Age of Mindfulness: Technology as Guide and Mentor?

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Jasprit Singh
Professor, EECS and Applied Physics
University of Michigan, Ann Arbor

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The Series will also be available for viewing on YouTube at:
http://www.youtube.com/user/EECSatUM

Engineers/Humanists/Entrepreneurs ... all Welcome!

Contact: Jasprit Singh
2305 EECS, Ann Arbor, MI 48109-2122
Phone: 734-834-0507
Email: singh@umich.edu
Modern technologies have transformed societies and brought us an enormous array of experiences.

Technology has removed scarcity in many spheres: food, gadgets, shelter, knowledge, credit… web-surfing, 200 channels of TV, reality shows!

However, technology has not removed (or even decreased) mental anxiety, mind stress. Can technology help our wellness by providing guidance to our brain and mind?
Good Life Layers: Body and Mind

✧ Physical Wellness: nutrition/shelter/health

✧ Creativity: New options, beauty, art, technology…

✧ Multi-dimensional role in society, balance in life

✧ Love: Have positive connections to others

✧ Express yourself: Harmony between thought and speech

✧ Self-Reflection and understanding of self

✧ Spirituality: Feeling part of the universe
Wellness Challenges

Challenges from the body: Diseases, environmental pollution, food scarcity, ..

Challenges from the biology of the brain and Addiction The brain as a controller – input-output-pleasure. Little self-monitoring circuitry.

Challenges from being “conscious”, “spiritual”: We are concerned about people we have never met, environments in places we have never been to, … Mind states of anxiety, optimism, joy, concern, empathy, …create challenges.
Age of Technology

- Sedentary lifestyle.
- 24 hour news cycles.
- Greater awareness of injustices.
- Human and Natural disasters in front of us.
Saturation effects are seen at about 2000 kgoe/person or about 75 GJ/person.

If the entire world consumed at the “saturation” point energy consumption would be just around 2010 level.
Happiness Index

Wealth clearly helps with happiness but why is Venezuela ($7K) on the same level as US or Germany or Japan (~ $30 K)?

Measuring Satisfaction

A new study shows that people in wealthier countries are more likely to be satisfied with their lives. Earlier research had suggested that satisfaction did not necessarily increase once basic needs were met.
A Universal Consumption-Fruit Relation Pleasure Diagram

Importance of Regions IV and V:

In 2008 the number of people suffering from diseases related to over-consumption of food exceeded the number suffering from under-consumption of food.

Five regions and four thresholds? What determines the thresholds?
A well designed technology will provide not only the low loss and high gain needed for regions I and II, it will also provide protection features to avoid Regions IV and V.

Monitor-Protection Technology: Voltage converters, Zener diodes; feedback systems; cooling systems; …
Technology of Food: Hunters to Agricultural to Big Agro-Business

With Industrial age food scarcity has almost disappeared.
Technology Ages: Food Scarcity Removal

Worldwide average calorie consumption of 3000 Kcal per day is above the healthy recommended limit.

If the pleasure source is mainly food – obesity is likely to result.
Technology Takes Over All Repetitive Work: Abundance of Gadgets

Human role? Beyond consumption?
Intelligent Technology: Abundance of Intelligence

- Transistor
- Laser, Light emitters, Light Detectors
- Touch Screen
- Liquid Crystal Display
Intelligent Technology+ Software+ Ecommerce

Abundance:
Telecommunications
Military
Entertainment
Video-gaming
Healthcare diagnostics
Aerospace, Transport

We are connected! To the “good, bad and ugly”!

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Brain Power: Mathematics
Anyone can solve differential equations!

Mathematics: From pen and paper to calculators to computers to MATLAB
Expanding Our Abilities: Simulation Tools

Highly complex problems are routinely solved by clicking on buttons. Accounting, law, medicine, … highly specialized professions are routinely helped by technology.
Scarcity shifts: Brawn to Brain to Mind

- Food
- Cars, furniture
- Credit and loans
- Gadgets
- Information
- Knowledge
- Knowledge-Action Gap
- Stress release
- Acceptance and mind state.

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Consumption and Fruit: When Scarcity is Removed

“Pleasure”

Consumption:

- Food, esp. sugar/fat
- Exercise
- “Free” loans
- TV and web (celebrity addiction and bad news addiction!)
- Material goods
- Gadgets
- Pain killers
- Pharmaceuticals
- Fame?
- Wealth?

How do we avoid the Regions IV and V?
Diversify our pleasure sources?
**Enabling Role of Technology In Personal Consumption**

Our Brain biology: Developed for Regions I and II is now in regions of abundance

Region I and II: Reduce losses and provide “more”

Region III: Provide warning to prepare to stop

Region IV: Try to intervene

Region V: Help repair the damage

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Wellness: How do we Achieve it?

Technology has primarily provided knowledge and infrastructure. Technology is also very useful in providing resources and fixing the “broken”.

Physical Wellness: Region V of breakdown
Medicine: Diagnostics Chemicals Surgery

Mental/Emotional Wellness: Region V of breakdown
Medicine: Psychiatrist Psychologist

Knowledge-Action Gap: Near Regions IV and V
Behavior modification therapies

✧ Technologists like Regions I, II, V.
✧ Funding models mostly support Regions I, II and V.
✧ Markets like Region V.
Technology: Advances in Brain Studies

- Mapping of the brain ✔
- Understanding the desire, effort, pleasure circuit ✔
- Understanding our addictive behavior ✔
Brain Imaging

- Hand movement and brain signatures
- Food and brain signature
- Exercise and brain signature
- Meditation and brain signature
- Drugs and brain signature
- Addiction and brain signature

A difficult challenge: From brain to mind
From Newton’s equations to thermodynamics
Consumption-Pleasure Circuits of the Brain

Desire, action, pleasure circuit: Driven by “pleasure” neurotransmitters.

What are the protection mechanisms to prevent reaching the threshold of “damage”? Very few!

Technology developed for 5 V supply will have a hard time when the source is 220 V unless… there is proper protection technology.
Brain Research Directions

✧ Functioning of the brain in voice, image, smell, .. recognition. Allow better computer designs.

✧ Brain imaging for drug therapies, intervention therapies.

Understand the relation between brain states and mind states? Not much known.
Challenges: Our Prehistoric Brain!

There are critical parts of our brain that are quite primitive!

- We want to hoard/consume even if there is no scarcity and even if it “hurts” us.
- Familiarity equals safety,
- Strange/strangers/out of our group equals suspicion, fear, …
- Beyond a threshold stress logic/learning is bypassed
- Release of stress is so hard!
Brain is well developed for Regions I and II. But we now live in an age where Regions III, IV and V are easily accessible.

Task A. Self-Observation: How do we observe ourselves?
Can technology help?
From Logical Mind to Instincts (which often don’t work)

Logic-plans-resolutions are bypassed beyond a stress threshold

Task B. How do we increase our stress threshold? Can technology help?

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Task C. How do we recover from stress? Can technology help?

Task D. How do we change our mind state? Can technology help?
Mind Challenges

Stress lingers long after its positive benefits

Mind remains in a ruminating state

Mind wanders into dark thoughts

Can technology interrupt us periodically and take us through techniques to bring us to an brighter state? Without chemicals?

Mind state related illnesses have become more important than body-related illnesses in the developed world.
Technology is known to create products that change people’s behavior:

Internet surfing, smart phones (texting, browsing); games; social networks, apps …

Technology can play a role in enhancing mindfulness.
Task A. Avoiding Regions IV and V.
Solution: Self-Observation: How do we observe ourselves?
Meditation Techniques: Require time and dedication

Task B. How do we increase our stress threshold?
Asans: Postures to simulate stress and train the mind to stay calm

Task C. How do we recovery from stress?
Breathing techniques

D. How do we change our mind state?
Visualization techniques, mantra repetition

How does technology validate and if useful mimic these approaches?
Help awaken higher senses?

Meditative techniques

Efficient Relaxation techniques

Can efficient techniques be developed and taught to us? Like solving differential equations by MATLAB?
Simulation Studies for the brain’s behavior: Develop Predictive Tools

Where do the thresholds occur for various consumptions?

Where does consumption start becoming dangerous to us?

Under what conditions and stress levels do we lose our “logical mind?”

How do we connect neuron activity to mind states of: joy, optimism, depression, hope, …?

What is the path from the biology of the brain to the mind?
Science of Consumption and Thresholds

What controls the thresholds and the onset of different regions?

Can the “problem” be treated with techniques used to design complex electronic systems … amplifiers, oscillators, …?
Simple models do provide us insights on our behaviors.

✧ Understand the fruit-consumption relation for different activities
✧ Importance of diversification of our pleasure sources
Technology and Stress Simulation: Mind Training

Simulations games:
- Difficult work conditions
- Financial stress
- Dealing with continual bad news
- Anxiety of “consciousness”

Flight Simulator as a model for preparing the mind for today’s stresses
Self Awareness
Stress Release, Relaxation

Technology Intervention

Level 1: Passive reminders like expiration labels on food

Gadgets we use everyday: Laptops, smartphones, tablets,… “get up and stretch”!

Reminders have a powerful effect.
Self Awareness
Stress Release, Relaxation

Technology Intervention:

Level 2: Active reminders. Observe superficially (seated, standing, talking, hunched) and remind: cameras, intelligent chips, ...

After sitting for an hour interrupt me: Make me stretch, breathe deeper, talk to a friend, …
Self Awareness
Stress Release, Relaxation

Technology Intervention:

Level 3: Observe “at a deeper level” and warn:
Brain activity sensors: High sensitivity magnetic wave detection

Breath pattern detection

Nudge us with suggestions!
“You need a break”; “Take five deep breaths”

New technologies of high sensitivity brain wave sensors, stress level sensors
Close the Knowledge-Action Gap: Increase the Threshold at which Logic is Released

Observe our “mood”: Posture, breath, voice, and provide us suggestions

The flight simulator like games to alter mind state
Self Awareness
Stress Release, Mind Relaxation

Technology Intervention:

Level 4: Intervene (with my permission) as a gentle “concerned person”. Provide guidance and mentorship

Robots beyond cleaning and cooking my food!

Meditation tools implemented with help of technology:
Can a robot teach me how to meditate?
Release my stress?

Jasprit Singh
Thanks!

Profs. Eusik Yoon, Wei Lu
Rose Anderson, Catharine June

Biofeedback: http://www.maximenterprises.org/maxim/biofeedbackWhatIsIt.do

Humpty Dumpty: http://www.gutenberg.org/files/25883/25883-h/25883-h.htm

Brain Study real time:


Food production: http://foododdity.com/local-farming-vs-big-agribusiness-the-real-costs/
Fmri image: http://www.martinos.org/neurorecovery/technology.htm

Intelligent camera:

Jasprit singh