.eswa.2022.117677



Gwangju Institute of  
Science and Technology



# Empathic Computing Technology

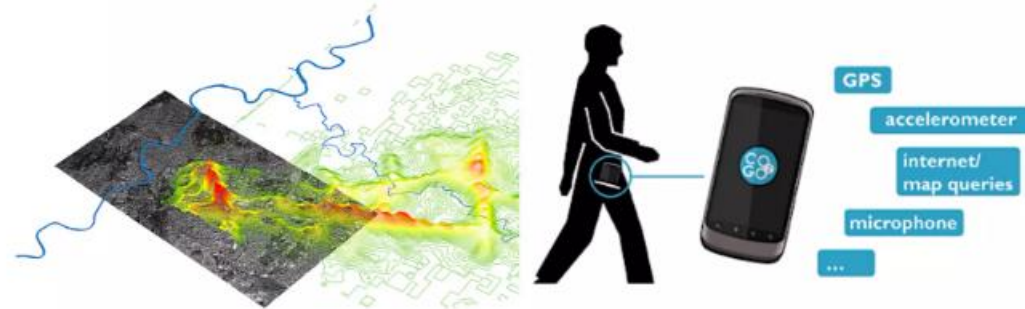
## Example: MIT SENSEable City Lab



<http://senseable.mit.edu/wikicity/rome/>



## AR + Smart Sensors + Social Networks



- Track population at city scale (mobile networks)
- Match population data to external sensor data
- Mine data for applications

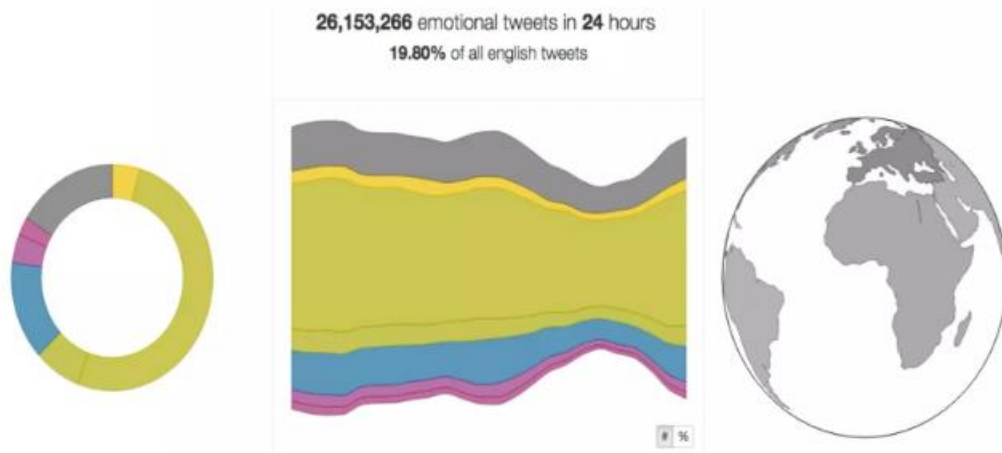


- Seeing actions of millions of users in the world
- Augmentation on city/country level

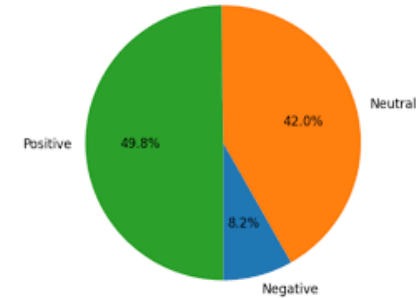
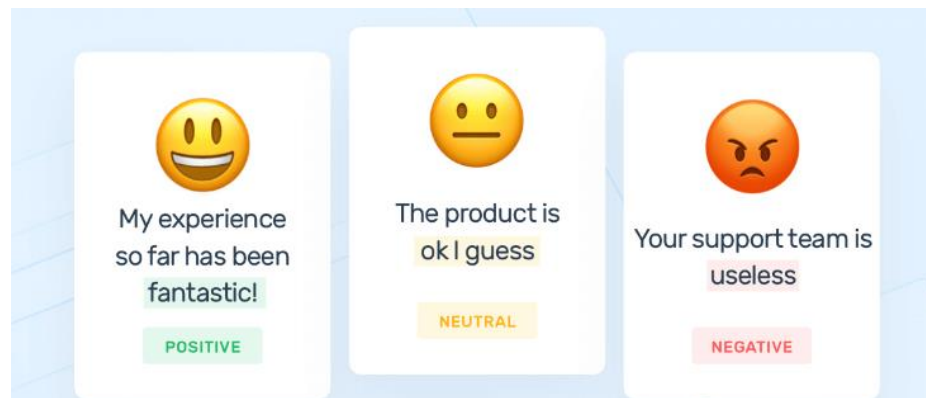


# Empathic Computing Technology

## Example: CSIRO WeFeel Tool



- Emotionally mining global Twitter feeds
- <http://wefeel.csiro.au>



Animals & Pets > Pet Stores > Pet Store



**Chewy.com**

Reviews 9,747 • Average



[chewy.com](https://www.chewy.com)  
Visit this website

Write a review

Reviews 9,747

Filter by: Rating (5 stars) English

Rating	Percentage
Excellent	82%
Great	4%
Average	2%
Poor	2%
Bad	10%

Business Transparency

- Claimed their Trustpilot profile: April 2015.
- Verified additional company details

See how this company has been using Trustpilot for the past 12 months

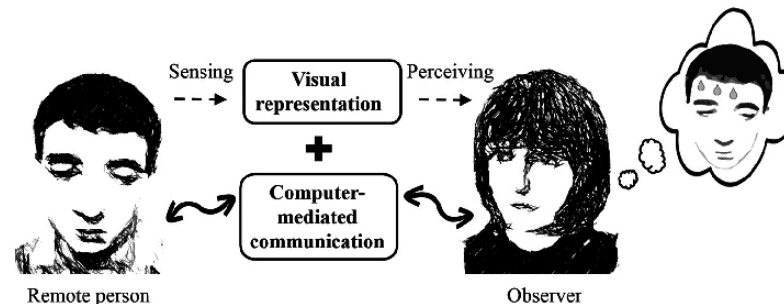
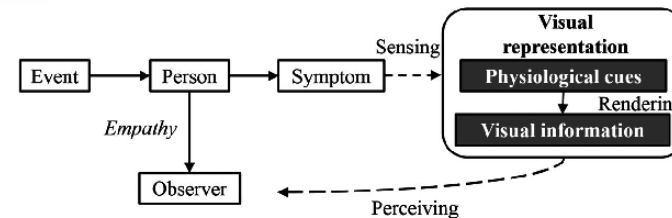
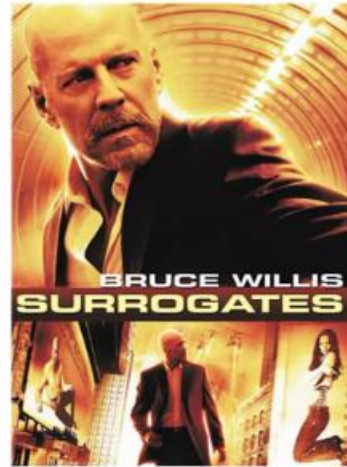
Hasn't replied to negative reviews for the past 12 months.

See a detailed overview →

# Potential Applications

## Potential Applications

- Education
- Sports training
- Rich life logging
- Remote meeting support
- Psychological treatments
- Virtual Travel/Entertainment
- Surrogate Adventure Tourism
- First responders (stress, team cohesion)

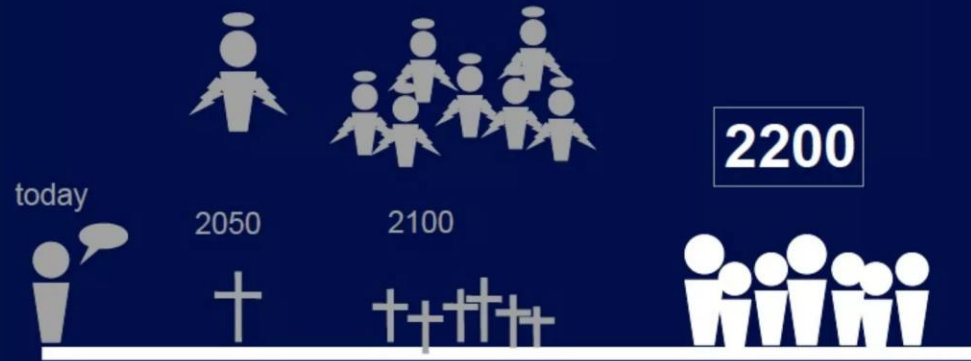


# Research Challenges

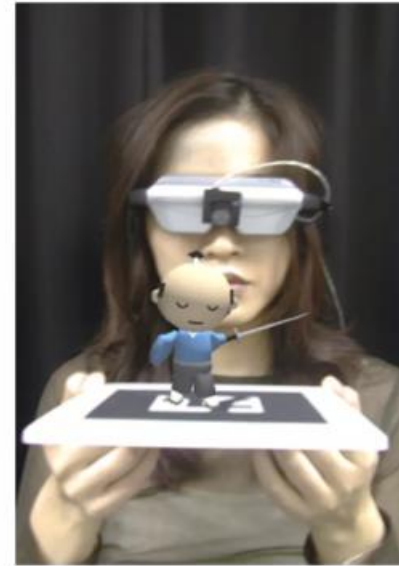
- How to capture emotion?
- How to measure empathy?
- Interface/interaction models?
- How to communicate emotion?
- How to create strong empathic bonds?
- How to scaling up to city/country scale?



How do you want to be remembered by people living in 2200? What will you leave for them?



© 2008 MIT Media Laboratory, Hiroshi Ishii





# Readings

- ▶ <https://www.cmu.edu/vis/NEW%20WEBSITE/images/publications/empathetic.pdf>
- ▶ <https://medium.com/super-ventures-blog/the-coming-age-of-empathic-computing-617caefc7016>
- ▶ <https://online-journals.org/index.php/i-jim/article/download/6385/4385/22144>
- ▶ <https://computethought.blog/2018/11/02/the-era-of-empathic-computing/>