



# The Feedback Cycle: Leveraging Everyday Technologies to Change the Way We Move

**my phd thesis focus is:**



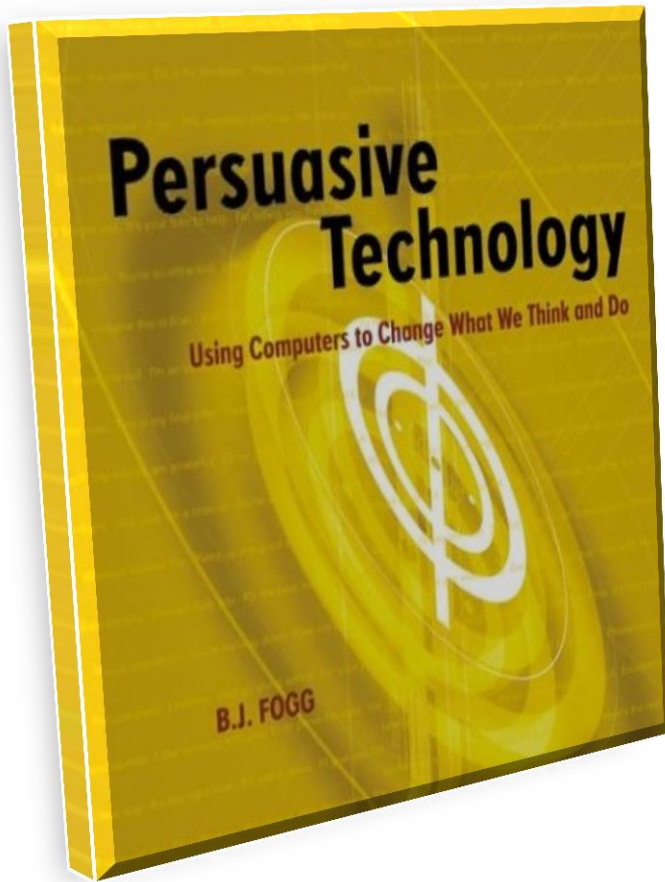
the design and study of *eco-feedback technology*

**technology that provides  
feedback on individual or group  
behaviors with a goal of reducing  
environmental impact**

# toyota prius



# persuasive technology



technology that intentionally  
changes attitudes or behaviors  
through persuasion and social  
influence

*- B.J. Fogg, 2003*

my work combines behavioral science,  
environmental psychology and computer science

# motivation techniques

- information
- goal-setting
- social comparison
- historical comparison
- commitment
- incentives / disincentives
- rewards / penalties
- feedback
- ....

Geller, E.S, et al. A conceptual framework for developing and evaluating behavior change interventions for injury control. *Health Education Research* 5, 2(1990), 125-137.



# Osceola County Rural Schools

## MONTHLY REPORT OF

Name Flossie Peterson a Member of  
the first Grade, District No. 8 frl.  
Evart Township  
191 3 and 191 ...

	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	Average
Times tardy....	0	1	3	3	1	1	0				
Days absent....	6	1	4	2	5	3	4				
Deportment....	93	93	93	92	90	91	92				
Reading.....	96	94	94	94	93	94	94				
Spelling.....	94	93	93	93	93	94	94				
Writing.....	90	90	91	91	94	95	92				
Numbers.....	93	93	93	94	95	93	93				
Language.....	98	96	97	96	96	96	96				
Arithmetic....											
Grammar.....											
Geography....											
U. S. History..											
Physiology....											
Civil Governm't											
Drawing.....											

SCALE—95, excellent; 90, very good; 85, good; 80, medium; less than 75, very poor.  
DEPARTMENT—E means excellent; G, good; M, medium; P, poor; B, bad.  
PARENT OR GUARDIAN—Please examine standing, sign name on back of this card and return promptly.

Mabel McMillan Teacher

1. low-level  
feedback

2. high-level  
feedback

# toyota prius

## Consumption

~50Wh Regenerated

OUTSIDE TEMP 61°F



Low-level Feedback

Energy

Average

60.5 MPG

204 miles

Reset

High-level Feedback

6:22

H  
M



ODO  
TRIP

km/h  
MPH

# render the invisible

feedback not only draws  
attention but also  
provides a learning  
function

*-Van Houwlingen & Van Raaij, 1989*



the power-aware cord

*- Gustafsson & Gyllenswärd, CHI 2005*



# goal-setting



1. direction attention
2. have energizing function
3. affect persistence
4. can affect behavior indirectly

*Latham & Locke, 2002*

**rewards / penalties**



P  
O  
O  
L  
C  
A  
R

P  
O  
O  
L  
C  
A  
R

P  
O  
O  
L  
C  
A  
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R

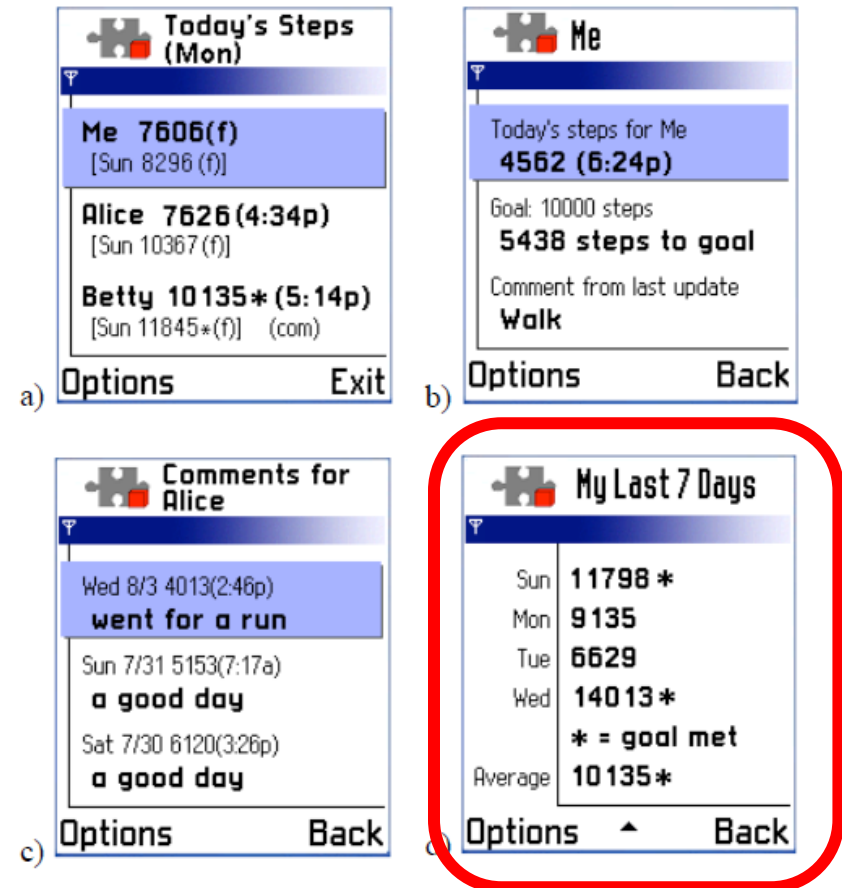
P  
O  
O  
L  
C  
A  
R



# pedometer cell phone fitness study



**Figure 1.** a) The Omron HJ-112 pedometer, b) the pedometer in use, and c) the Nokia 6600 mobile phone running Houston.



**Figure 2:** Houston screen shots. (a) Main screen, (b) detail screen, (c) recent comments, and (d) trending information.



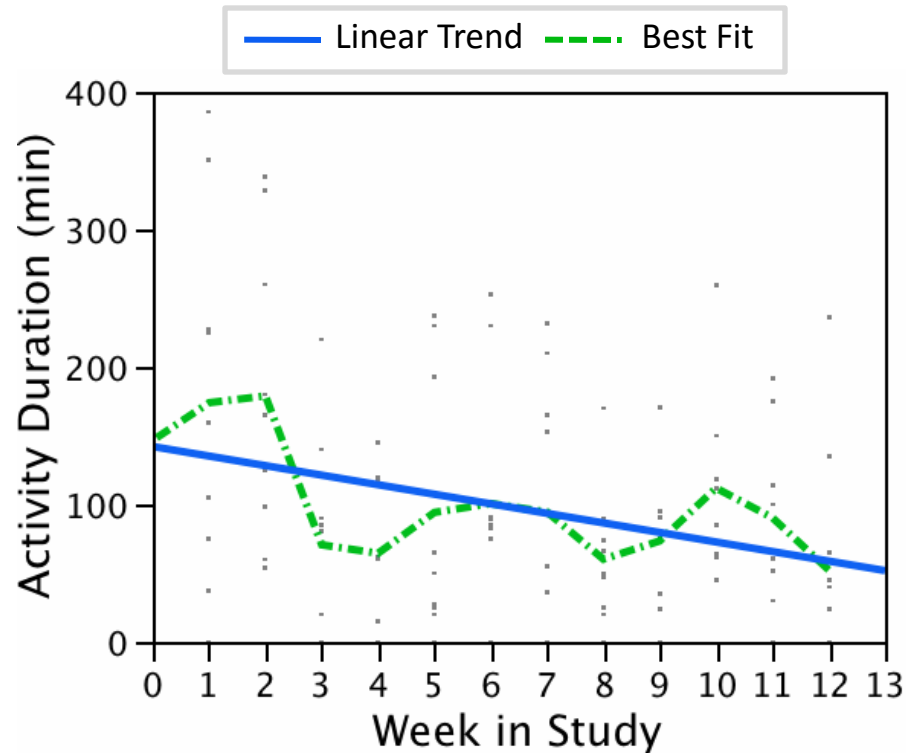
# ubifit

- fitness monitoring application
- automatically senses activity
- at-a-glance goal information

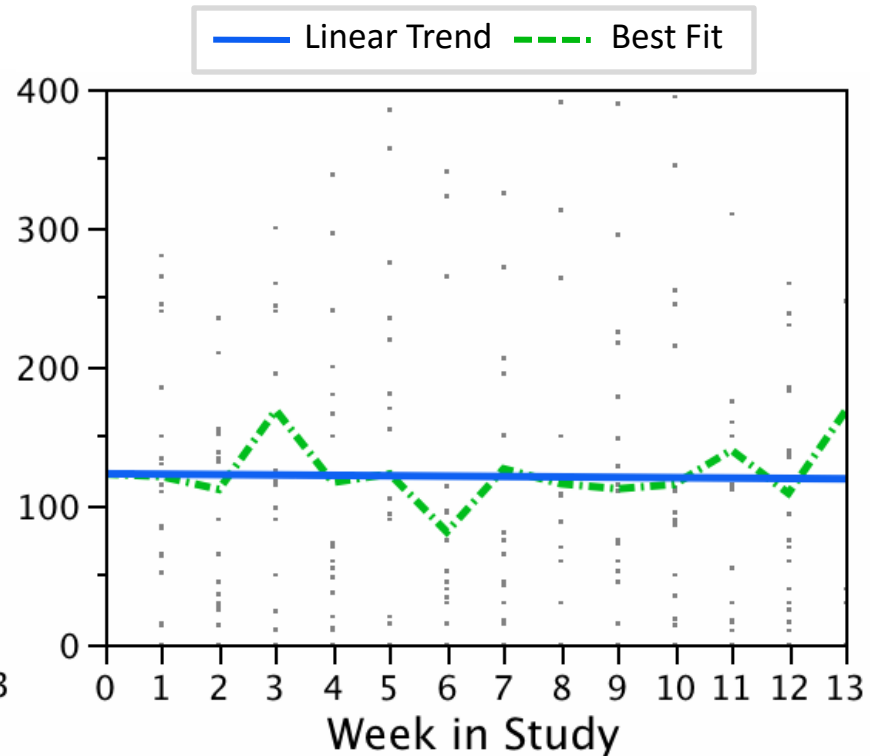


-  strength
-  cardio
-  flexibility
-  walk
-  week's goal met
-  recent goal met

# effectiveness of the ubifit glanceable display



**no glanceable display**



**glanceable display**

Study occurred over Thanksgiving, Christmas, and New Years.

sensing feedback

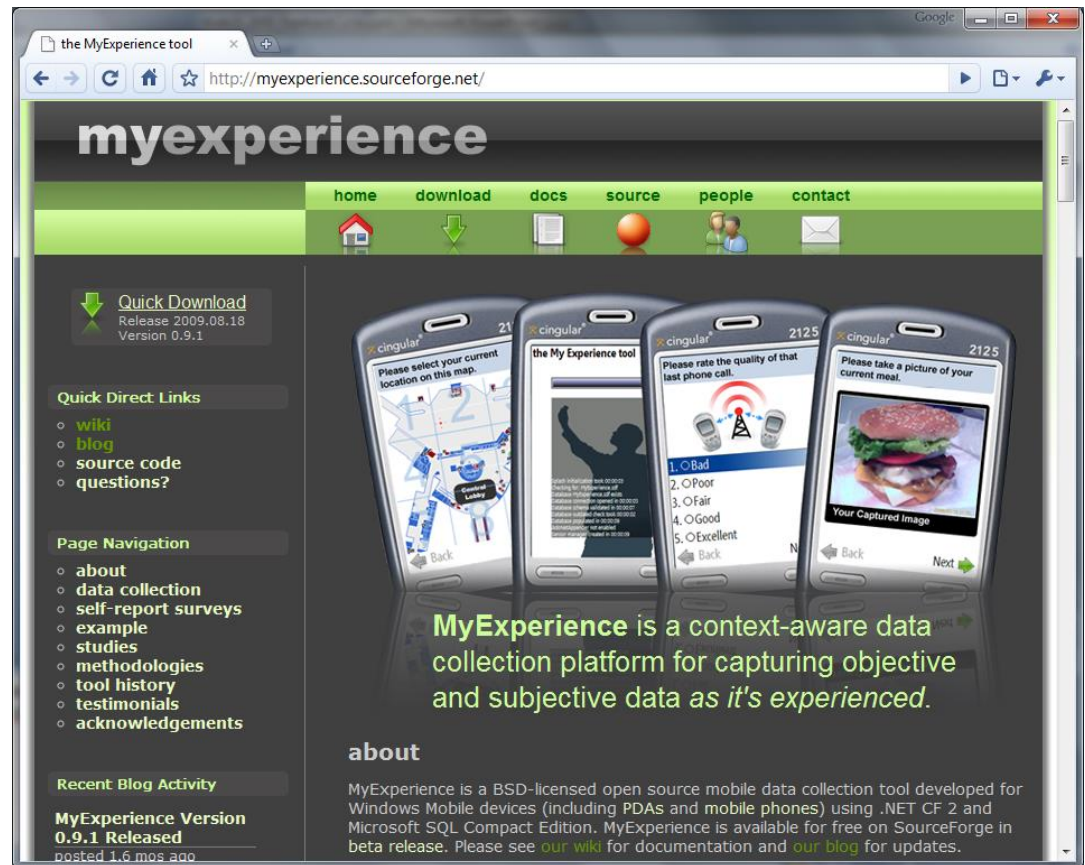


# ubigreen

transportation display

exploring the use of mobile phones as a persuasive eco-feedback technology to sense and feedback information about personal transportation

# formative studies of transportation choices and behaviors



download myexperience here:

<http://myexperience.sourceforge.net>



# studying transportation decisions *in situ*



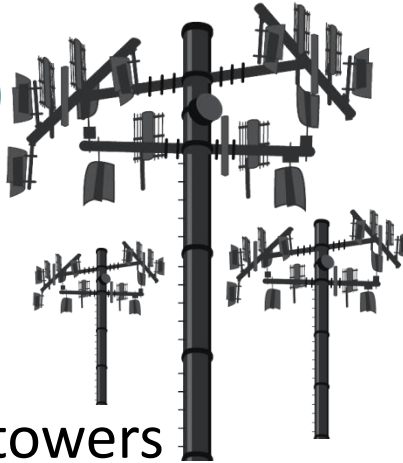
# sensing transit

1



msp

2



cell towers

3



user



Drive Alone



Walk



Bike



Train



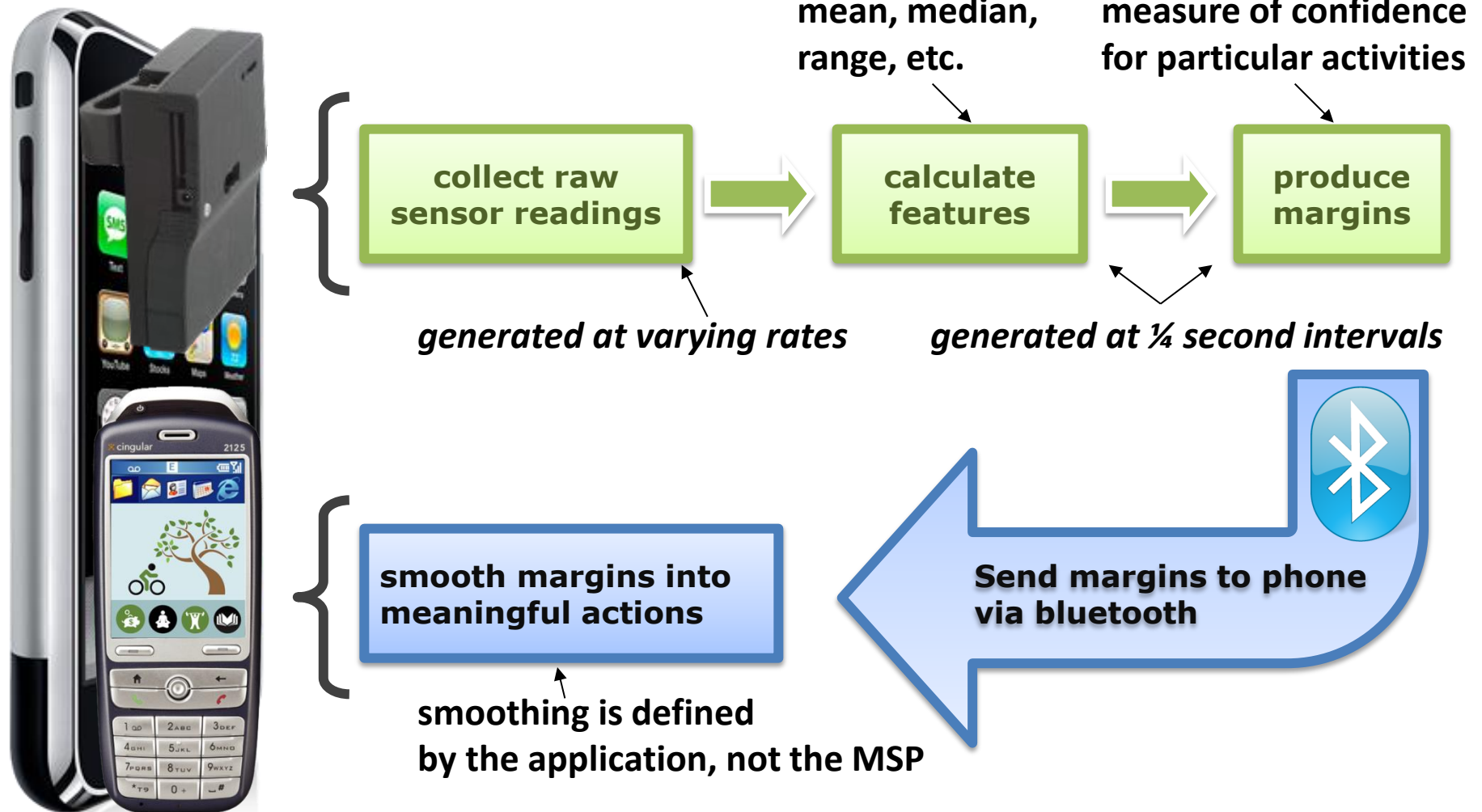
Carpool



Bus

**minimum activity duration: 7 minutes**

# raw sensor data to transit activity





current  
activity

phone  
background  
(wallpaper)

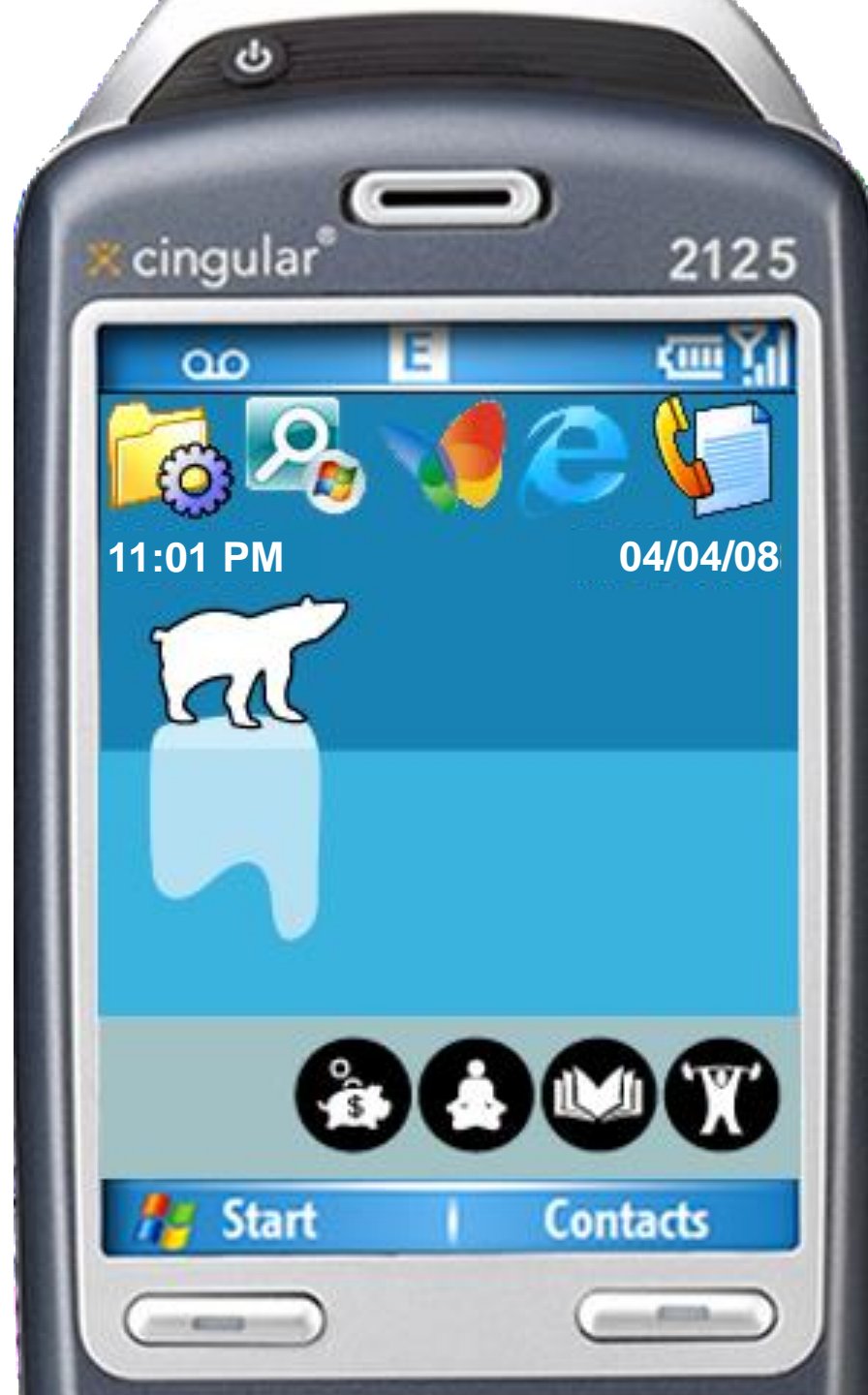
value  
icon bar

evolving  
image

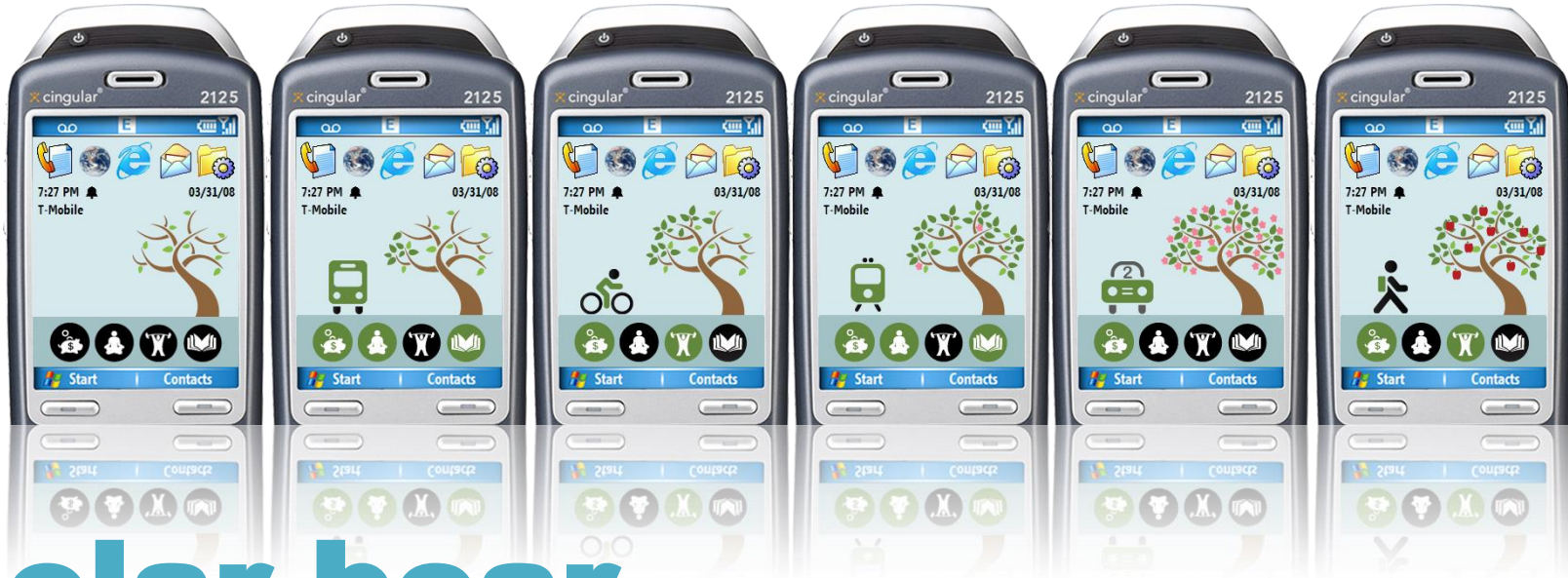




everything resets  
on sunday



# tree



# polar bear





seattle

pittsburgh

N=6

N=7



office admin

4 weeks



consultant

3



program manager

3



programmer

4



consultant

4



student

1

sales clerk

4 weeks



law enforcement

3



student

1



engineer

3



student

2



student

2



student

1







## Saturday

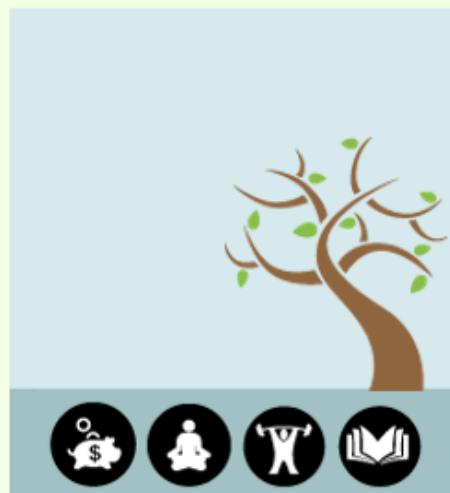
### RESEARCH PARTICIPANTS



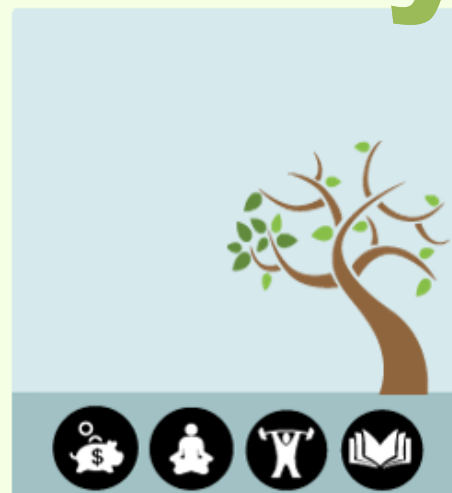
ubigreen1



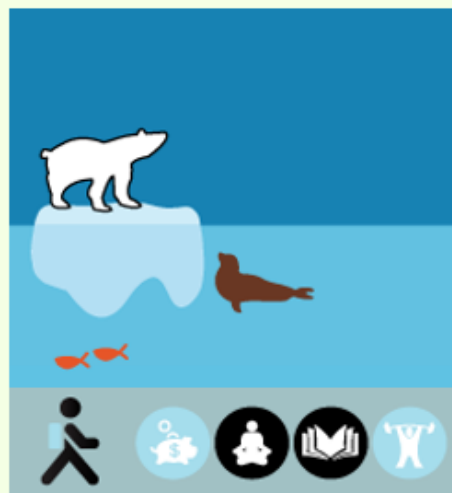
ubigreen2



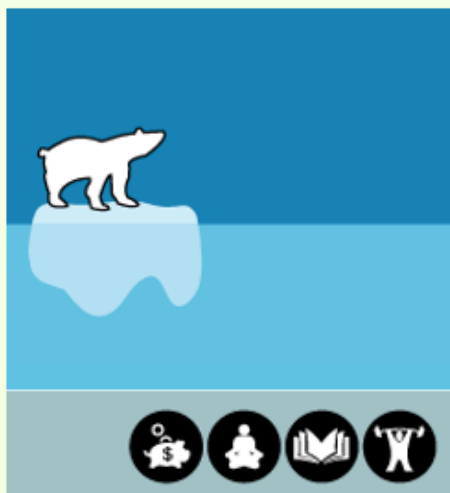
ubigreen3



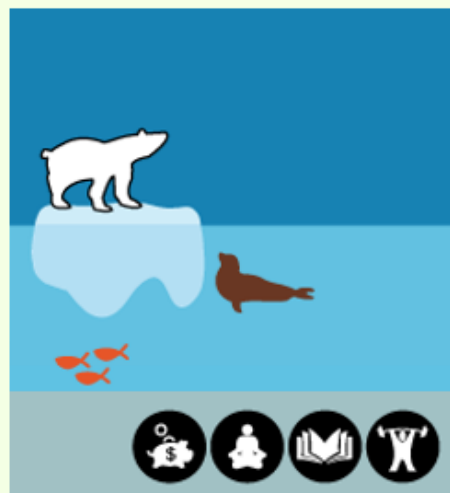
ubigreen4



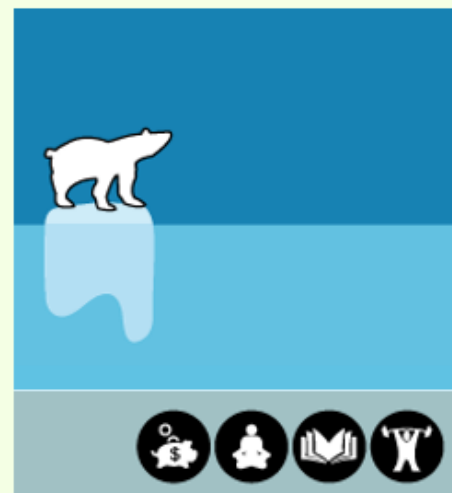
ubigreen5



ubigreen6



ubigreen7



ubigreen8

# visual design



## images revealed progress

I **liked the tree** because it was, to my mind, a **pretty progress bar**. I could tell the difference **at a glance**.

- Participant 11

## need for quantitative data

I would **like to see some graph** or raw data.

- Participant 13

I would like **more information about carbon emission savings**.

- Participant 15

# increased awareness



It's **omnipresent**

- Participant 9

It definitely **keeps you more aware** of it [personal transportation] every single day. **You use your phone every single day** so you know.

- Participant 6

# engagement



## anticipation

I liked that **we didn't know what it was going to do**. Like when your phone turned from leaves into flowers and then apples.

- Participant 15

## sustaining anticipation

I want to have **different stories every week ...** to maintain curiosity in the app.

- Participant 8

If you opened it up, **people would generate their themes online and share them**. It would be cool.

-Participant 10



# social engagement



Some **people at work knew about the polar bear** and every day they asked me about it. **'Did you get a seal today?'**

**- Participant 14**

**I would show my friends, 'look at my tree, isn't it cool, look at the flowers...'** They thought it was pretty cool.

**- Participant 9**

# concept of gaming

## our real-world interactions as input to games



I want to **see the final stage** I can get to...

- Participant 7

One participant stated that when a trip hadn't been automatically recorded, "I felt like **I was being cheated out** of my 'points'"

- Participant 15

# nike+ipod



nike+ipod tracks your runs and provides low-level and high-level feedback about performance



NIKERUNNING

myLOCKER ORDER STATUS CART 0

SEARCH

SHOP

NIKEiD

TRAINING

EVENTS

NEWS

SUPPORT

VIDEO

NIKE+

Home

Runs

Goals

Challenges

Coach

Map It

Forums



andicolortoo

6

MY NIKE+ LEVEL: GREEN

TOTAL  
897.79 KM

102km to reach the next level.

What are levels? ▶

3:51 PM



HOW WAS YOUR RUN? ▶

FASTER

DISTANCE



6.56 KM

S

M

T

W

T

F

S

SEE ALL RUNS ▶

RUNS



17.67km this week

GOALS



You did it!

CHALLENGES



Compete With Friends

COACH



Train Like a Pro

MINI



Lets turn it up a Notch!

FRIENDS AND FOES

NOTIFICATIONS (6)



SHARE

Link your activity with Facebook and Twitter for immediate status updates.

SHARE MY ACTIVITY

IMPORT

Find out which of your friends are already on Nike+ and

EVENTS  
THE NIKE+  
HUMAN  
RACE 10KNEWS  
THE BOLD  
NEW NIKE+  
SEE WHAT'S NEW ▶

RETURN TO THE CLASSIC NIKE+ ▶





NIKERUNNING

MY NIKE+ LEVEL: GREEN

myLOCKER ORDER STATUS CART 0

SEARCH

SHOP

NIKEID

TRAINING

EVENTS

NEWS

SUPPORT

VIDEO

NIKE+

Home

Runs

Goals

Challenges

Coach

Map It

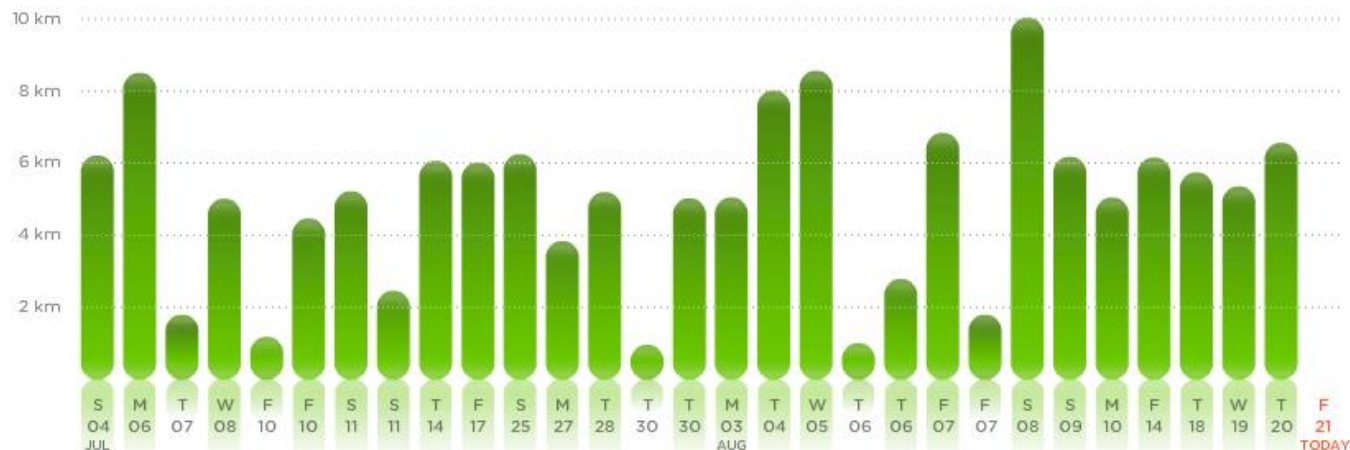
Forums



andicolortoo

6

ALL RUNS WEEKLY MONTHLY YEARLY



138 WORKOUTS

71:40:08 DURATION

897.79 KM

4:47 /KM

69141 CAL

&lt; JUL 4, 2009-AUG 20, 2009 &gt;

PAGE 5 OF 5

## My Goals &amp; Challenges



1 Medals



1 Trophies

## My Farthest Run

21.5  
km

## My Fastest Runs



6'35"

1 MI

21'32"

5K

43'54"

10K



You run 4 times a week on average. Make it 5 with a

You run most on Friday. Add more days to the mix with a training

# BURN MORE WITH EACH STEP

## What is Nike+ Active?

A fun way to motivate you to get moving. With each step you'll uncover new goals, reach new heights and track how active you've become.



### Become Nike+ Active

Sync your iPod nano Pedometer data to track daily and weekly progress. See how you stand compared to the entire Nike+ Active community.



### Conquer Yesterday

Improve your personal best and take on bigger goals as you go.



### Show off your Triumphs

Share your Nike+ Active accomplishments with family and friends.


## Counting All Your Steps

Every step matters with the new iPod nano.

- iPod nano can now track your steps and calories burned with its new built-in pedometer
- An Always-On mode monitors your activity in the background or you can set exactly when you start and finish a walk
- See your hourly, daily, weekly and monthly steps walked and calories burned on the iPod nano
- Connect your iPod nano to iTunes to automatically sync your data to Nike+ Active



**Purchase the new iPod Nano**

 Nike+ Active


leah5200

Celebrate with friends

SHARE ON FACEBOOK

# CLIMB A 100 STORY SKYSCRAPER

4,500 steps  
(225 calories)



2,263 STEPS

50% Completed

IN PROGRESS

My Week Sep 27-Oct 3

My Best Day

My Totals

# difficulty estimating levels of personal activity



underestimate food



overestimate levels  
of activity



Nike+ Active

leah5200

Celebrate with friends

SHARE ON FACEBOOK

29% Completed

1,436  
STEPS

**BURN  
THROUGH A  
HOT DOG**

5,000 steps  
(250 calories)



My Week

Sep 27-Oct 3

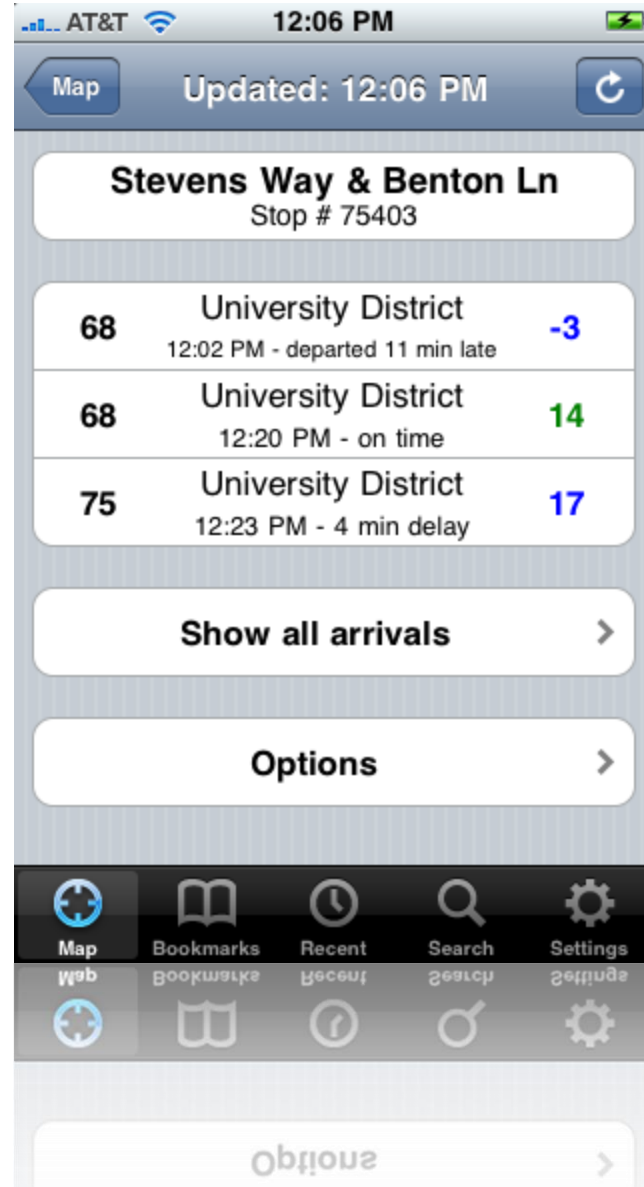
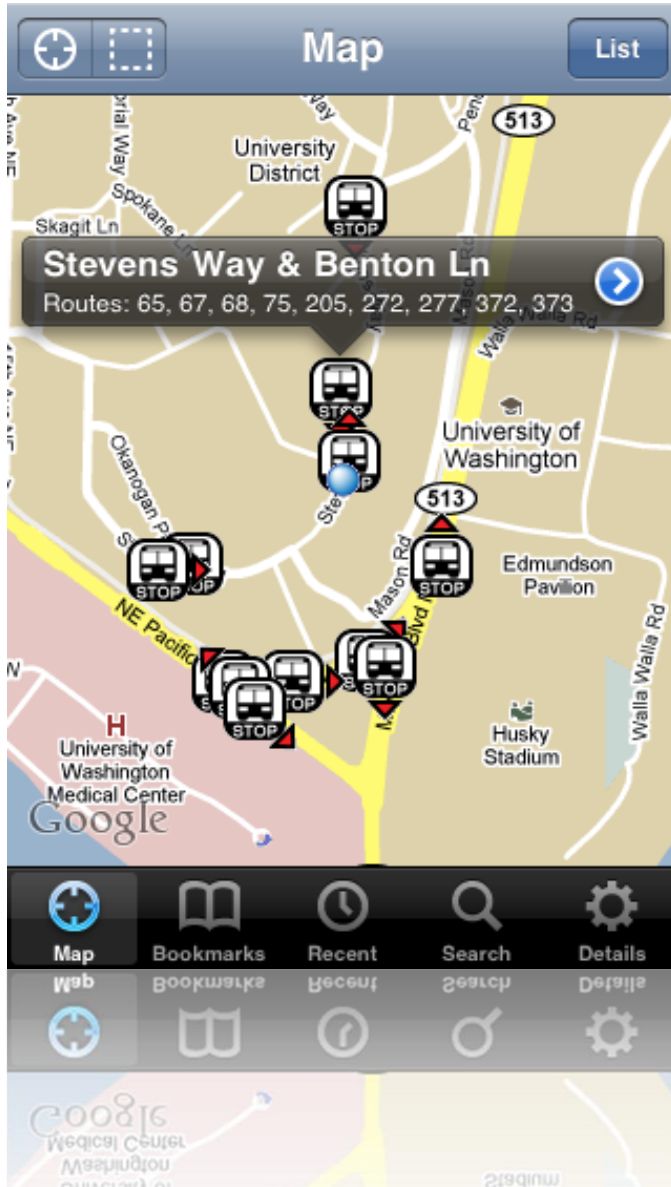
My Best Day

My Totals

# across air nyc nearest subway iphone app



# <http://onebusaway.org/>



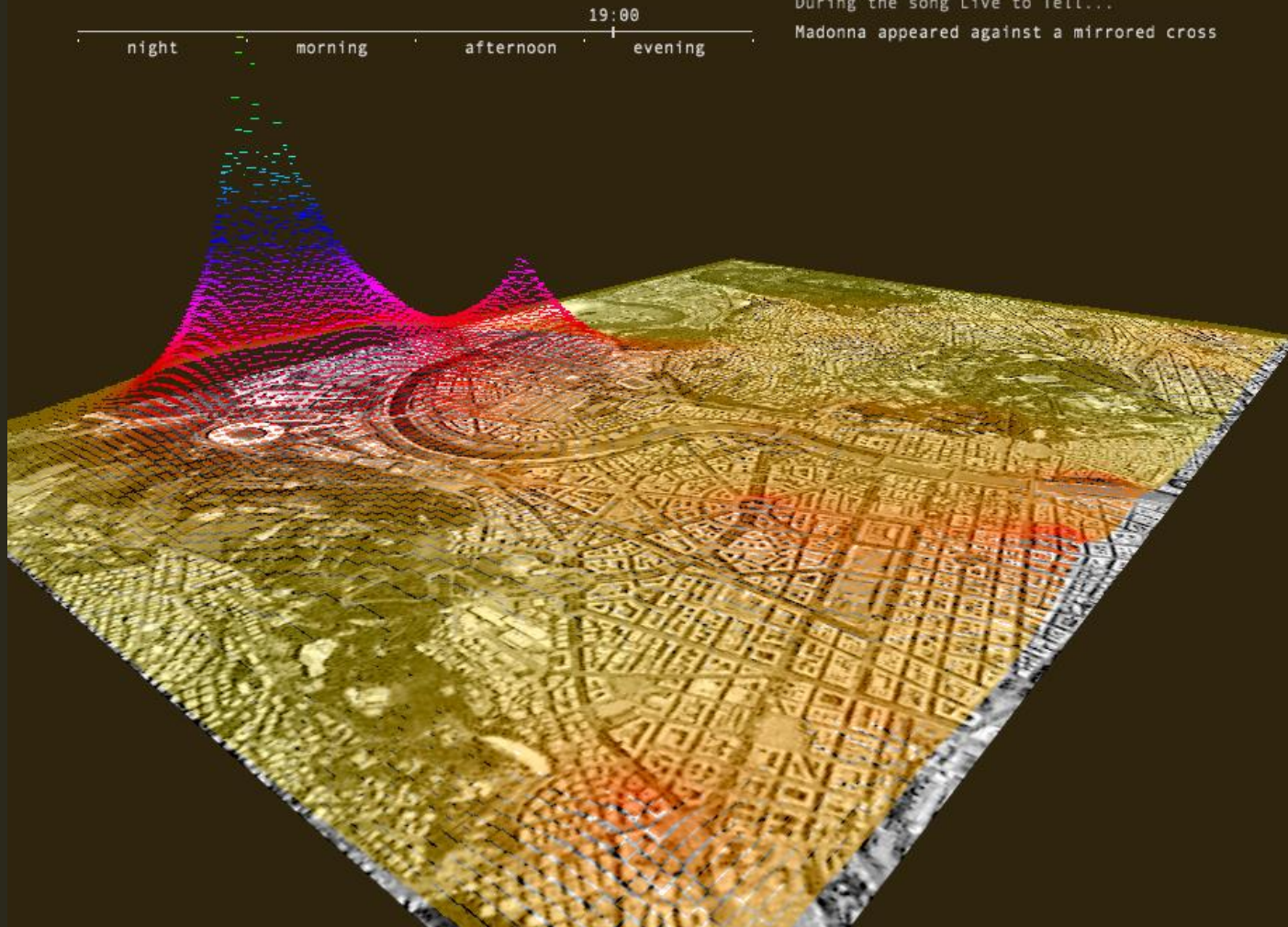


# real-time rome

MIT's SENSEable City Lab, directed by Carlo Ratti

Madonna Concert  
Cellphone activity in Stadio Olimpico Rome  
2006-08-06

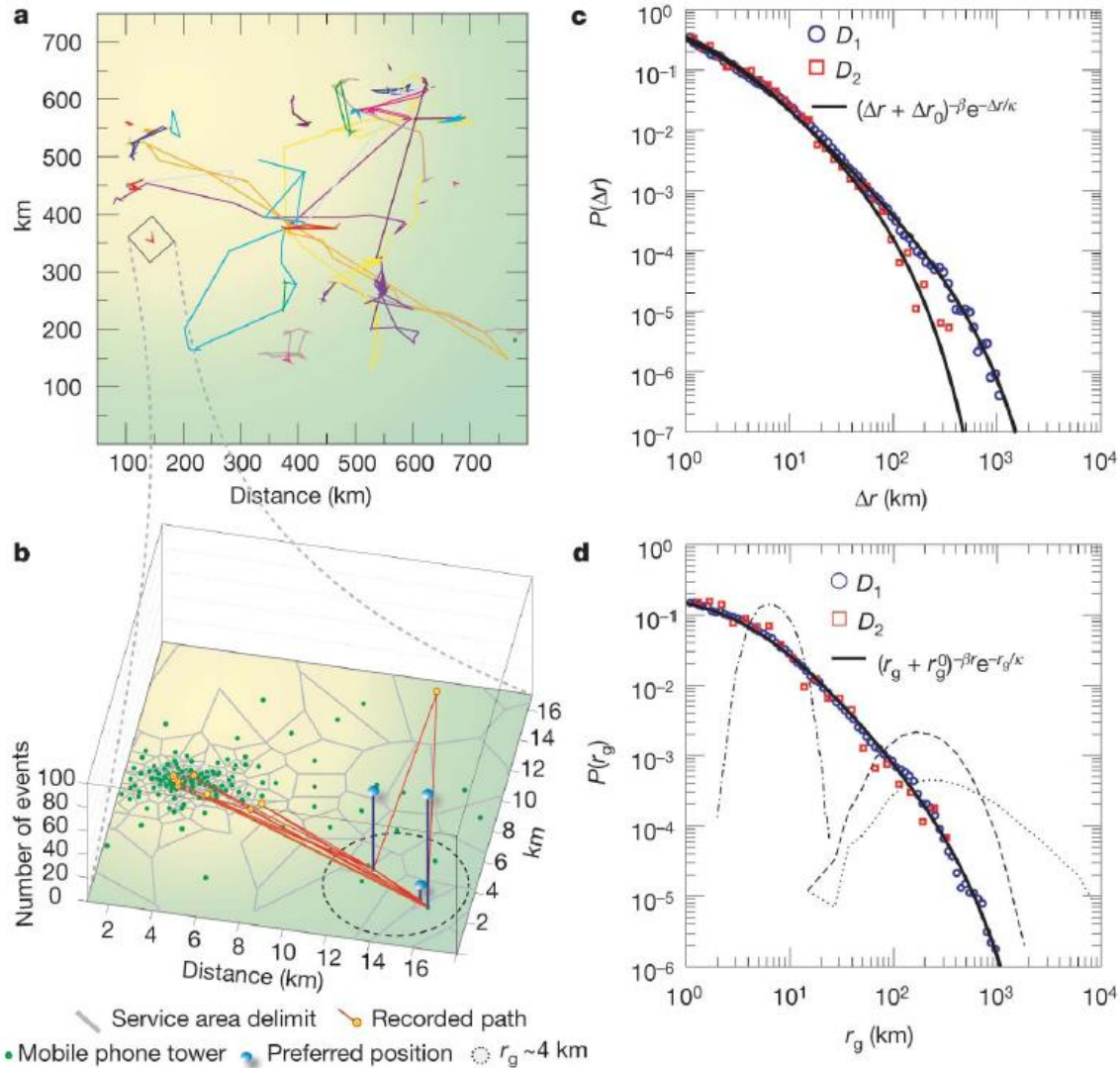
Cellphone activity from 19:00 to 20:00 on August 6, 2006  
At Rome's Olympic Stadium  
Located about three kilometres from the Vatican  
During the song Live to Tell...  
Madonna appeared against a mirrored cross





# understanding human mobility patterns

Marta C. González, César A. Hidalgo & Albert-László Barabási, *Nature*, 5 June 2008





**thank you!**  
**google: “Jon Froehlich”**