Andrea Gaggioli

Università Cattolica del Sacro Cuore
http://www.positivetechnology.info
Outline of my presentation

1. HCC sense: living in digital ecosystem
2. Why Positive Technology?
3. Key concepts
4. Applications
HCC Sense: living in digital ecosystems

- new ways of perceiving (new senses) and interacting with the real world or virtual artefacts
- Involves using a novel combination of senses

How is living in such digital ecosystems?
Digital Ecosystems

ubiquitous
disappearing
responsive
intelligent
Is technology making us happier?
excessive Internet use is correlated with depression!!

overuse of GPS devices may reduce our ability to develop “mental maps”!!

electronic media use breaks down basic family communication!!

electronic intrusions leave workers feeling frustrated, pressured and stressed!!
MULTITASKING
ENVIRONMENTAL IMPACT
ETHICS AND VALUES
THE HISTORY OF TECHNOLOGY

ME NOT HAPPY

STILL NOT HAPPY!
How to design systems that minimize the barrier between the user’s intention and computer’s understanding of that intention

How to design systems that support user’s empowerment and wellbeing
What does science tell us about wellbeing?

\[
\smile = S + M + f(0) + f(w) + f(\delta)
\]
The goal of Psychology

Understanding what makes people:

- Suffer
- Stressed
- Anxious
- Depressed
- Unhappy
- Angry
- Aggressive
- Violent
- Strange
- Mentally ill

The goal of Positive Psychology

Understanding what makes people:

- Happy
- Enjoy life
- Content
- Satisfied and fulfilled
- Emotionally stable
- Mentally healthy
- Functional
- Able to cope
- Successful
- Strong
The pleasant life
achieved through the presence of positive emotions

The engaged life
achieved through engagement in satisfying activities and utilization of one’s strengths and talents

The meaningful life
achieved through serving a purpose larger than oneself

M. Seligman
“Authentic Happiness” model
(1) The *pleasant life*: the role of positive emotions

According to Fredrikson, positive emotions:

1. *broaden* Thought-Action Repertoires
   - Joy > PLAY
   - Interest > EXPLORE
   - Contentment > SAVOR AND INTEGRATE
   - Love > ALL OF THE ABOVE

2. *build* durable personal resources
   - Physical resources
   - Social resources
   - Intellectual resources
   - Psychological resources

(2) The *engaged life*: the role of flow


**Key features:**
- high concentration
- high involvement
- intrinsic motivation
- positive emotions

**Key antecedents:**
- challenge/skills
- clear goals
- clear feedback
(3) The meaningful life

“using your strengths in the service of something greater than yourself”

E.g. belonging to and serving institutions such as:

- Education
- Religion
- Science
- Democracy
- Family
- Etc..
Technology & well-being

“I think with technology, entertainment and design, we can actually increase the amount of tonnage of human happiness on the planet.

And if technology can in the next decade or two increase the pleasant life, the good life and the meaningful life, it will be good enough”

M. Seligman – TED 2009
Positive Technology domains

**The pleasant life**  
achieved through the presence of positive emotions

**Hedonic technologies**  
using technologies to support positive and pleasant experiences

**The engaged life**  
achieved through engagement in satisfying activities and utilization of one’s strengths and talents

**Eudaimonic technologies**  
support individuals in reaching engaging and self-actualizing experiences

**The meaningful life**  
achieved through serving a purpose larger than oneself

**Interpersonal technologies**  
support social integration and connectedness

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Can you make some examples?
Positive Technology applications

The pleasant life achieved through the presence of positive emotions

Hedonic technologies using technologies to support positive and pleasant experiences

1. Using technologies to *induce positive* emotional states
2. Using technologies to *reduce negative* emotional states (i.e. stress, anxiety)

Hedonic Computing
Affective Computing
Emotional Design

**RELATED HCI CONCEPTS**
(1) Using technology to induce positive emotional states


(2) Using technology to monitor and manage psychological stress

www.interstress.eu

Detecting psychological stress: challenges

1) people respond differently to stress

2) classification of stress from physiological data requires appropriate strategies to:
   
   a) control the confounding effect of physical activity
   b) correlate physiological data to perceived stress levels (ground truth)
Background: Experience Sampling

ESM is a naturalistic observation technique that allows capturing subjects' experience and activities in real-life contexts (Larson and Csikszentmihalyi, 1983)

Participants fill out multiple brief questionnaires about their current activities and feelings by responding to random alerts throughout the day.
PsychLog

- PsychLog allows real-time collection of psychological, behavioral and contextual data for research and clinical applications
- It collects ECG, motion data (via 3-axis accelerometer) and self-reported quality of experience
- Open source, free app!

www.psychlog.com
Pilot study

GOAL
– to measure concurrent stress and physiological arousal within subjects’ typical daily environments and activities

PARTICIPANTS
– 15 university students (8 males and 7 females, $M = 23.33$, $SD = 1.49$)
– Opportunistic sampling
Pilot study

EXPERIMENTAL DESIGN
- Participants carried Psychlog + sensors during daily life
- One week of observations
- 6-7 surveys collected per day at random times

MAIN MEASURES
- Jacobs et al. (2007) ESM survey for studying the immediate effects of stressors on mood
- ECG and motion activity from accelerometer
Data analysis

A total of 374 valid samples were included in the analysis, which focused on:

-Self-reported psychological stress
-ECG signals
-Motion activity data
Hierarchical Regression Model

Mixed-effects ML regression

Number of obs = 374

<table>
<thead>
<tr>
<th>Group Variable</th>
<th>No. of Groups</th>
<th>Minimum</th>
<th>Average</th>
<th>Maximum</th>
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<tbody>
<tr>
<td>Subject</td>
<td>15</td>
<td>7</td>
<td>24.9</td>
<td>35</td>
</tr>
<tr>
<td>day</td>
<td>114</td>
<td>1</td>
<td>3.3</td>
<td>6</td>
</tr>
</tbody>
</table>

Wald chi2(5) = 11.65
Log likelihood = -521.73879

Prob > chi2 = 0.0398

| zstress | Coef.   | Std. Err. | z     | P>|z|  | [95% Conf. Interval] |
|---------|---------|-----------|-------|------|----------------------|
| ZHR     | .5130362| .2169258  | 2.37  | 0.018| .0878694 .938203    |
| ZRMSSD  | -.5350813| .2151596 | -2.49 | 0.013| -.9567863 -.1133763 |
| ZNN50   | -1.152351 | .5322348 | -2.17 | 0.030| -2.195512 -.1091898 |
| ZLF     | .6218279 | .3082483  | 2.02  | 0.044| .0176724 1.225983   |
| ZLF/HF  | 1.176422 | .5386275  | 2.18  | 0.029| .120731 2.232112    |
Case studies
Frequency domain results

Each band represents a different frequency component

\[ \text{LF(blue)} / \text{HF(yellow)} = \text{sympathovagal balance} \]

An high value of LF/HF indicates stress

VLF indicates stress
Perceived stress: high

Stress: 6 (mean 2.9)
Activity-Related Stress: 7 (mean 3.7)
Social Stress: 7 (mean 3.7)
Event-Related Stress: 3

Thoughts: I’d not like to argue
Activity: Unsuccessfully studying
Location: Home
People: Mother and dog
Perceived stress: low

Stress: 1 (mean 2.9)
Activity-Related Stress: 2.5 (mean 3.7)
Social Stress: 3.5 (mean 3.7)
Event-Related Stress: 0
Time: 13.39.35 - 13.51.35

Thoughts: Zapping
Activity: Watching TV
Location: Home
People: Dog
### Features

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
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<tr>
<td>mean_RR LF_power_nu</td>
<td>RMSSD LF_HF_power ApEn RPA.DIV</td>
</tr>
<tr>
<td>AR_HF_power_nu</td>
<td>NN50 VLF_peak SampEn</td>
</tr>
<tr>
<td>std_RR HF_power</td>
<td>SDANN AR.HF_peak DFA.alpha1 VLF_power AR.LF_power prc</td>
</tr>
<tr>
<td>AR.LF_HF_power</td>
<td>SDNN_HRV AR.HF_peak RPA.DET</td>
</tr>
<tr>
<td>mean_HRV LF_power_prc</td>
<td>DFA.alpha2 VLF_power_prc AR.LF_power_nu</td>
</tr>
<tr>
<td>Poincare_SD1</td>
<td>VLF_peak AR.VLF_power RPA.ShanEn</td>
</tr>
<tr>
<td>std_HRV HF_power_prc</td>
<td>CorDim.D2 LF_power AR.HF_power</td>
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<tr>
<td>Poincare_SD2</td>
<td>LF_peak AR.VLF_power_prc LF_power_prc AR.HF_power_prc</td>
</tr>
</tbody>
</table>

### Fuzzy Membership Functions

### Kohonen self-organized maps

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### Test Set

- Download Data from remote DB obtained from Mobile Application
- Features Extraction

### Training Set

- Download Data and Survey Answers from remote DB obtained from Mobile Application.
- Features Extraction

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### Mobile application

- Upload SENSOR DATA

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### Mobile application

- Upload SENSOR DATA + SURVEY ANSWERS

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### Stress Tracker

- Your current stress level:

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### Stress History

- View history

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### Stress Level inferred from Measured data

- Stress Level inferred from Survey Results
Positive Technology applications

The engaged life (2)
achieved through engagement in satisfying activities and utilization of one’s strengths and talents

Eudaimonic technologies (2)
support individuals in reaching engaging and self-actualizing experiences

1. Using technologies to support flow and engagement
2. Using technologies to facilitate transformation of flow

RELATED HCI CONCEPTS

- Serious Gaming
- Persuasive Technology
- Virtual rehabilitation
(1) Flow and Virtual Reality

- Opportunities of actions
- Task complexity
- Multimodal feedback
- High feeling of control

(2) Transformation of Flow

- Real World Demands
- Use of Technology
- Link with Experience

- Environment
- Optimal Experience in the Environment
- Cultivation of the Optimal Experience

Trasformation of Flow in rehabilitation settings

Flow Games as “transpersonal technologies”

--> personal interactive art products that are purposefully designed to foster the development of consciousness.

..a TP is any medium that “enables us to transform our selves, transfer our thoughts and transcend the limitations of our bodies. Transpersonal experience gives us insight into the interconnectedness of all things, the permeability and instability of boundaries, the lack of distinction between part and whole, foreground and background, context and content”

FORECAST 2009 – 2019: Game designers become *happiness hackers*.

They are called upon to help *individuals, communities, and entire populations* better structure their everyday lives for *authentic happiness* and *sustainable well-being*.
Positive Technology applications

The meaningful life achieved through serving a purpose larger than oneself

Interpersonal technologies support social integration and connectdness

1. Using technologies to enhance social integration & connectdness
2. Using technologies to foster social change

Social Networks
Persuasive Technology
Social Presence

RELATED HCI CONCEPTS
MAMA – Mobile Alliance for Maternal Action

Far too many mothers and children die.

Pregnancy and childbirth should be a safe and positive experience for all women and provide the healthiest start for newborns. But tragically, 1,000 mothers die every day due to complications from pregnancy and childbirth. More than 3.1 million newborns die every year in the first month of life. 99% of these deaths occur in the developing world.

MAMA is a global community to deliver vital health information to new and expectant mothers through mobile phones.
(3) Patients Like Me

120,752 patients
500+ conditions

Who's like you?

Share your experience.
The more you share, the easier it will be to find patients like you. Start by adding a condition, symptom or treatment.

I have
Type at least 3 letters of a condition

I take
Type at least 3 letters of a treatment

I am
Male  Female

My Age

Get your health in order.
Join PatientsLikeMe.

http://www.patientslikeme.com/
(4) Participative ecology

UbiGreen

• It uses built-in accelerometers like the iPhone has to figure out if you're walking, running or biking, and cell phone towers to determine when you're in a vehicle.

• The greener you travel, the leafier your tree will be.

http://dub.washington.edu/ubigreen/
To summarize: domains of Positive Technology

Experiential features targeted by technology

- Emotional Quality (Arousal, Valence, Object)
  - Hedonic level
    - Technologies used to induce positive and pleasant experiences
  - Eudaimonic level
    - Technologies used to support individuals in reaching engaging and self-actualizing experiences

- Engagement/Actualization (Challenge/skills, Goals, Presence)
  - Social & Interpersonal level
    - Technologies used to support and improve social integration and connectedness

- Connectedness (Collective Intentions, Social Presence, Empathy)

Link with Well-Being

  - Flow (Csikszentmihalyi, 2001)
    - Transformation of Flow (Delle Fave, 1996; Riva et al, 2006)
    - Networked Flow (Riva et al, 2010)

Related ICT topics

- Affective Computing, Emotional Design, Engineering Aesthetic, Hedonic Computing
- Persuasive Computing Presence, Serious Gaming, Simulations, e-health, Virtual Reality Therapy
- Persuasive Computing Serious Gaming, Simulations, Social Networks, Social Presence

Features of Positive Technology as a potential new area in HCI

• *theory-driven* (Positive Psychology)
• *evidence-based* (based on controlled studies)
• *user-centered* (participatory design approach)
SELF-IMPROVEMENT MARKET (US)
Source: Marketdata

Value of Self-Improvement Market Segments: 2005 ($millions)

- Infomercials: $3970
- Mail Order Catalogs: $354
- Personal Coaching: $693
- Top 12 Motivational Speakers (e.g. Anthony Robbins and Deepak Chopra): $320
- Books: $1290
- Audiotapes: $2400
- Holistic Institutes & Training Companies: $10
- Weight Loss Programs: $6
- Stress Management Programs: $9.7
- Yearly Avg. Growth to 2010 (%)
  - Infomercials: 0%
  - Mail Order Catalogs: 12.6%
  - Personal Coaching: 9.8%
  - Top 12 Motivational Speakers (e.g. Anthony Robbins and Deepak Chopra): 4.5%
  - Books: 8.3%
  - Audiotapes: 10
  - Holistic Institutes & Training Companies: 17.5%
  - Weight Loss Programs: 6
  - Stress Management Programs: 9.7
Thanks

www.positivetechnology.info