



Class 11-12 CS545

Gregg Vesonder
Stevens Institute of Technology

© 2020 Gregg Vesonder



Roadmap

- GOMS
- Communication and collaboration
- Social media
- Parting thoughts
- Note some of this lecture is derived from chapter 11 of Shneiderman, et.al., Designing the User Interface 6th Edition, a good reference but expensive ~\$150!

© 2020 Gregg Vesonder

2

Today is about communication and social media. Smart phones have clearly changed the landscape!

Log Book



- The B1 Bomber – interfaces we did not cover



© 2020 Gregg Vesonder

Here is one type of User interface that we did not cover, a very hybrid and complex mix of computers and switches. There is extensive HCI and Human Factors that go into these devices and it spans from initial design through training and operations. As you might suspect ergonomics is an important too!



GOMS

GOMS

- Goals, Operators, Methods and Selection rules
- Caveats:
 - "...what an experienced interface designer can learn passively from observing a test of a new interface with a few subjects can be as valuable as what she can learn from any quantitative analysis." – Raskin(2000)
 - Not widely used
- Best quantitative stuff we have

© 2020 Gregg Vesonder

On to GOMS. GOMS is a classic in usability and looks at user interactions with interfaces at a fairly low level. Note Raskin's caveat. This along with Fitts Law is some of the most quantitative methodologies we can use, so it is worth covering.



GOMS

Simple GOMS

- Simplest model – predict how long an experienced worker will take to do a particular operation with a given interface
- There are lots of other variants:
 - CPM-GOMS “critical path model”
 - NGOMSL “natural GOMS language” for non expert behavior adding learning time
- Basic premise – time for a user to complete a task with a computer is **sum** of times it takes to do the **serial, elementary** gestures
- Best for ordinal comparisons, one interface faster than other, more complex models are necessary for precise times, CPM-GOMS

© 2020 Gregg Vesonder

What we will cover is the simplest variant of GOMS. There are a fair number of variants but the basic model does give you a flavor for the technique. The model is reductionistic, in that it breaks down your interaction with the computer into a series of small steps. It is best for comparisons between interface designs relying on the ordinal positioning the model suggests, interface A is faster than B rather than A is 10 seconds faster than B. More precise estimation requires some data from your users and tasks and involve more complex instances of this model.


GOMS

GOMS Table

Abbreviation	Duration	Description
K	0.2 sec (.08 – 1.2)	Keying: time it takes to tap key on keyboard
P	1.1 sec	Pointing: time it takes user to point to a position on display
H	0.4 sec	Homing: time it takes a user's hand to move from the keyboard to GID (Graphic Input Device) or from GID to keyboard
M	1.35 sec	Mentally preparing: time for user to prepare for next step
R	?	Responding: time for computer response

Looks simple but gets complex quickly
 © 2020 Gregg Vesonder

This table provides a presentation of all the parameters, their description and the values in seconds that have been established through user studies. Note again these are average times. These 5 parameters and related steps become complex to apply very quickly, even when using this elementary model. R depends on the system used – for our purposes we will ignore



GOMS

GOMS Rules

- **Rule 0:** *Insert Ms in front of all Ks.* Place Ms in front of all Ps (acts of pointing with GID) that select commands, but do not place Ms in front of any Ps that point to arguments of those commands
- **Rule 1:** *Deletion of anticipated Ms.* If operator in front of M is fully anticipated in an operator just previous to that M, then delete that M. For example, if you move GID with intent of tapping the GID button when you reach target of GID move, then you delete by this rule the M you inserted as a consequence of rule 0, P M K ---> P K

© 2020 Gregg Vesonder

What makes it complicated are the rules for how to construct the model for a specific interface. Note that M is mental preparations time which is required before typing a sequence or pointing (Rule 0). Recall that GID means Graphic Input Device. Basically rule 1 says that a given M may prepare for a sequence of behaviors, therefore you do not have to put an M before each component of that behavior.



GOMS

GOMS Rules

- **Rule 2: Deletion of Ms within cognitive units.**
If a string of M Ks belongs to a cognitive unit, then delete all the Ms but the first. A cognitive unit is a continuous sequence of typed characters that form a command name or is required as an argument to the command, move, Y, Gregg Vesonder or 3.14 can be [examples](#) (there is a relativity) of cognitive units

© 2020 Gregg Vesonder

If a string of Ks form a cognitive unit rather than discrete characters, e.g. when you type a hex key, then you can remove the interior Ms. For example for Gregg, rather than MKMKMKMKMK, MKKKKK. Of course you must be aware of what constitutes typical cognitive units for the user population. For example oft-used acronyms.



GOMS Rules

- **Rule 3: *Deletion of Ms before consecutive terminators.*** If a K is a redundant delimiter at the end of a cognitive unit, such as the delimiter of a command immediately following the delimiter of its argument then delete the M in front of it.

© 2020 Gregg Vesonder

And you continue removing Ms in places which represents parts of a unit rather than discrete components.



GOMS

GOMS Rules

- **Rule 4:** *Deletion of Ms that are terminators of commands.* If K is a delimiter that follows a constant string, for example, a command name or any typed entity that is the same every time you use it, then delete the M in front of it. (Adding the delimiter will have become habitual, and thus the delimiter will have become part of the string and not require a separate M.) But if K is a delimiter for an argument string or any string that can vary, then keep the M in front of it.

© 2020 Gregg Vesonder

Again extending this for exceptions. Note if you have a choice of delimiters, then that takes thought, which is represented by keeping the M.



GOMS

Last GOMS Rule!

- **Rule 5:** *Deletion of overlapped Ms.* Do not count any portion of an M that overlaps an R, a delay, with the user waiting for a response from the computer.

© 2020 Gregg Vesonder

The delay itself provides thinking/preparation time. Whew! And this was the simple model! Now onto a “simple” example.



**GOMS Example: Temperature Converter
(adapted from Raskin)**

Choose which conversion is desired, then type the temperature and press ENTER.

- Convert F to C
- Convert C to F



© 2020 Gregg Vesonder

So the example will involve interacting with this interface. I think it is self explanatory.



Example

- Move hand to GID: H
- Point to desired radio button: H P
- Click on the radio button: H P K
- Move hands back to keyboard: H P K H
- Type the 4 characters: H P K H K K K
- Tap ENTER: H P K H K K K
- RULE 0: H M P M K H M K M K M K M K
- RULE 1: does not apply
- RULE 2: H M P K H M K K K
- RULES 3 & 5 do not apply

© 2020 Gregg Vesonder

I submit this as an exercise to the user to follow the application of this model. Note that the rule that is invoked in each step. The most complicated part, with some level of subjectivity is first adding the Ms and then deleting them according to the rules. Note that since a M is a long duration, over a second, it is important to follow the rules carefully.



Example

- $K = 0.2, P = 1.1, H = 0.4, M = 1.35$
- where we left off: H M P K H M K K K K M K
- Which really is: $H + M + P + K + H + M + K$
 $K + K + K + M + K$
- Substituting: $0.4 + 1.35 + 1.1 + 0.2 + 0.4 +$
 $1.35 + 4 * (0.2) + 1.35 + 0.2 = 7.15 \text{ secs}$
- What if conversion is already selected?

© 2020 Gregg Vesonder

And If the conversion is already selected it reduces to:

MKKKKMK

3.7 sec!



Viz

© 2020 Gregg Vesonder



“The real voyage of discovery consists not in seeking new landscapes but in having new eyes” - Marcel Proust

© 2020 Gregg Vesonder

So this is part of the mantra of visualization – that by representing data in different ways, different aspects and relationships of the data become known. During our statistics lecture I mentioned Tufte’s books on viz. These slides skim the topic at a high level.



Visualization

- The idea of data driven pictures is visualization
 - Massive bandwidth of our visual system
- Visualization minimizes the gulf of evaluation
- Viz is now interactive
- Top down: Shneiderman's mantra: "overview first, zoom and filter, then details on demand"
- Bottom up: retrieve value, filter, compute derived value, find extremum, sort, determine range, characterize distribution, find anomalies, cluster and correlate

© 2020 Gregg Vesonder

Viz concentrates on understanding and takes it from both a top down and bottom up perspective. Recall the minimum visualization we did with box plots when we discussed datat.



High level Taxonomy of Task Types for Viz

- Data and view specification
- View manipulation
- Process and provenance

© 2020 Gregg Vesonder

So we will go through these 3 topics in a bit of detail



Data View and Specification

- Visualize data by choosing visual encodings
 - e.g., a palette of available charts
- Filter data to focus on relevant items
- Sort items to expose patterns
 - e.g., sort by age
- Derive values of models from source data
 - Mean, median, deviation and even more powerful manipulations
 - *Visual Analytics*, calculating derived data as part of an interactive system with the user



<http://technologyadvice.com/products/tableau-reviews/>

© 2020 Gregg Vesonder

The chart on the right is an example using the tool tableau – I use it and like it, it is free for educational use.

As you can see one of the techniques is to visualize the data in different ways.



View Manipulation

- **Hah, manipulate the view on the screen!**
 - Select items to highlight, filter or manipulate
 - Navigate to examine high-level patterns and low level detail (zooming and panning)
 - Coordinate views for linked exploration – charts affect other charts
 - Organize multiple windows and workspaces.

© 2020 Gregg Vesonder

After you visualize it you may want to zoom in or re-represent it – even coordinate the view so that a change in one view changes others.



Process and Provenance

- Record analysis histories for revisititation
 - In fact we have not discussed history enough as a user experience mechanism, including play back
- Annotate patterns to document findings
- Share views and annotations to elaborate collaboration
- Guide users through analysis tasks or stories
 - Tell a story about the spread of a plague or even phone calls across the US

© 2020 Gregg Vesonder

Keep a record of how you have analyzed the data both for this and future data, this helps you and helps your collaborators. You also want to indicate the source of the data – some data is more credible than others. Provenance is the fancy term for knowing the source of the data. Really important in these days of fake news!



1D Data

Word clouds!

accessibility
gulf
HCI

sustainability

Complements of wordle

© 2020 Gregg Vesonder

If you would like to experiment with novel ways of representing data try word clouds. The sight <http://www.wordle.net/> provides a way to experiment – word clouds by the size of the words indicate words relative frequency - hah I did it for some of my text



History (Grudin, 1994)

- Early efforts under domain of office automation
 - integrate word processors, spreadsheets to support groups and departments
- 1984 (Sic) Iren Greif, MIT, and Paul Cashman, DEC organized work shop -> Computer Supported Cooperative work
- "cooperative" versus "collaborative" still contentious
 - creative tension between small vs large groupware
 - large (6+): meeting rooms, workflow automation
 - small(2-4): desktop conferencing, collaborative writing
- developers needed to learn more about how groups function - needed multidisciplinary help (anthropologists, social psychologists, economists, ...)
- Related efforts: CAD/CAM, Computer Aided Software Engineering, distance learning, telemedicine, gaming

© 2020 Gregg Vesonder

The early history dealt with specialized machines for office automation. As more general purpose machines began to dominate the market place there was an opportunity to explore more general and powerful techniques and applications. But all was not rosy, there was even some contention over the expansion of the acronyms! Part of it had to do with scope. Interesting that in many ways very informal schemes became very powerful, crowd sourcing for example. It was also clear that a broader range of disciplines should be enlisted.



Small vs. Large Groups

- CSCW bias toward small groups
- From perceptual and cognitive issues to social, motivational and political
- small shared goals, large usually conflicting goals, especially cross organizations
- small focus on cooperation, ignoring conflict
- add difference between European approach (philosophical, social theoretical) and American empirical approach
- cultural differences affect this distinction too, for example Japanese show consensus in large meeting and real decisions are made in private discussions

© 2020 Gregg Vesonder

This is all fairly straightforward. Cultural differences, however did become an issue and we will have more to say about them later in the lecture.



Groupware Categories

Grudin(1994)

	Same time	Different time but predictable	Different time but unpredictable
Same Place	Meeting facilitation	Work shifts	team rooms
Different place (predictable)	tele/video/desktop conferencing	electronic mail	collaborative writing
Different place (unpredictable)	interactive multicast seminars	computer bulletin boards, blogs, wikis	workflow (handoffs), wikis, blogs

© 2020 Gregg Vesonder

This table attempts to map the space that CSCW was targeting and what some possible solutions were. It is interesting to create such charts, if only to see the items in the cells grow. However as practitioners, such charts can be valuable since they point to a solution, given the current constraints. Unfortunately most situations map to several cells.



Development Aspects

	Pluses	Minuses
Collaboration transparency	No extra development, familiar apps (interop of different editors)	Higher bandwidth, strict WYSIWIS, no concurrent work
Collaboration awareness	Lower bandwidth, relaxed WYSIWIS, concurrent work, detailed group awareness	Extra dev costs, unfamiliar apps (training and adjustment)

© 2020 Gregg Teske

Think of transparency as having a large screen that looks into another room of colleagues that may be in a different building, city or country. Awareness provides for concurrent work and requires specialized apps. It constructs a “world” rather than using what currently exists.



Collaboration Situations

- Focused/forced :-) partnerships - class project
- Lecture or demo
- Conferences - program committee
- Structured work process -- mortgage review
- Meeting and decision support
- Ecommerce
- Teledemocracy - town meetings (voting)
- Online Communities
- Collaboratories - share telescopes
- Telepresence

© 2020 Gregg Teske

The taxonomy for types of situations is vast and here are some of the alternatives. In one very true sense Wimba is collaborative but most of the information still flows one way. Teledemocracy becomes a really interesting case – most of these political systems, as we discussed in the first lecture are considered socio-technical systems and requires lots of specialized support and it is an unsolved and high risk problem. As you might suspect there is a heavy component of security and privacy in such systems. Others are a lot cooler and refer to “big science.” One University might not be able to support a telescope in South America, but a consortium might and they can share operation across the web.



Became Social Computing

Less about collaboration and work and includes cooperation, collaboration and competition as well as gaming and romance

© 2020 Gregg Vesonder

Then social computing came along and suddenly the use of information systems change. Not only did we collaborate and work with them but also cooperate and compete!



Collaboration

- Computer Supported Cooperative Work (CSCW) design and evaluate new technologies to support work processes
 - But it is not limited to work, also social exchanges, learning, games and entertainment
- The new zeitgeist: computing once seen as alienating and antihuman is becoming a socially respectable and interpersonally positive force
 - Collaboration as the motivating factor for using computers



But then again
divisiveness
twitter & facebook

© 2020 Gregg Vesonder

This field has been around for awhile and has expanded from its early years of developers sharing screen images to a variety of social computing topics. Understanding how group work is accomplished using information technology involves a variety of fields and disciplines. Interesting that we have gone from the computer as a computational device – dealing with equations to an information processing device to a collaborative, social network.



People adapt tech to their needs

- Yo, yo
- Twitter – retweeting was a social norm at first (provide credit) not an option
- Social media is iterative and constantly evolving
- Research methods are data science
 - Ethics, privacy and anonymization

© 2020 Gregg Vesonder

Again yo! And studying this tech is indeed in the large what was once study of small groups of individuals has evolved to study sections of a country or the whole country (think politics for example) using big data techniques.



Some historic taxonomies

Sidenote – a taxonomy, ordering and categorizing, is often the first step in the formation of many sciences

© 2020 Gregg Vesonder

Indeed taxonomies are the beginning of any science – first we must establish order.



Taxonomy

- Problem solving: brainstorming to structuring ideas to evaluating ideas
 - Delphi crosses all
- Cooperation Tools (groupwork): calendars, searches, social filtering, authoring (wikis), video (audio) conferencing
- Computer based teaching
- Group Decision Support Systems

© 2020 Gregg Vesonder

There are a bunch of taxonomies describing CSCW. You may recall that taxonomies are the early stages of any science – in effect selecting and categorizing what the science studies. None of these groupings are particularly novel but they do capture most of the aspects of group work.



Yet Another Taxonomy

- Interaction: sync/async
- Coordination, depends on size, larger more, smaller less (techniques: talking stick, posting strategies)
- Distance (same room -> global)
- WYSIWIS(what you see is what i see)
versus public/private data

© 2020 Gregg Teske

This taxonomy views CSCW from a capability perspective. WYSIWIS is particularly compelling and stretches as far as virtual worlds and multi player game. There is a lot of group problem solving in Worlds of Warcraft and books have been written on the skills developed, e.g, **WoW Factor: an insider's look at the real skills developed in the virtual World of Warcraft .**



Modern "Taxonomy" MoCA

- Models of Coordinated Action
 - Synchronicity
 - Physical location, same versus different
 - Scale, 2 to n
 - Number of communities of practice, 0 to n
 - Nasence
 - Planned permanence
 - Turnover

Social
Media
Influenced

© 2020 Gregg Vesonder

The new taxonomy arose with the ubiquity of the smart phone and tablets. We will go through these concepts in the next few slides. One word that should jump out at you – Nasence. It refers to the level of which coordinated action is established or routine, or if they are unestablished new and developing. From nascent – the degree of coming into existence.



Synchronicity

- Synchronous – skype. Phone call, ...
- Asynchronous – email, Q/A forums

© 2020 Gregg Vesonder

Synchronous vs asynchronous – live interaction vs deferred.



Physical location

- Same place
- Different place
- Distance and cultures a factor

© 2020 Gregg Vesonder

Place still affects us – culture is an issue as is the effective time of the day – calling Europe or India from the US



Bits and Pieces

- Distance does matter
- Lurkers
- Active participation on internet resulted in less varied social contact but this has changed
- Open Source -- The cathedral and the bazaar and Homesteading the Noosphere
- Virtual realities and WIKIs
- Data: Work Space alone (computer) vs WS with audio vs WS audio + video. Result WS alone took twice as long as the others. **Audio is important!**

© 2020 Gregg Vesonder

Open Source indicates that such systems can work, albeit I this instance there is a self selection process, rather than being assigned a project. One negative for any culture is to insure the folks involved in the collaboration are project members. Lurkers, non project members contributing little value, are to be avoided. One study demonstrated that work spaces with audio were better than work spaces alone. CSCW still has a ways to go – 2014 will be the 17th ACM conference on CSCW, but technology is finally available to address some of the issues. That is about all I intended to cover on CSCW. Now onto advice from Thimbleby. Not we are not using his book but this material is understandable from the slides and commentary.



Scale

- Difference between writing a paper with a co-author versus wikipedia article with 10 to 100 others!
- As efforts scale, the role of leadership and expertise become important
 - Open source and Eric Raymond papers:
 - The cathedral and the bazaar
 - Homesteading the Noosphere

© 2020 Gregg Vesonder

Scale is an issue, as the world becomes more connected, popular topics and projects have many participants. Even 100 participants is sometimes a small group in this new, connected world.



Number of communities of practice

- Participants with different skills teach each other
- Diversity of skills to result in a product
- May be none, strictly social

© 2020 Gregg Vesonder

Basically it varies, as does the population. One thing that it almost always brings is diversity and this is a strong positive for co learning and building.



Nasence

- Nasence refers to the degree to which coordinated actions are already established and routine or if they are unestablished, new and developing
- Research has shown that characteristics and behaviors of founders early in a group's lifespan predict how long it survives
 - Visiting group frequently, having a logo, articulating a group description early in the formation (first week) predicted group survival

© 2020 Gregg Vesonder

In most instances there has to be a core community that shows continued interest and displays this interest in social media!



Planned Permanence

- Planning for a longer term collaboration (or even shorter term) need to develop a shared vocabulary and coordinate work practices and output.

© 2020 Gregg Vesonder

Early on, just like clubs and other organizations, common ground in terms of terminology, common language and how the work is done. For example in a coding project, early on establishing coding and documentation standards.



Turnover

- Stability of the people involved in a collaboration
- **Badges** signifying tenure in the community or contributions to the community help

© 2020 Gregg Vesonder

Community need a sustaining core. The community should encourage and reward tenure - badges signifying longevity are not only a reward but also provide experts that can consult with new members.



Specific Goals and Contexts

- Communication and collaboration
 - communication systems vary in degree of synchronization (skype vs facebook)
- Ephemeral communications – Snap-Chat
 - Limiting the planned permanence may lead to interesting new genres of communication
- Large scale discussions – commenting on a NY Times article or a popular facebook post or tweet

© 2020 Gregg Vesonder

This slide provides a sampling of the many dimensions one can take social media. Also how social media evolves. It is common to comment on a facebook post but now we also can do so from NY Times articles!



Specific Goals and Contexts-2

- Online markets
 - Collaborative filtering, matching folks likes, e.g., netflix, tivo
- Meeting Coordination
 - meetup platform
 - Dating sites

© 2020 Gregg Vesonder

And the technology helps too! Advanced machine learning techniques of user viewing habits on netflix lead to recommendations on what you might want to watch based on what other folks watched that have similar viewing habits to you.



Specific Goals and Contexts-3

- Creative Production
 - Example tool Bootlegger mobile app
 - Big, creative projects demand that users work together
 - Standard tools: GitHub, Dropbox, Slack, Basecamp
 - Basically covers all of MoCA



© 2020 Gregg Vesonder

Model of Coordinated Action

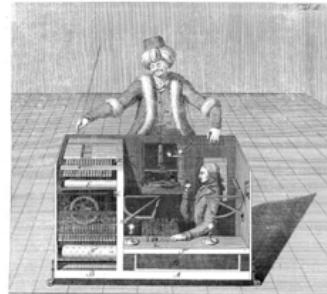
Slack – messaging for teams

There are many tools that are necessary for large creative productions. Most coders would not seriously approach a project without establishing a base on github.



Specific Goals and Context -4

- Crowd Sourcing and Crowdwork
 - Bootlegger
 - Amazon mechanical turk
 - Suggest a HIT (Human Intelligence Task)
 - Turkers can browse HITs and sign up
 - High turnover and nasence
 - Crowdsourcing software - TopCoder



© 2020 Gregg Vesonder

Yet again since it is such a novel word -nasence degree to which coordinated actions are already establish or not.

Crowdsourcing is getting the vast legions on the web to help you with a task. One popular mechanism is Amazon's mechanical Turk – you provide the task and the reward and they will find you users. This is a very popular mechanism for doing research.



Specific Goals and Context -5

- Entertainment and gaming
 - MMORPGs Massive Multiplayer Online Games
 - WoW World of Warcraft
 - Guilds
 - » Smaller more social
 - » Larger more goal oriented

© 2020 Gregg Vesonder

Online games are an example of LARGE social collaboration. And folks adjust to their needs. In WoW the smaller guilds have a social component, people interact and bring some of their real life into the game. Larger guilds really want to just play the game, size becoming an impediment for social interaction.



WoW in China

- Largest market, roughly half of all players
- Largest difference was setting "wang ba" internet cafes, *virtual and physical social interaction*
 - "... missing the more complex experience in which a merge of virtual and real occurs." -p182
- More issues with fraud because of this – key logging
- Video games seem to attract the attention of moral arbiters – government in China, fundamentalists Christians (40% of Americans)

© 2020 Gregg Vesonder

WoW has becoming very complex socially and mirrors the real world in terms of the types of interactions.



Circling Back - Ethnography

- Nardi –“ethnographic monographic”
 - Book by Bonnie Nardi: My Life as a Night Elf Priest: An Anthropological Account of World of Warcraft
 - WoW – World of Warcraft
 - Harvard Business Review – Reeves, et.al., 2008 – experience makes better corporate managers
- Study of play, study of exploration, creativity

© 2020 Gregg Vesonder

In 2014 an article in the Harvard Business Review suggested the WoW experience may be a plus in hiring considerations - <https://hbr.org/2014/08/should-you-put-world-of-warcraft-on-your-resume>



Ethnographic Investigation

- Rather than hypothesis generation, ethnography is "go with the flow"
- *"Ethnography is ... the deliberate attempt to generate more data than the researcher is aware at the time of collection... Rather than devising research protocols that will purify the data in advance of the analysis, the anthropologist embarks on a participatory exercise which yields materials for which analytical protocols are often devised after the fact"*
– Marilyn Strathern(2004) – p28
- **Participant-observer** – participates to varying degrees
 - Observe the everyday, the mundane, the boring
 - Often cannot make sense of the "culture" until we have "grown up" in it
 - Participant-engagement – researcher deeply immersed in native practices
- Research methods: interviews (fixed set of questions, audio taped and transcribed), observations, participant-observation, informal conversations and document analysis

© 2020 Gregg Vesonder

Just a bit of description in depth of Ethnography by example. Professor Nardi spent two years as a participant in WoW.



Specific Goals and Contexts- 6

- Education

- Coursera, Udacity, Udemy, many universities ...
- MOOC – Massively Open Online Courses

© 2020 Gregg Vesonder

You should all be acquainted with at least one of these – if not, do so. It is vital to continuous learning over your career!



Examples

© 2020 Gregg Vesonder

These next slides provide examples of how data from social media interactions provide insight on our world



Fukushima

© 2020 Gregg Vesonder

A tidal wave sept Japan



Japan's Tsunami



blog.salvationarmyusa.org
© 2020 Gregg Vesonder

on 11 March 2011



Fukushima



3 of 6 nuclear reactors melted down

[money.cnn.com](#)

© 2020 Gregg Vesonter

Meltdown of 3 of the plants 6 nuclear reactors in the Fukushima power plant



Radiation Spread

- Government reported on the spread of radiation
- A 20 kilometer exclusion zone was established
- Citizens were skeptical about the government reports
- Radioactive water was leaking into the ocean



wikipedia

© 2020 Gregg Vesonder

It is best to flip to the podcast for this but basically after the reactor melted down, a wide swath of land in Japan was uninhabitable. What was even more concerning is that citizens thought more of the radiation was leaking into the ocean and the government was not being accurate in its reporting.



Personal Radiation Detectors

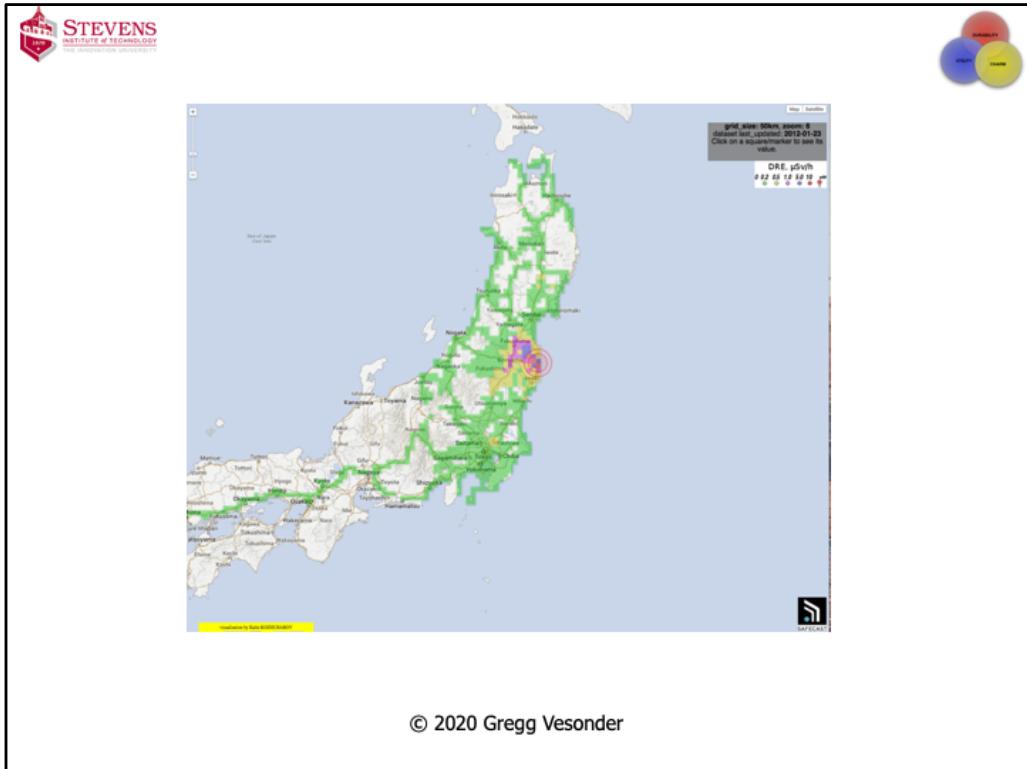
- Citizens needed another way to assess the threat
- Personal radiation detectors emerged built on microprocessor technology
- iPhone Safecast app
- Data placed in repository
- APIs to access data
- Soon citizens were posting their own data



© 2020 Gregg Vesonder

Medcom.com

So the citizens used the web and smart phones (and some customized devices) to do some citizen science to provide additional data and compare it with what the government provided. They uploaded data to the web.

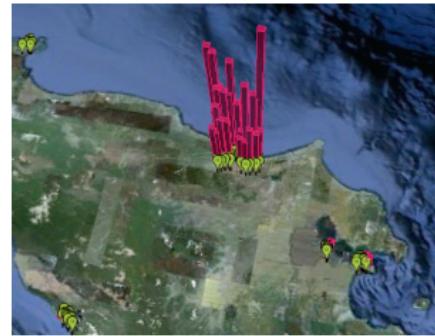


23 Jan 2012, and other folks took the data and created visualizations, that basically indicated that radiation was traveling through the waterways to other parts of the country.



Other Maps

- Large number of readings invaluable
- Compared against government produced data
- Compared against their data – calibration is an issue
- Real-time data
- Multiple visualizations



© 2020 Gregg Vesonder

Of course calibration of sensors is an issue, but the data overwhelming indicated that there were larger issues that effected more of Japan.



How it works

- People or machines generate data
 - PAN
- Data is transferred to a collecting point
- Data is ordered in some way
 - Database
- Code is written to access the data -> APIs
- Developers use APIs to access data

© 2020 Gregg Vesonder

And this is how it happened – the radiation detector reported data to the smartphone creating a PAN – a Personal Area Network.

The phone is loaded into the web and the data is ordered in a database.

Code routines are written that can be used to access the data, i.e., APIs

Developers use these APIs to access the data and then visualize it



Smart Phones as sensor devices



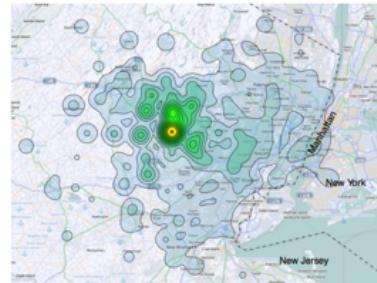
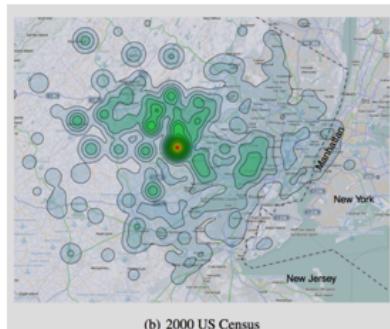
The next few bits of research use data from smart phones just like sensor data

A Tale of One City

Becker, R.A., et.al. AT&T
Labs-Research



- 15 million voice CDRs
- 26 million SMS CDRS
- Was it reflective of behaviour, the laborshed?



(a) Call Detail Records

Essentially the researchers collected anonymized (all personal identification) removed of smart phone records for a moderate size town in New Jersey. They then used it to show where the workers originated that were working in NJ and compared it to the census that showed what towns workers came from that worked in Morristown, NJ. As you can see the census data and phone data agree indicating that information on phone calls can be used to understand behavior of populations

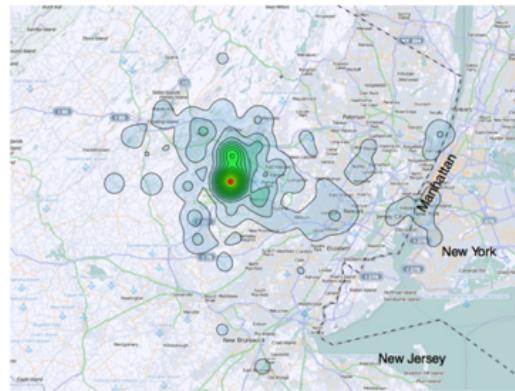


Figure 3: Morristown partyshed map showing the home locations of people who used their cellphones during weekend late nights in downtown Morristown. Comparing to the earlier laborshed maps, partiers' homes are concentrated in areas closer to Morristown than workers' homes.

This is another attempt at inferring behavior. Where do people live who party in Morristown?

SMS + Telephone calls

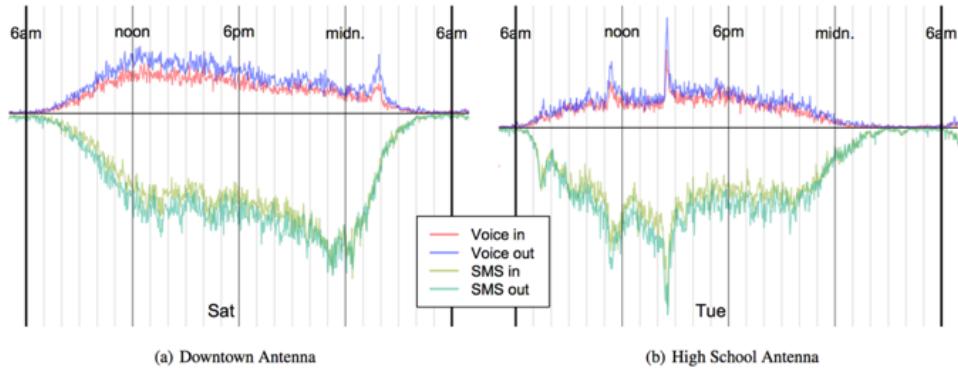


Figure 4: *Lip plots* of voice call and SMS volumes show unusual spikes highlighting local patterns or events in Morristown. Call volume (plotted upwards; inbound: red; outbound: blue) and SMS volume (plotted downwards; inbound: light green; outbound: dark green) on two antennas are shown. The antenna in (a) points towards the commercial and restaurant district and the antenna in (b) points towards the high school. A voice peak occurs Saturday at 2AM when the bars close. Both voice and SMS peaks occur Tuesday when the school lets out.

The description of Figure 4 explains this data fairly well.



Anonymization

The data was collected and anonymized by a party not involved in the data analysis. In place of the phone number of the person involved in a transaction, each CDR contains an anonymous identifier consisting of the 5-digit billing zip code and a unique integer. Each CDR also contains the starting time of the voice or SMS event, the duration of the event, and the locations and azimuths of the antennas of cell tower antennas associated with the event.

Just to assure you privacy was protected



Smart phones as sensor devices(Cisco)

Measure	Description	Application
Number of devices	The number of Wi-Fi devices (smartphones, tablets, or laptops) identified within an area during a time window	Determine the number of customers or potential customers by date and time
Dwell/waiting time	An estimation of the duration during which a device is present in a particular space	Determine the amount of queuing or the average time spent in a shop or facility
Crowding factor	A normalized value determined by the number of devices seen within an area during any time window	Helps determine potential bottlenecks or where extra resources are needed
Dominant direction	The most typical directions of travel through an area	Knowing the flow of pedestrians across a hallway at various times promotes better safety precautions
Speed	The straight-line distance between two points divided by the duration between them	Being able to differentiate between pedestrians, cyclists, and cars, for example, is important in a city context
Churn	The relative number of devices that appear and disappear during a time window	How well restaurants process clients at different times of the day is crucial to their profitability
Retention	The opposite of churn, measuring the relative numbers of devices remaining in the area over time	Measures how well certain venues attract and keep an audience
Frequency	The number of times a device is detected within a specific time window	Measures the loyalty of the visitor, or how many need to be informed of the layout if they are first-time visitors

http://www.cisco.com/c/en/us/products/collateral/wireless/mobility-services-engine/white_paper_c11-728970.html

© 2020 Gregg Vesonder

In fact Cisco has provided a table of what data smart phones can provide. This is for your information and you will not be tested on it.



Some Final Thoughts

© 2020 Gregg Vesonder



The machine itself makes no demands and holds out no promises; it is the human spirit that makes demands and keeps promises. In order to reconquer the machine and subdue it to human purposes, one must first understand it and assimilate it. So far we have embraced the Machine without fully understanding it.
Lewis Mumford
1934

Or it understanding us!
Gregg Vesonder
2016

© 2020 Gregg Vesonder

Over time we have to come to a mutual understanding of machines (and they understanding us. One way to prevent the matrix!



The grand challenges - context

- Computing, everywhere cheap and small
- Wearable, mobile, personal and portable
- Embedded, context-aware and ambient
- Perceptive and multi-modal, suggesting that they can perceive user needs and allow interaction by visual, aural, tactile, haptic, gestural and other stimuli.

© 2020 Gregg Vesonder

So I leave this for you to ponder- the world is changing in terms of technology and we will adapt, the key is with your new gained knowledge of HCI can you move from adapting to leading!



Selective Challenges

- Shift from user experience to community experience
- Encourage resource conservation
- Shape the learning health system
- Support successful aging strategies
- Amplify empathy, compassion and caring
- Encourage reflection, calmness and mindfulness
- Clarify responsibility and accountability
- Provenance!

© 2020 Gregg Vesonder

There also are important socially relevant issues. Perhaps I should show this slide in the beginning to motivate our projects!

One of the key issues (upping the size of the word in my word cloud) is provenance – we need to understand where “data” and “facts originated. It has been fun interacting with you all semester, I hope I gave you a different perspective on computing.



Thanks!

© 2020 Gregg Vesonder