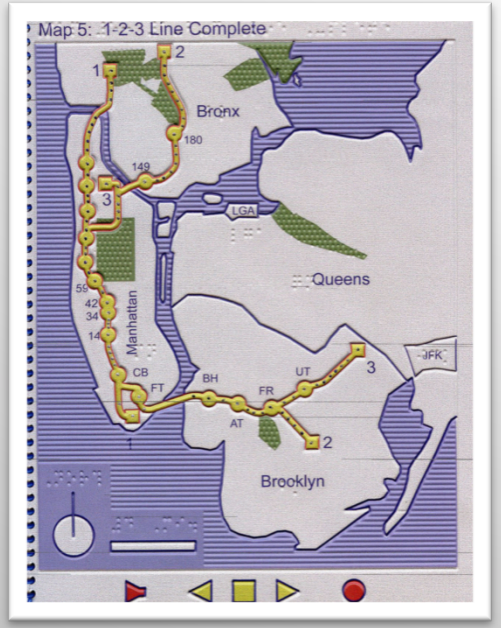
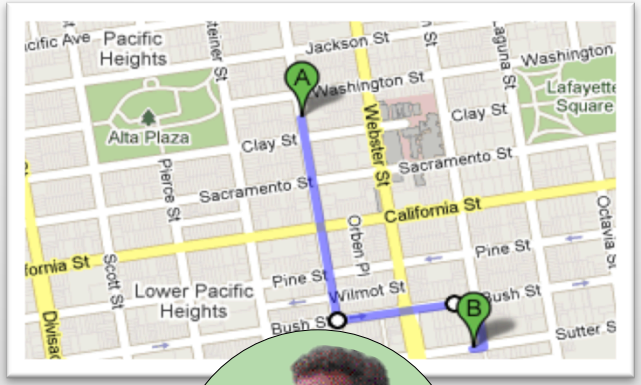
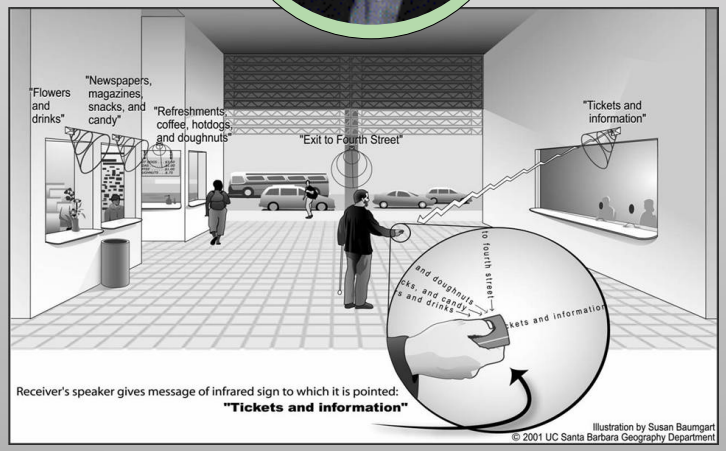






Survey of Accessible Signage:

Implications for linkage to the World Wide Web

Bill Crandall, Ph.D.
Smith-Kettlewell

Introduction

New developments in wayfinding reinforce each other – not only technically, but also functionally – resulting in significant advantages for people who cannot read print as they move about the world.

Although this presentation relates new and important approaches to enhancing the travel experience of people who do not see – or do not see well, by providing access to information generally experienced by sighted persons through signs and landmarks, it is also a review of most common signage strategies used by people who have other disabilities such as deafness, cognitive and mobility impairments.

This survey will hopefully also prompt a context in which to think more deeply about the different PROBLEMS of accessibility by revealing the different SOLUTIONS we already have, knowing that there is always room for improvement, as problem solving is never finished. It is the growth in information technology - and networks (at all levels) in particular - that will be the direction in which these systems will improve most productively and most rapidly; directly enhance these existing solutions and create entirely new ones we can't even dream about.

Specific references will be made to the internet but at present, in the field of accessibility, this connection is relatively limited. It will be up to W3C to promote integration and resolve conflicts that will lead to more efficient, useful and safer systems. The broad range of interests coming together in the W3C determine, through consensus, the “look and feel” of the foundational structure from which future possibilities will necessarily be derived. That is to say, it is much more difficult to change the direction of some effort than to anticipate and build in mechanisms that will allow for it. Otherwise future enhancements are structurally "Locked out”; an unwelcomed side effect of the attempt to maintain some kind of rational control over implementation and deployment of these emerging technologies..

Effective mobility depends upon proper orientation; for the non-disabled public this is accomplished by printed signs that provide general information, identification and directions. In the broadest sense, signs comprise a menu of choices; they present travelers with the options available at any given point in their environment. In addition, signage acts as a form of memory for travelers, “reminding” them about important characteristics of the environment. Signage is such a prevalent and integrated component of the built environment that people who cannot read or understand conventional signage are at a significant disadvantage in their ability to conduct even the most ordinary activities unassisted.

Let’s begin with a rationale for having signs that are usable by people with various disabilities. Suppose you’re on your way to the subway and you’re blind….

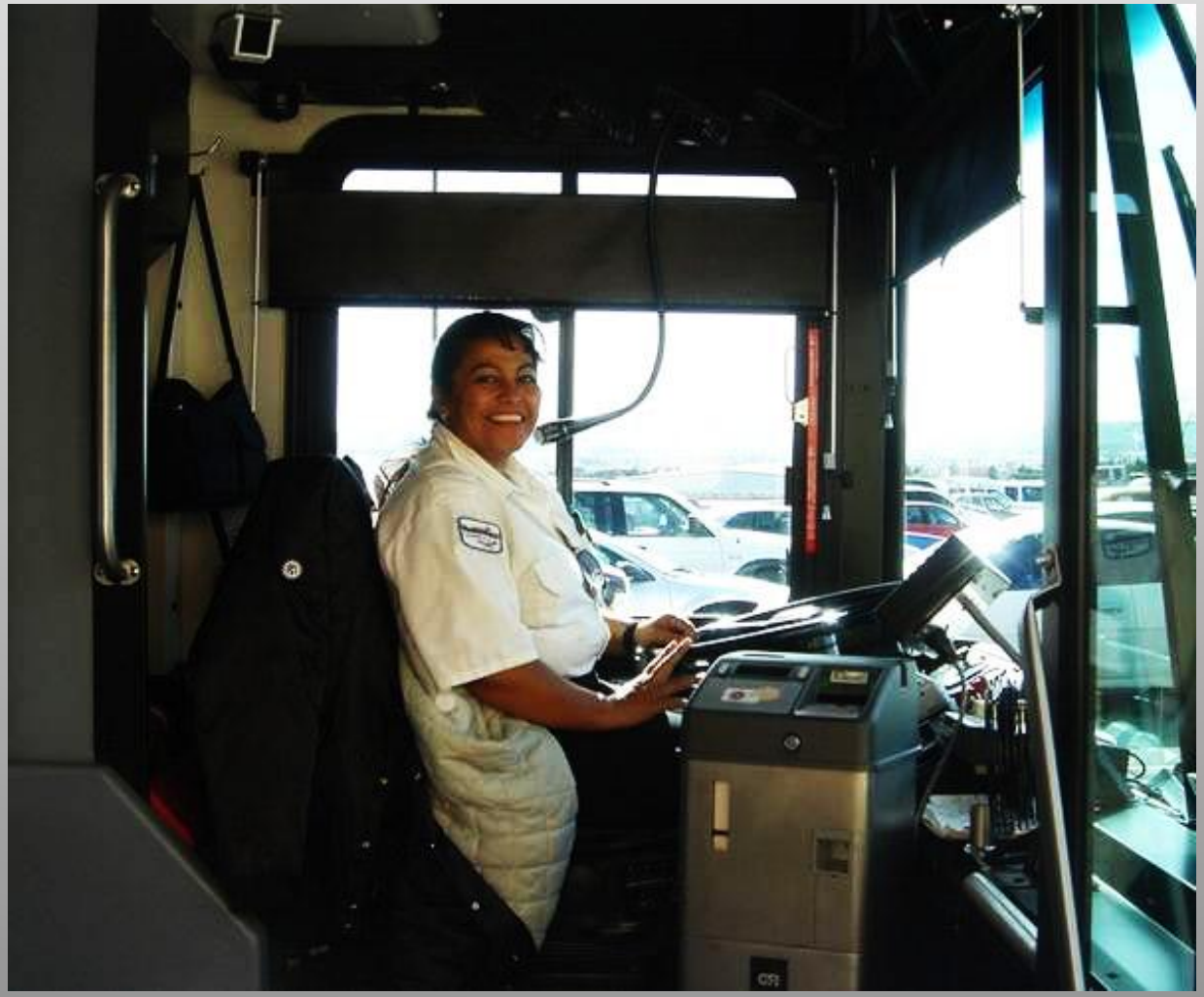
In a typical trip using public transportation…

… travelers perform a number of tasks, each of which can be challenging to travelers with impairments to their vision.

Such a complex activity may be thought of as…

a chain of sub-activities that must take place in a specific order. And, like any chain, it is only as strong as the weakest link; any broken link can significantly delay the trip.

Communication Barriers in Transportation Facilities and Vehicles



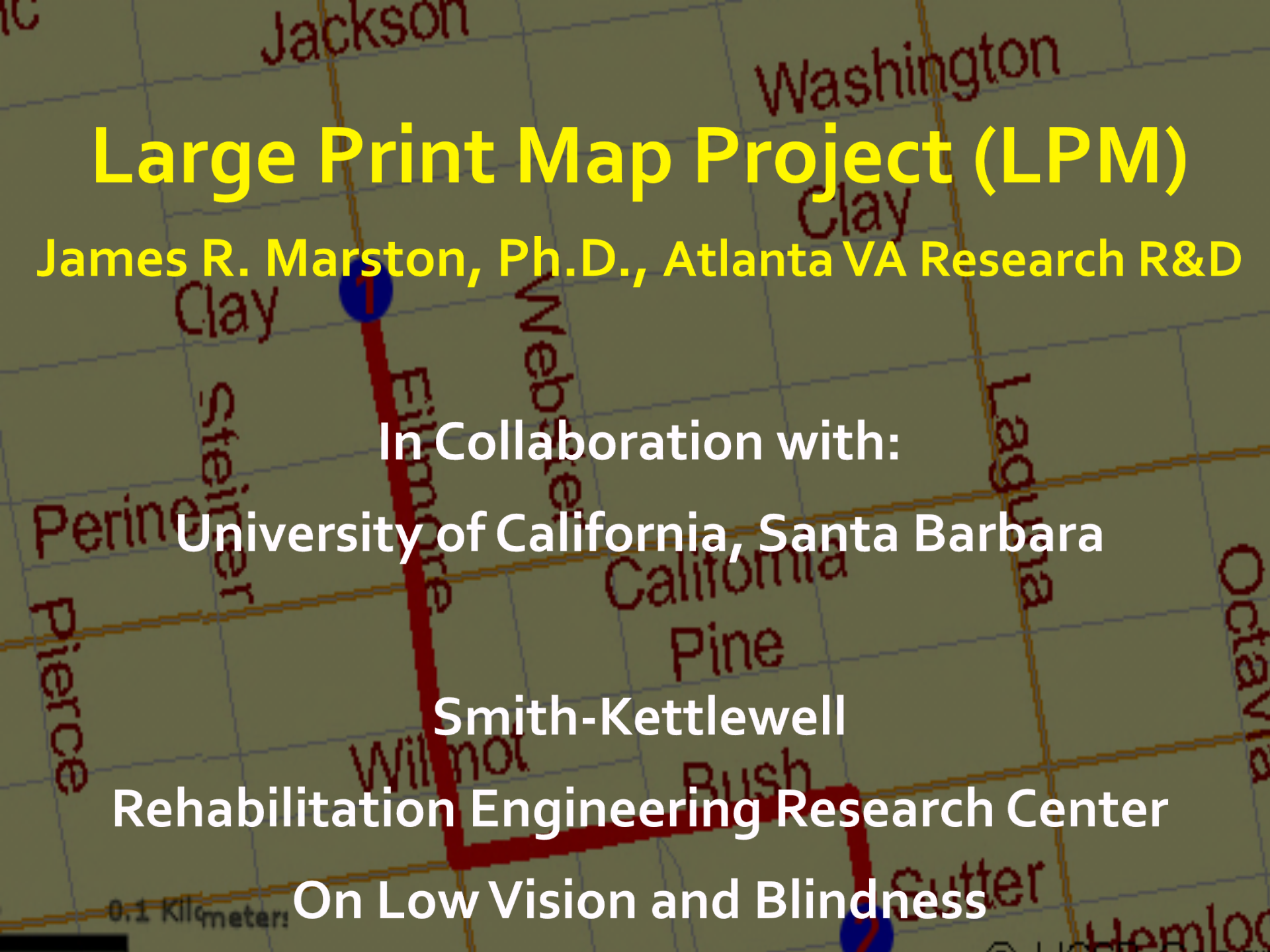
The frustration brought about by these delays and the effort needed to locate the proper information may be sufficient to prevent the traveler from attempting this trip again.

For an unfamiliar trip, the trip must first be planned, including routes and schedules

Then travelers must get to the stop or station and identify that they have arrived in the correct place.

Once they have arrived at the beginning of their journey on public transportation, they need to figure out how to pay.

Depending on the operation of individual transit systems, travelers may need to locate fare machines and use them correctly to pay for the desired trip. They may need to correctly insert bills, fare cards, or tokens, or use non-contact passes.



Large Print Map Project (LPM)

James R. Marston, Ph.D., Atlanta VA Research R&D

In Collaboration with:

University of California, Santa Barbara

Smith-Kettlewell

Rehabilitation Engineering Research Center

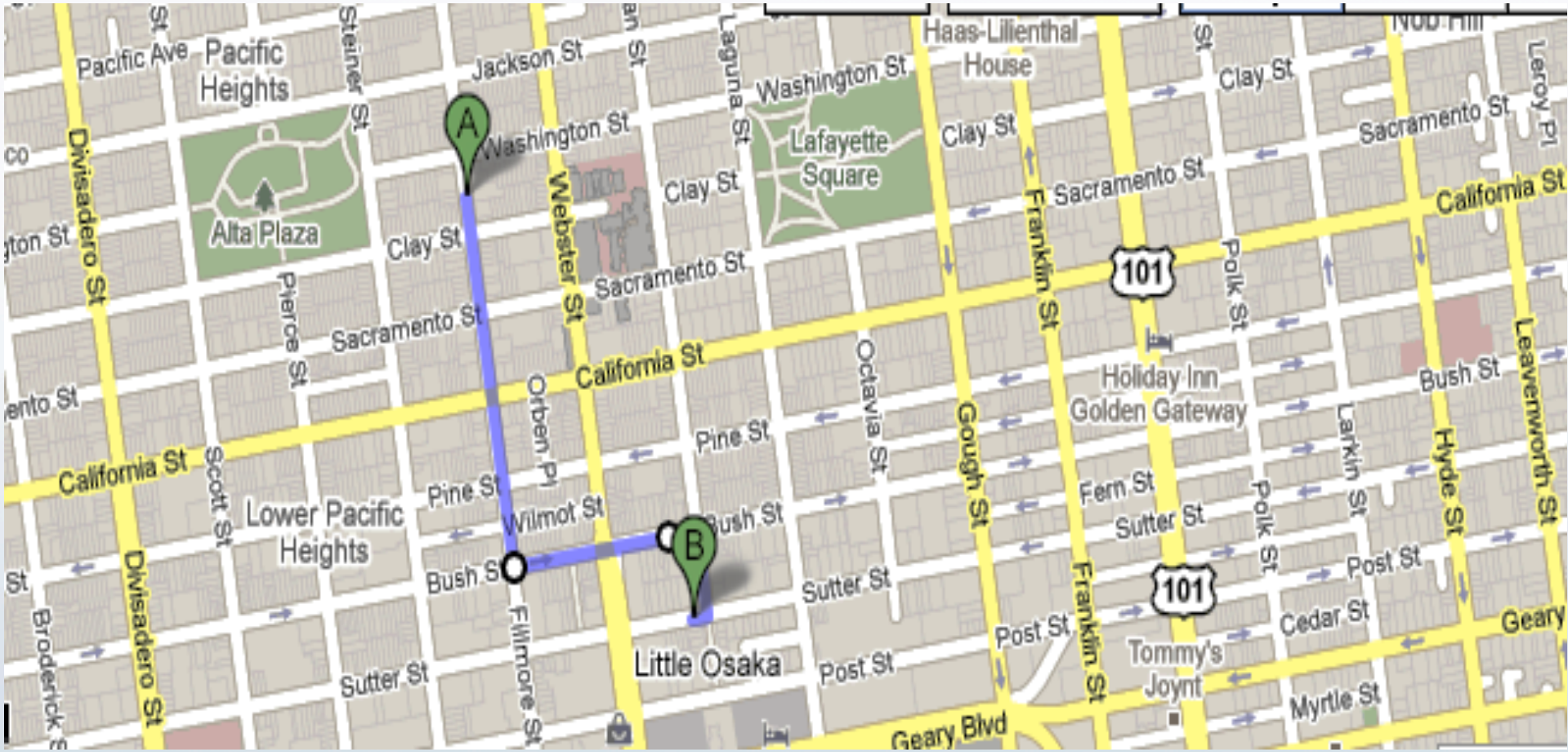
On Low Vision and Blindness

Geographic Information from Maps

Useful for:

- Understanding a new Environment (Overview)
- Trip Planning
- Routes and Directions

Standard Google Map with Route

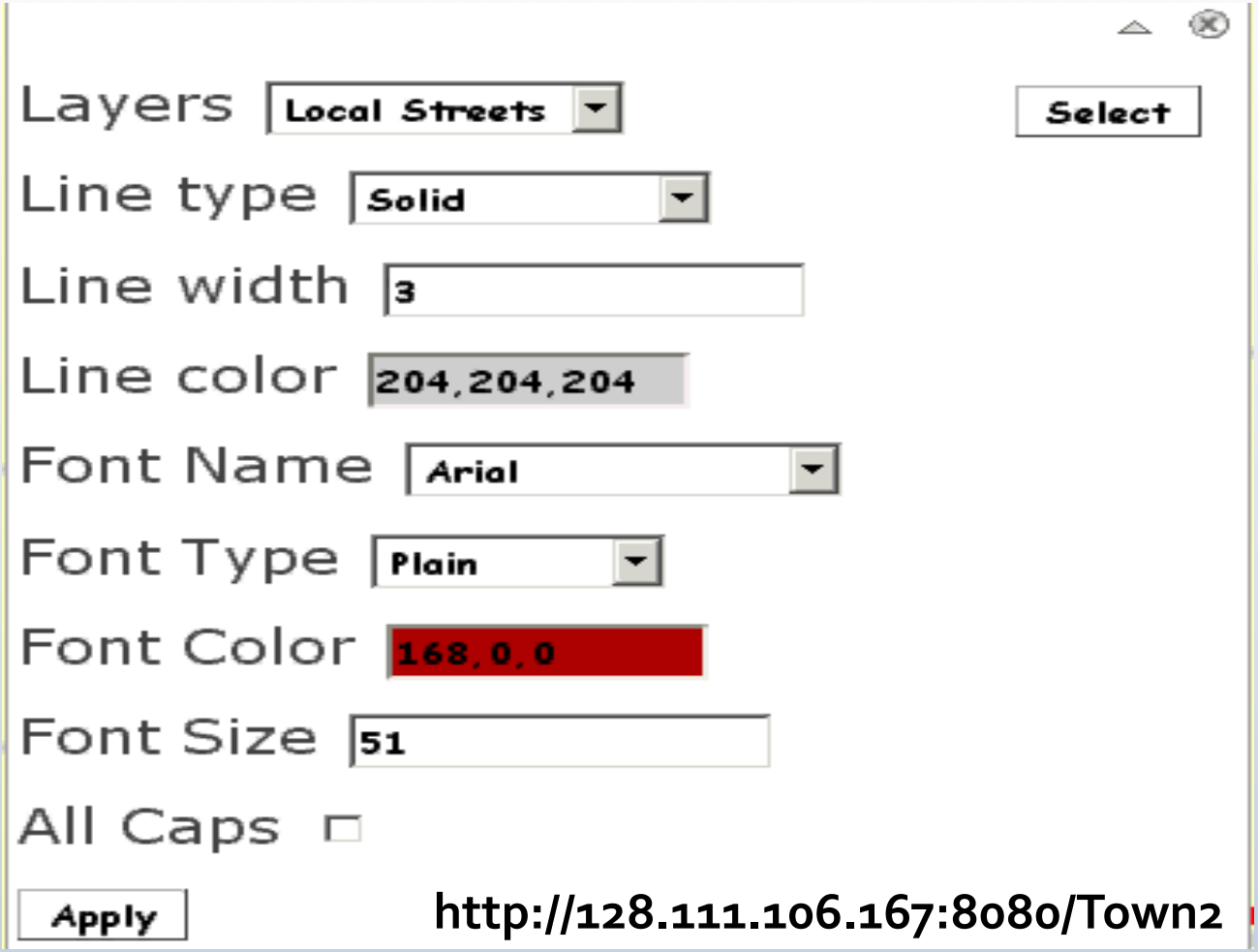


"Zooming In" increases size of feature,
but not size of the font.

The down side of "zooming in" is a reduction
of map area being displayed.

On-screen tool for users to set map parameters

Subjects were given an On-Screen tool to make adjustments in these web map characteristics.



Parameters important for Low Vision users of on-screen maps

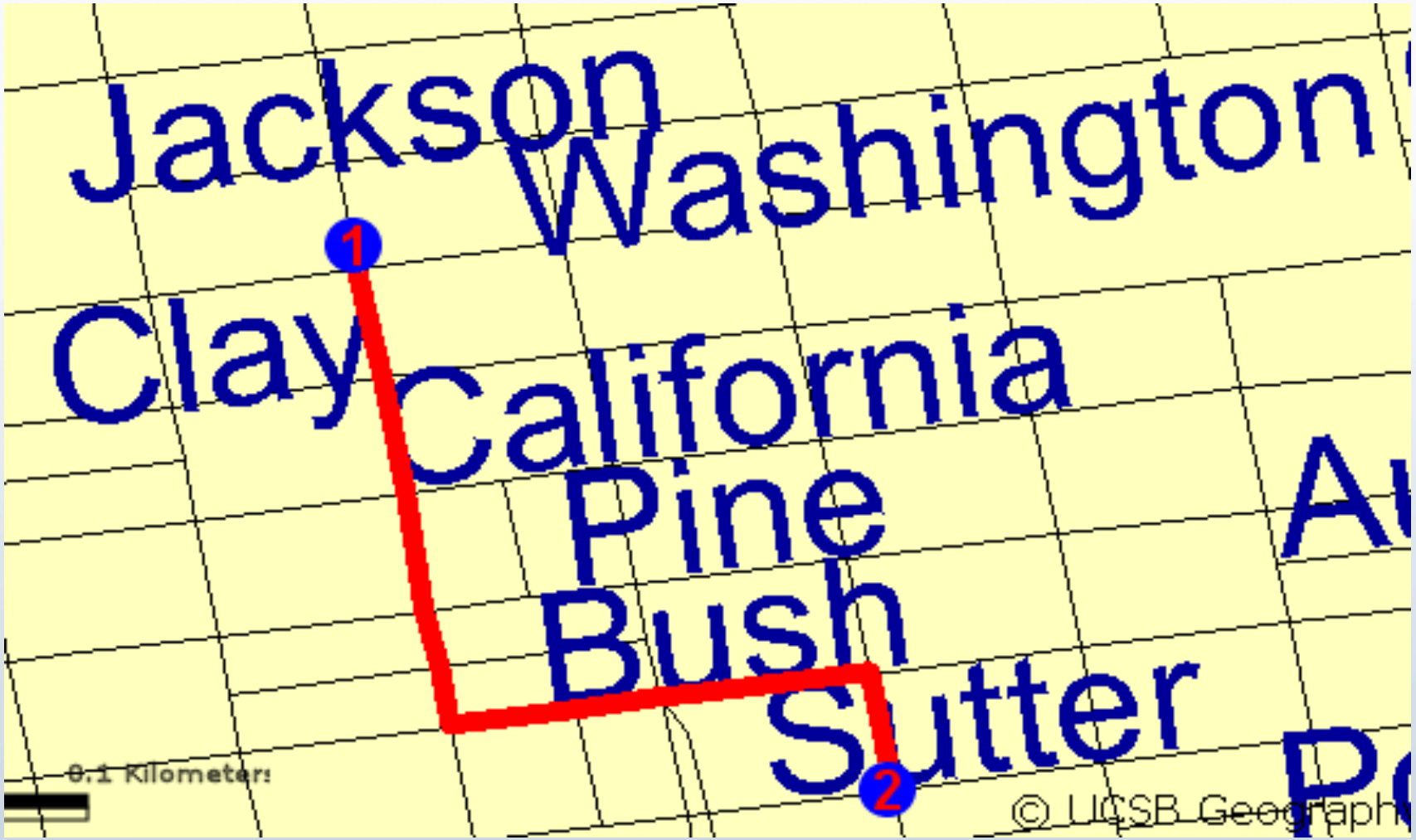
Maximized by subjects for *Usability* and *Legibility*

- A A A — **Font size**
- A A A — **Font style**
- A A A — **Color choice for names or streets**
- **Line size of streets**
- **Overall colors including color contrast.**
- 

Too much information (just need streets and their names)

Default setting for Large Print Map website 18 pt. font

User-customized map set for 48 pt. font



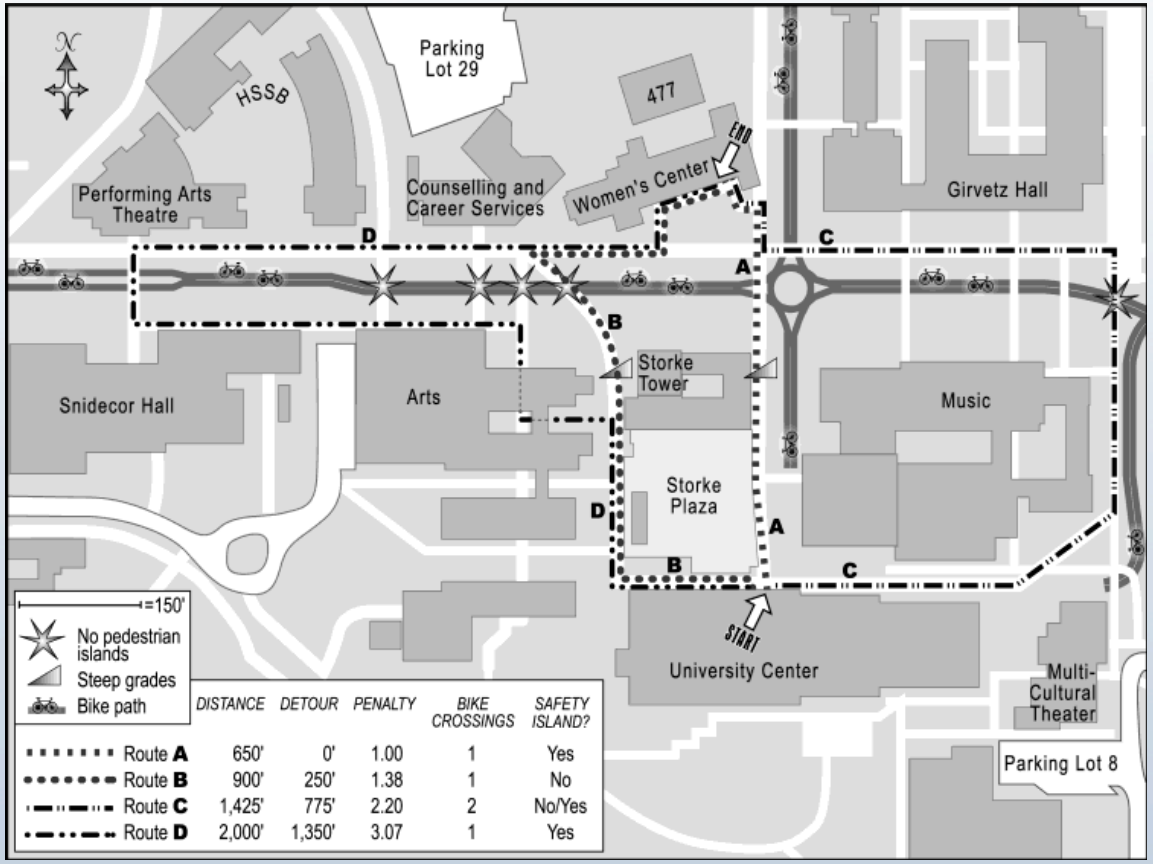
11 of the16 subjects read all street names

Accessible routes for mobility

Print Sign on the campus of UC Santa Barbara marking unobstructed path of travel for people with mobility impairments.

Accessible routes for mobility

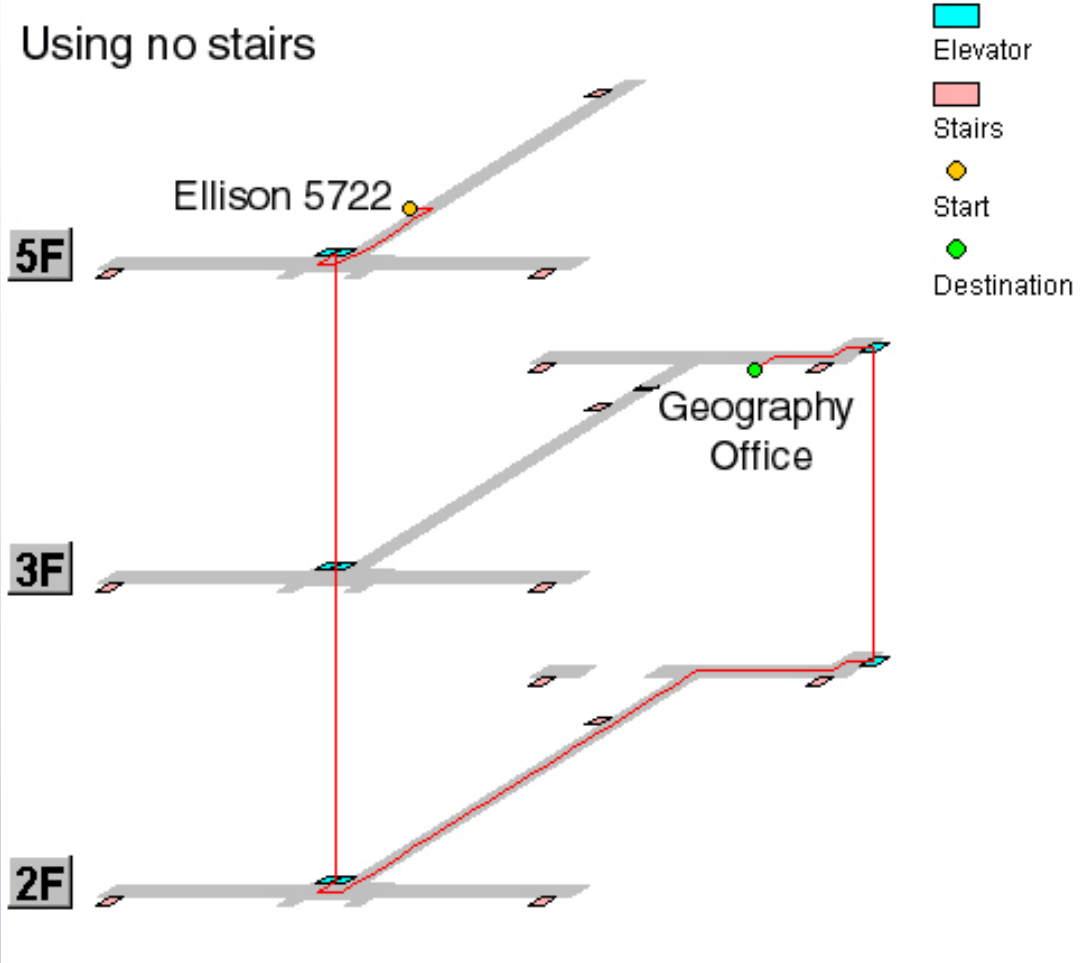
Survey of campus comprises the on-line database of accessible routes segments. User notifies system of START and END points. Algorithm connects accessible links to provide for shortest route.



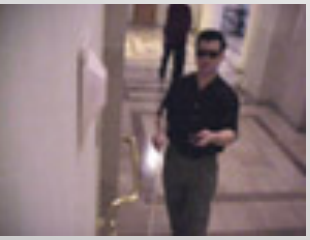
	DISTANCE	DETOUR	PENALTY	BIKE CROSSINGS	SAFETY ISLAND?
Route A	650'	0'	1.00	1	Yes
Route B	900'	250'	1.38	1	No
Route C	1,425'	775'	2.20	2	No/Yes
Route D	2,000'	1,350'	3.07	1	Yes

Accessible routes for mobility

Three-level campus building with interfering stair steps requires complex routing – made easy by the on-line algorithm developed at UCSB.



TALKING SIGNS®





Advances in

Remote Infrared Audible Signage

(RIAS)

Smith-Kettlewell

Rehabilitation Engineering Research Center
On Low Vision and Blindness

Partnerships

Billie Louise Bentzen, Ph.D. & Linda Myers, M.Ed.
Accessible Design for the Blind

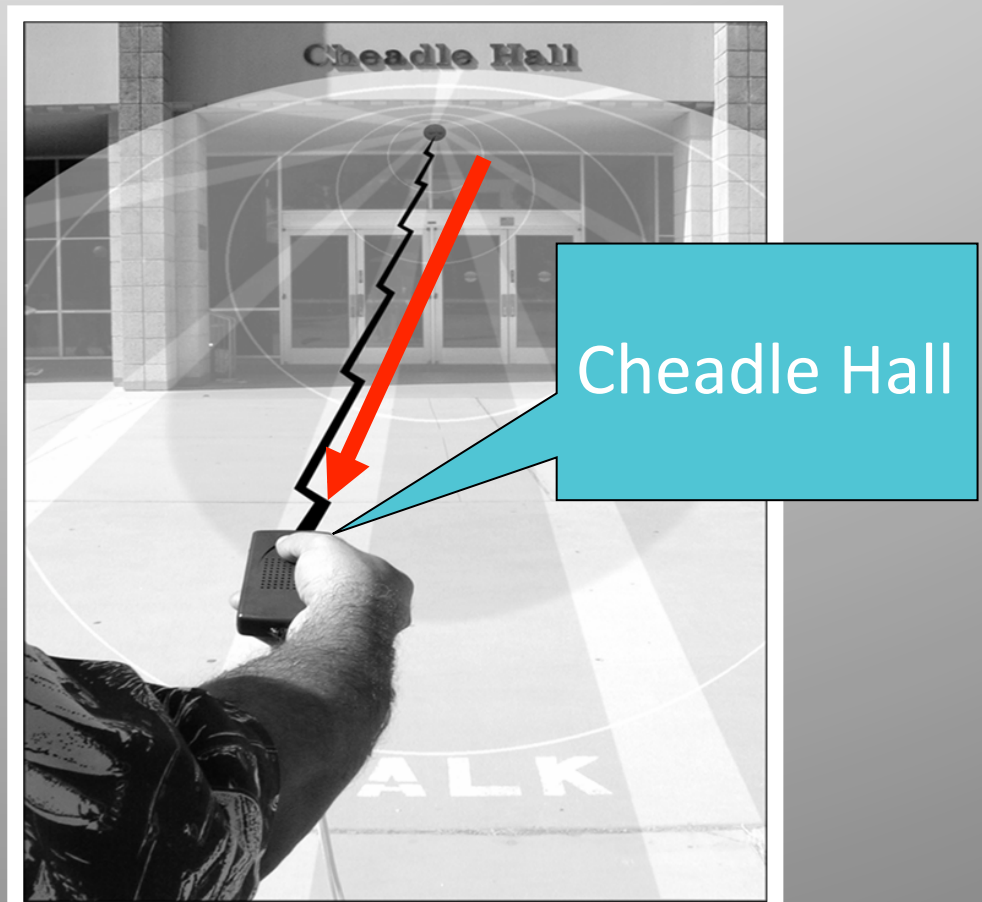
Jim Marston, Ph.D.
Atlanta VA

TALKING SIGNS®

RAIS (Remote Infrared Audible Signage) label the environment so that people who cannot see or otherwise read print signs have access to information usually provided by the print signs. Using a receiver (shown on the right), a person scans the area to find the infrared transmitters (shown on the left) labeling what is around them, both indoors and out doors… such as bus stops, train platforms, ticket machines, information windows, elevators or stairs.

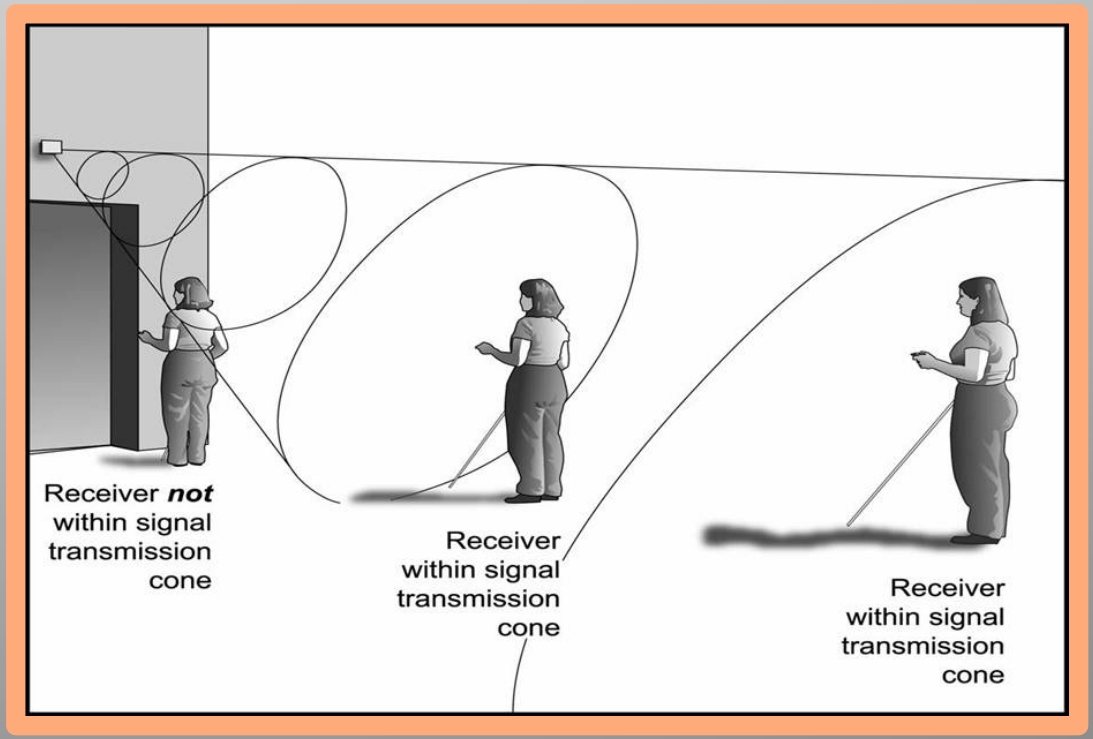
Walk in the direction from which the message is strongest.

Because the light signals are directional, the user can find the exact location of the sign by walking in the direction from which the message is received.



“Cone” of Transmission

- The sign can be adjusted to be as narrow as 6 degrees or as wide as 360 degrees.
- As you walk closer to the sign the message gets clearer and louder.
- As the person gets under the sign they can look up with their receiver and know they are at their destination.

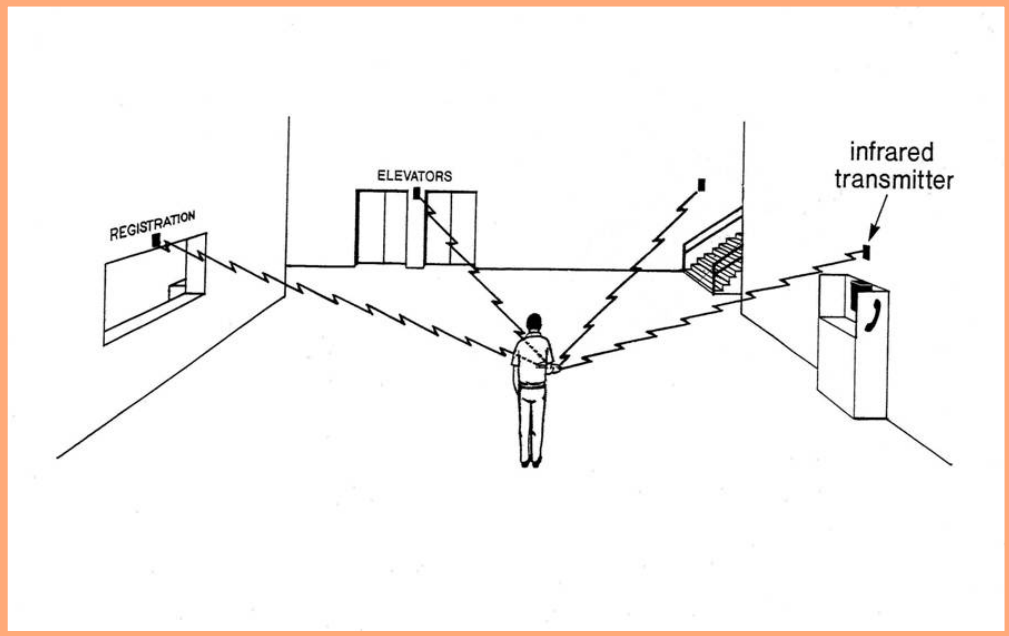


Multiple RIAS Transmitters

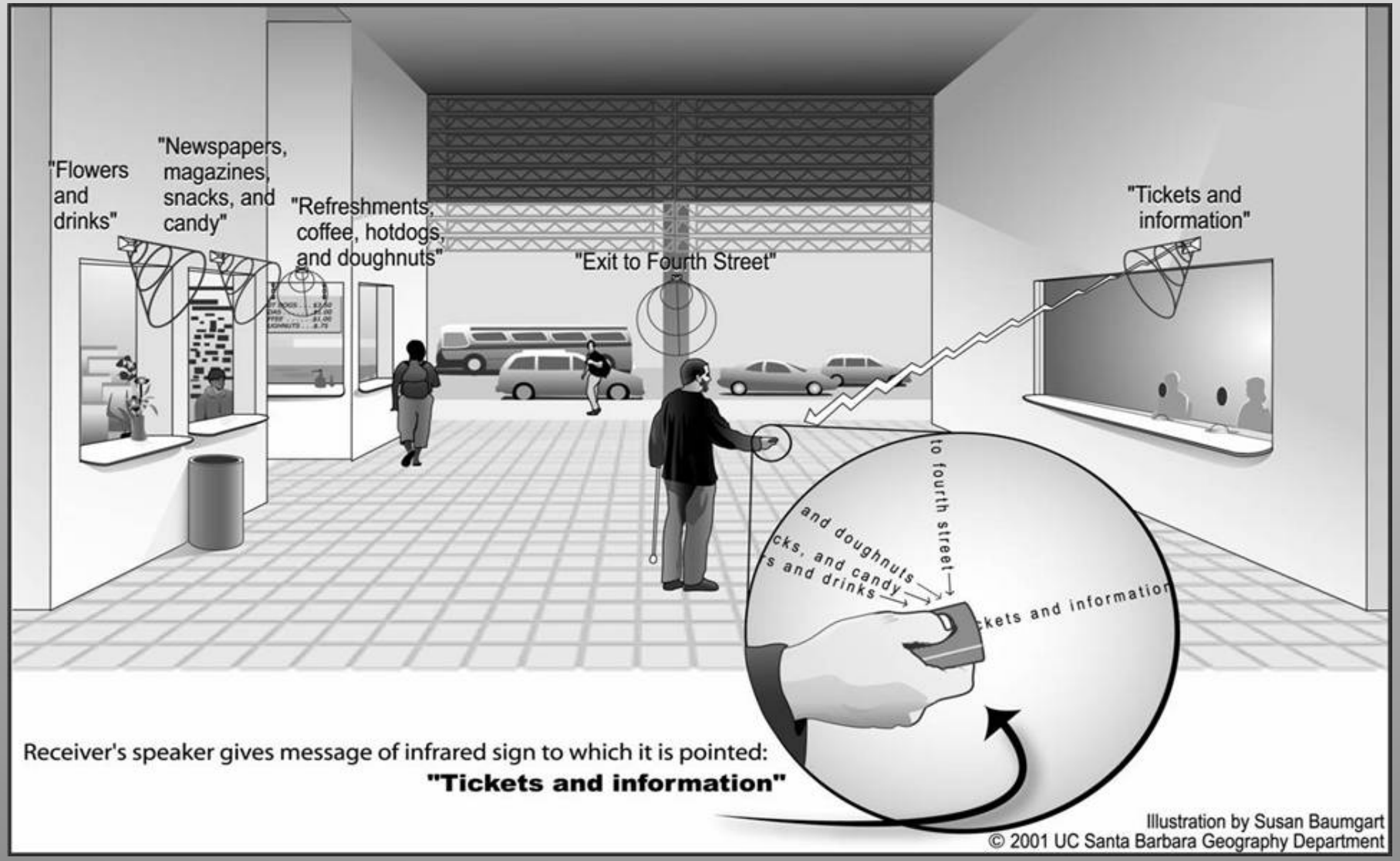
Characteristics:

•Only picks up strongest signal that you are pointing toward.

•Most announcements are unique and short, simple and straight- forward.



Cal Train Station Installation in San Francisco



A specific example of a very useful application of RIAS is found in San Francisco's Caltrain Station where 39 transmitters label all the important features in that facility. You can see the person scanning with his receiver in order to "see" the ticket window, the exit, and several stores all from the place where he is standing.

Training is simple:

- Hold receiver as if shaking hands;
- Press the On and Off button under thumb;
- Hear message;
- Turn receiver left until you don't hear the message, then turn it right until you don't hear the message;
- Where do you think the sign is? Through ear and hand coordination, RIAS provides a direct and efficient solution to wayfinding… It's in the middle, where the message is the clearest. Using this system is easy. There is nothing to remember.

“Entrance to Platform 6;
doors open 10 minutes before scheduled departure”

Seamless Information Access to Multimodal Transit

300 RIAS transmitters are installed throughout six transit stations in the Seattle area for Sound Transit

"Everett Station Bus bay B2 for buses 270, 271 Gold Bar, 275 Monroe and 280 Granite Falls"

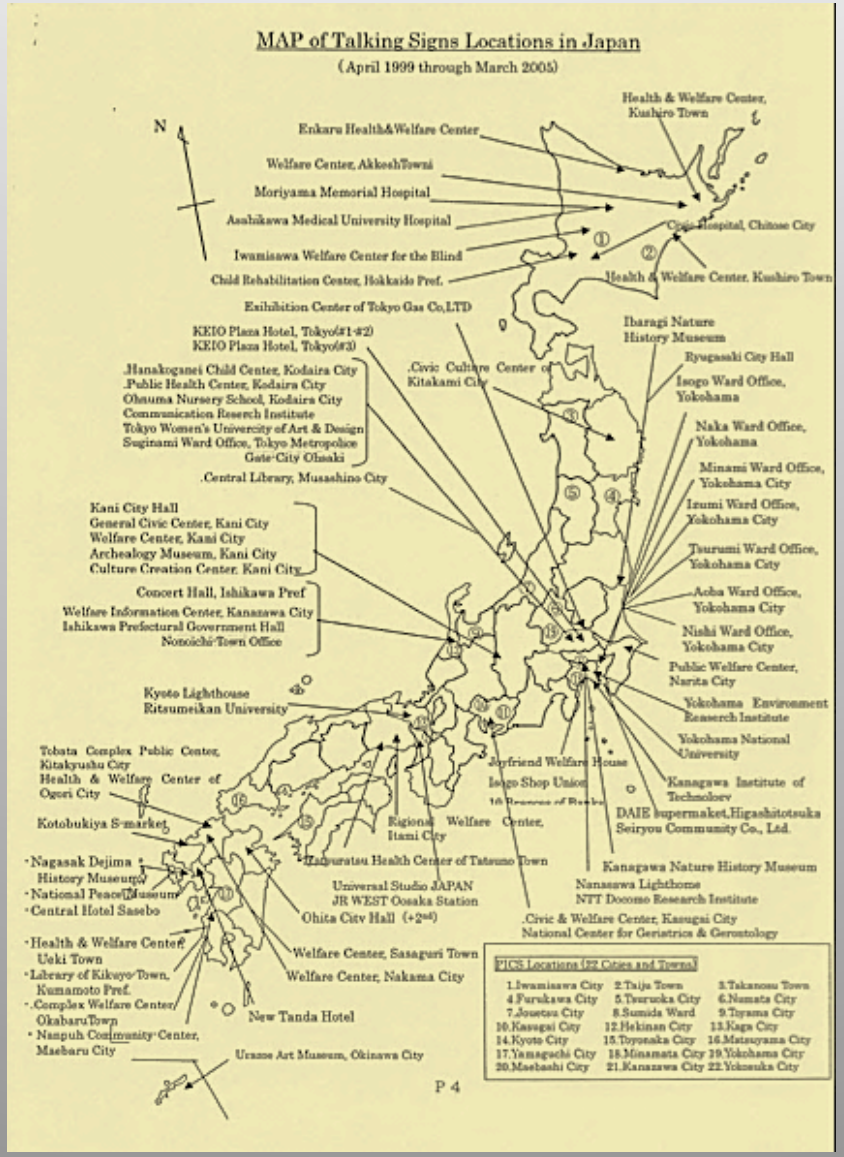
"Greyhound bus ticket counter"

"Espresso Americano Café"

New Oslo Opera House - 84 Talking Signs

Japanese Railway East Isogo Station

RIAS has been installed in 50 cities throughout Japan



Functional word list for RIAS testing

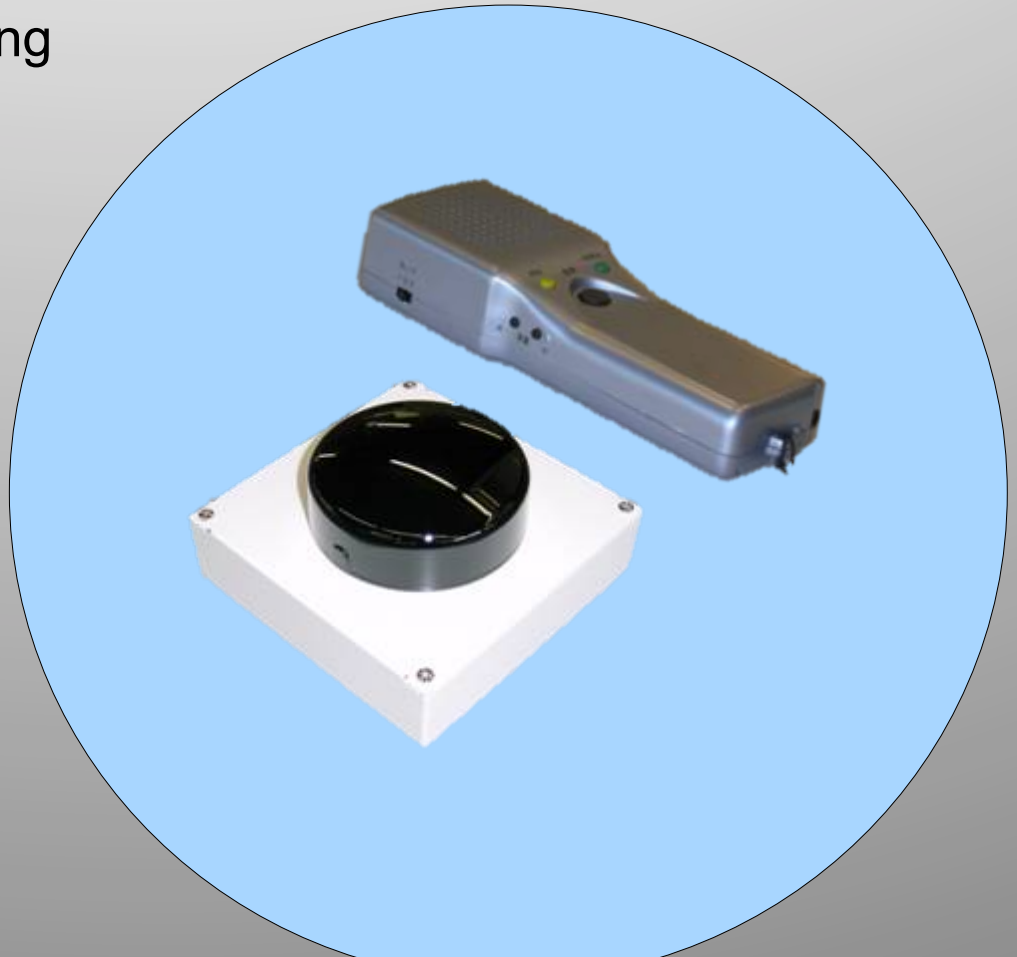
of developmentally disabled in a transit facility.

Most DD subjects could read individual words but could not get to the meaning of phrases or sentences. But they could easily follow up on spoken instructions using the same words.

- **TO ALL TRAINS**
- **EXIT - HALLIDIE PLAZA AND MARKET STREET**
- **ELEVATOR TO STREET**
- **DOWNTOWN**
- **OUTBOUND**

Mitsubishi Precision RIAS Museum System

For use in museums for delivering wayfinding as well as artifact-specific information is desirable. In addition to speech messages, the “Museum System” uses a code unique to that sign to index into the receiver’s on-board flash memory containing extended speech narration; a kind of ‘Random Access” speech player.



Smith-Kettlewell is in the process of making a very radical addition to Mitsubishi Precision's "museum" RIAS system.

Max's Hoagies is an example: What's for lunch?

Request Loop

CDMA/GSM

(for TCP/IP communication)

Server

Mac's Hoagies

Bluetooth wireless sends location code

RIAS Infrared wireless

Bi-Directional RIAS communication based upon an integration of IR, Bluetooth and 3G/GSM/WiFi

An infrared code (separate from the speech message) reaches the RIAS receiver which then transfers a request (via Bluetooth RF) to the smartphone for more information about Mac's Hoagies. The smartphone in turn transmits the RF request to the server via 3G/GSM/WiFi.

The RF reply reaches the infrared receiver by the reverse route.

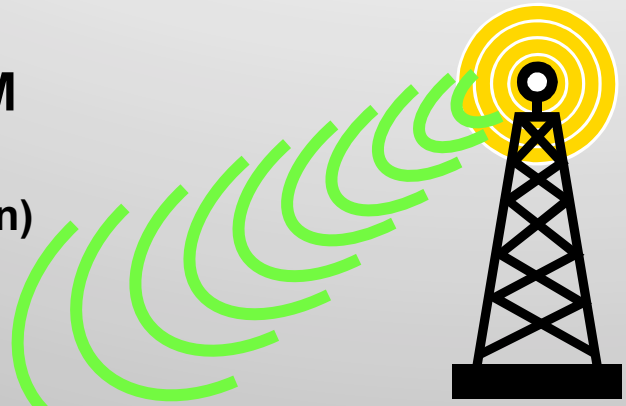
This web-based addition can be thought of as "*Point and Click the Environment*" because for any place you might be, your *physical coordinates* form the context for your *information coordinates*. By this I mean that your physical location has already gotten you drilled down pretty deeply into the relevant information space.

…. The space where you are most likely to find the answers to the questions you might have.

Reply Loop

CDMA/GSM

(for TCP/IP communication)



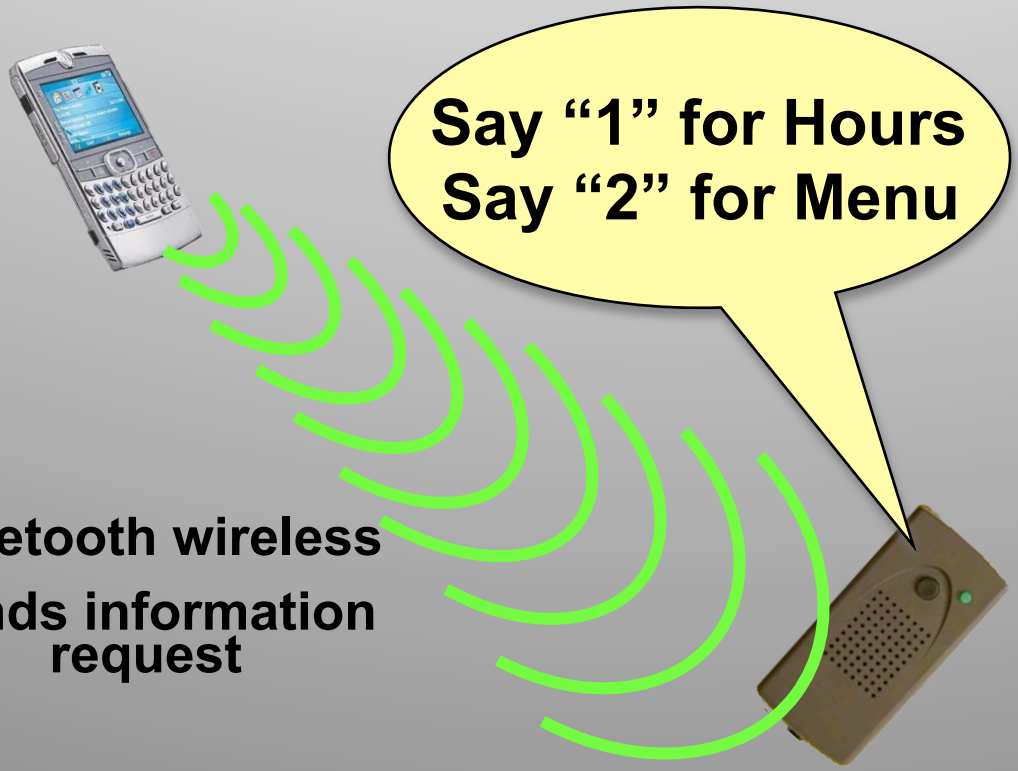
Server

Bluetooth wireless sends information

RIAS Infrared wireless

Natural Language Processing

We would like to provide random access to any location-based queries. However, to do this right requires a level of natural language processing that is just now starting to show some promise; otherwise, it's frustrating and people give up. But for starters, what we can do to prove the concept is provide for limited vocabulary – speaker-independent queries ----- the simplest being a restricted menu of choices.



Bluetooth wireless sends information request

Photovoltaic Bus Pole Sign plus Wireless GSM/GPRS

Northern Italy

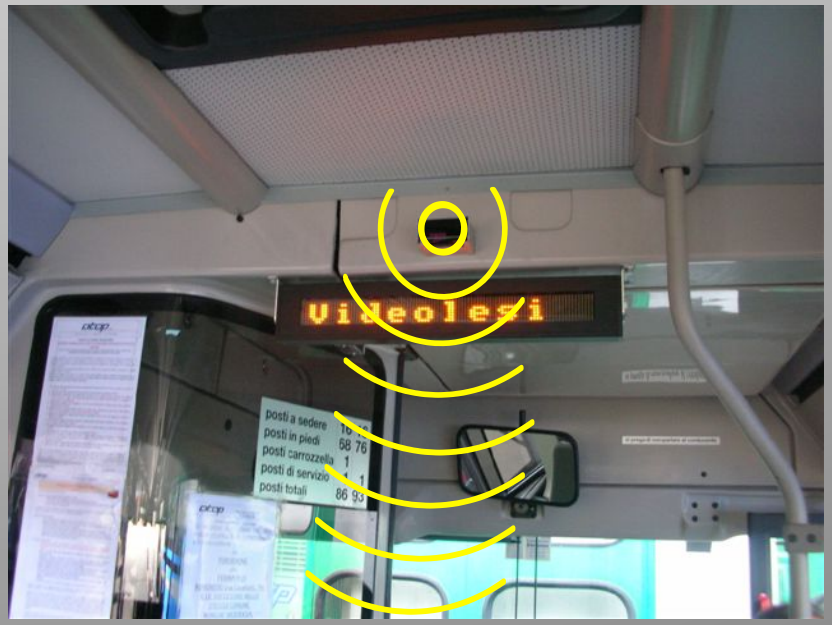
Bus Pole wireless RIAS:
Both mains power and communications are handled wirelessly by using photovoltaics for power and GSM/GPRS for communications to update the message giving arrival times for busses in Northern Italy.

This development was fairly straightforward for Solari as they manufacture parking meter equipment that is both photovoltaic and communicates financial over transactions over GSM/GPRS.

Text-to-speech conversion of graphic message

Announces bus destination through IR from up to 150 feet away.

On-bus Next Stop announcement available at any time.



Remote Infrared Audible Signage
American National Standards Institute

703.8 Remote Infrared Audible Sign (RIAS) System

703.8.1 Transmitters. Where provided, Remote Infrared Signage Transmitters shall be designed to communicate with receivers complying with Section 703.8.2.

703.8.2 Remote Infrared Audible Sign Receivers.

703.8.2.1 Frequency. Basic speech messages shall be frequency modulated at 25 kHz (+/- 10% deviation), and shall have an infrared wavelength from 850 to 950 nanometer (nm).

703.8.2.2 Optical power density. Receiver shall produce a 12 decibel (dB) signal-plus-noise-to-noise ratio with a kHz modulation tone at +/- 2.5 kHz deviation of the 25 kHz subcarrier at an optical power density of 26 picowatts per square millimeter measured at the receiver photosensor aperture.

Remote Infrared Audible Signage
American National Standards Institute (cont'd.)

703.8.2.3 Audio output. The audio output from an internal speaker shall be at 75 dB(A) minimum at 18 inches with a maximum of 10% distortion.

703.8.2.4 Reception range. The receiver shall be designed for a high dynamic range and capable of operating in full-sun background illumination.

703.8.2.5 Multiple signals. Capture of the receiver by the stronger of two signals in the receiver field of view requires a received power ratio on the order of 20dB for negligible interference.

Published in the 2003 Edition
of the American National Standards Institute

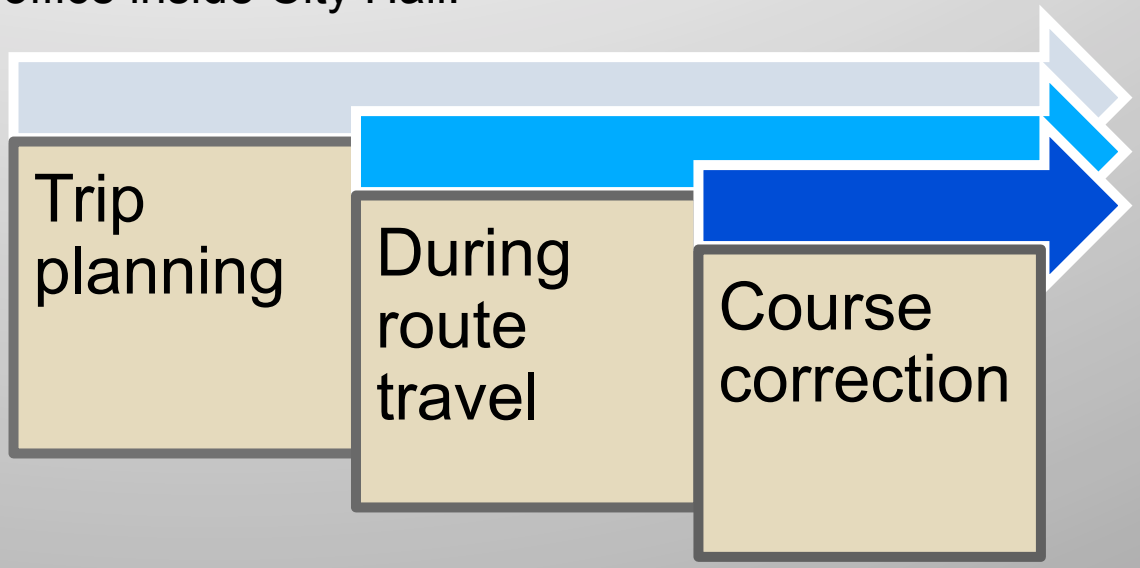
ClickAndGo Audible Mapping

- ClickAndGo service provides assistance in both trip planning and in-route.
- Site Surveys of buildings made by trained Orientation and Mobility specialists form a verbal building map database that is accessible by phone.
- The user calls ClickAndGo, announces a start location and the desired end location…
- The text-to-speech directs the user to the requested
- destination.

"The hotel main entrance has a revolving door with 2 manual doors 6 feet to the right and left of this revolving door. This entrance leads you to the first of 2 interior foyers. Enter through either manual door and you will be in the first foyer, a circular space 60 feet in diameter. Continue Towards 12:00, and 75 feet away are Automatic Double doors. Pass through These Double doors, and you enter a 30 foot long and 8 foot wide hallway bringing you to the hotel main foyer area."

Application of Convergence

So here we have our ClickAndGo user who has called ahead to study travel directions to the tax office inside City Hall.



Error Correction

And he once again consults ClickAndGo after arriving at City Hall.

Oops! He makes a wrong turn but has no way to determine he has gotten off track.

How does he get back on track? RIAS installed in the travel environment “knows” his location and would have be constantly notifying the ClickAndGo database of his travel progress. The system automatically re-calculates to correct his route as does Google maps.

Smart Phone offers flexibility in User I/O

COMMUNICATION

- CDMA/GSM
  (for voice and data)
- Wi-Fi
- Bluetooth

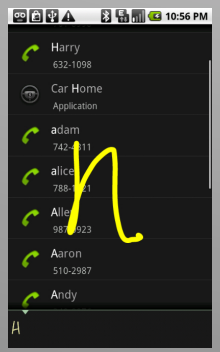
INPUT

- Keyboard
- Joystick
- Touchscreen*
- Speech

OUTPUT

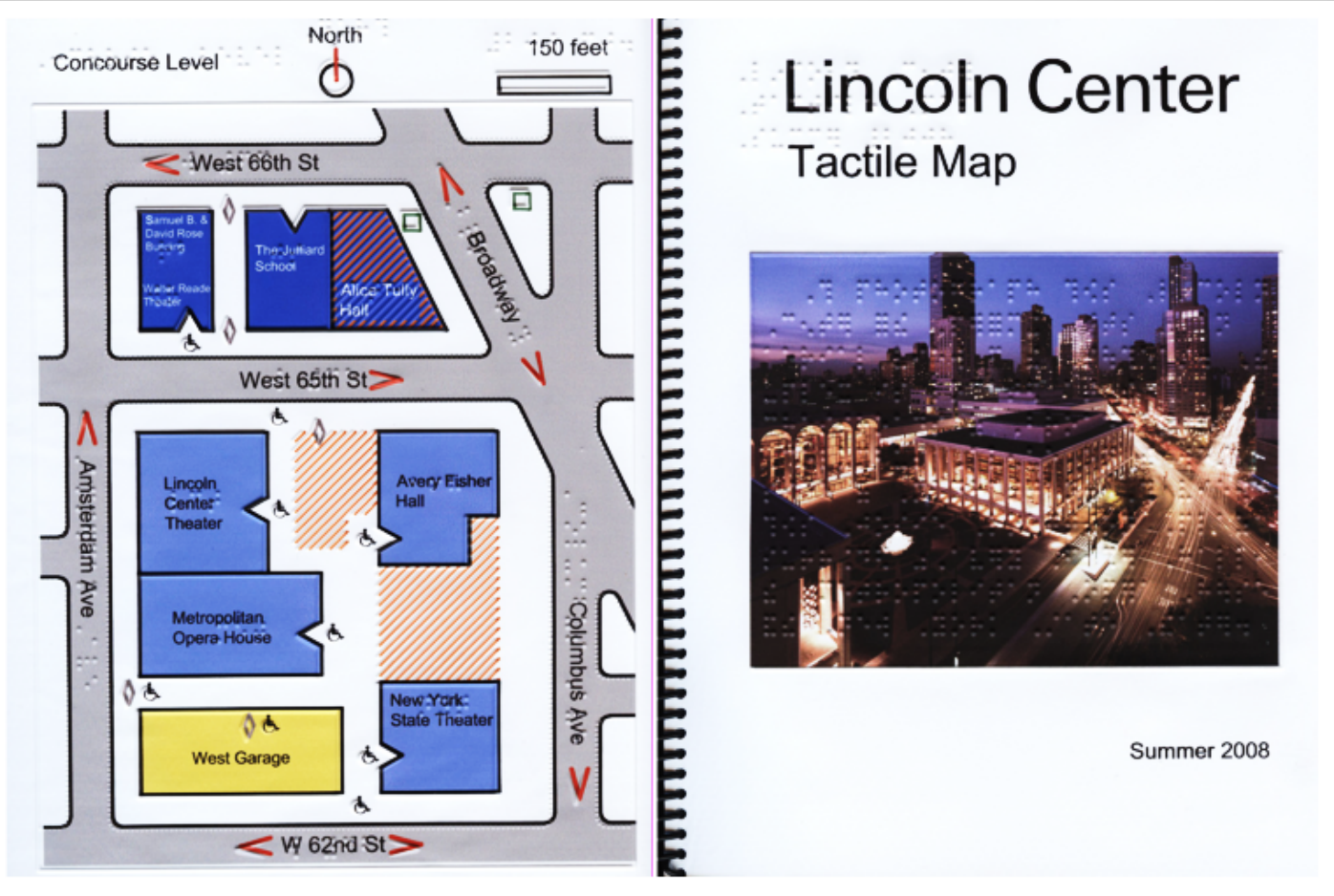
- Vis. Display
- Speech
- Sounds
- Vibration

* Finger gestures



Lincoln Center
Portable Tactile Map

Braille and Raised lines/markings show transit related information, including bus stops.



BART Map:
Portable Audible & 'Embossed' Tactile Map Uses "Smart" Pen

Pen tip reads X/Y code from map surface and speaks related information.

C&O Canal Model:
Audible & Tactile Map

This model of the C&O Canal (located in MD and DC) is both an Audible and three-dimensional Tactile Map

Unlike this static hands-on audible/tactile display, there exists a dynamic model called the “Shape Table” where the three-dimensional structure morphs in real time.

“ADA” Light

Audible construction hazard warning and detour system.

- Easily program your message with built-in microphone and speaker.
- Record up to a 20 second message.
- Customize message for each location.

Loudspeaker System

Step-Hear®
Audible triggering with remote.

Units are installed within the travel environment. The Fob vibrates when you are within range of the speaker. Pressing buttons on the Fob triggers the from the loudspeaker.

Loudspeaker System

Navigator ®
Polara Engineering
Audible Pedestrian Signals

This pole-mounted device has a “Click” type of sound to identify the location of the pushbutton that calls the crossing light.

Visual Paging System

Sky Harbor (Seattle)

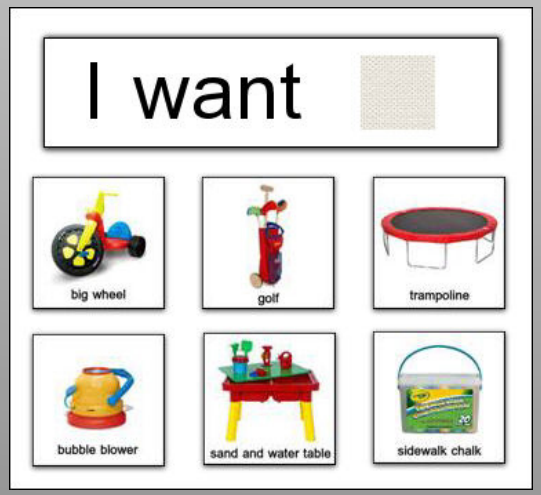
Provides access to audible announcements for people who cannot hear (or cannot hear well).

Pictograms

Pictograms are useful for communication by people with developmental delays, head trauma, dyslexia, Asperger's, and Autism. Imagine how much more information could be communicated (how much less ambiguity) if certain of these pictograms (or new, especially designed ones) were "mini-animations".

Dewey Decimal System – Stack Signage

'Needs' – type PICS®



PICS® (Picture Exchange Communication System)

Impact of new “Location Based Services”

Methods of knowing where your are (more-or-less)

Dead Reckoning – combine step-count with, accelerometer, compass, etc.

Triangulation using Wifi, for example:

- Time of flight mapping – is relatively stable. Measures and computes delay between arrival time of signals from different ‘beacons’ in the environment to give location of the receiver.
- Amplitude mapping – is relatively unstable. Measures and computes differences in signal strength between arrival time of signals from different ‘beacons’ in the environment to give location of the receiver. Due to obstructions and changes in the configuration of the environment the Mapping is very non-linear.

Wireless Emergency Alerting

Richard Ray
ADA Compliance Coordinator
Department of Disability
City of Los Angeles
Co-Chair at FCC - Emergency Access Advisory Committee
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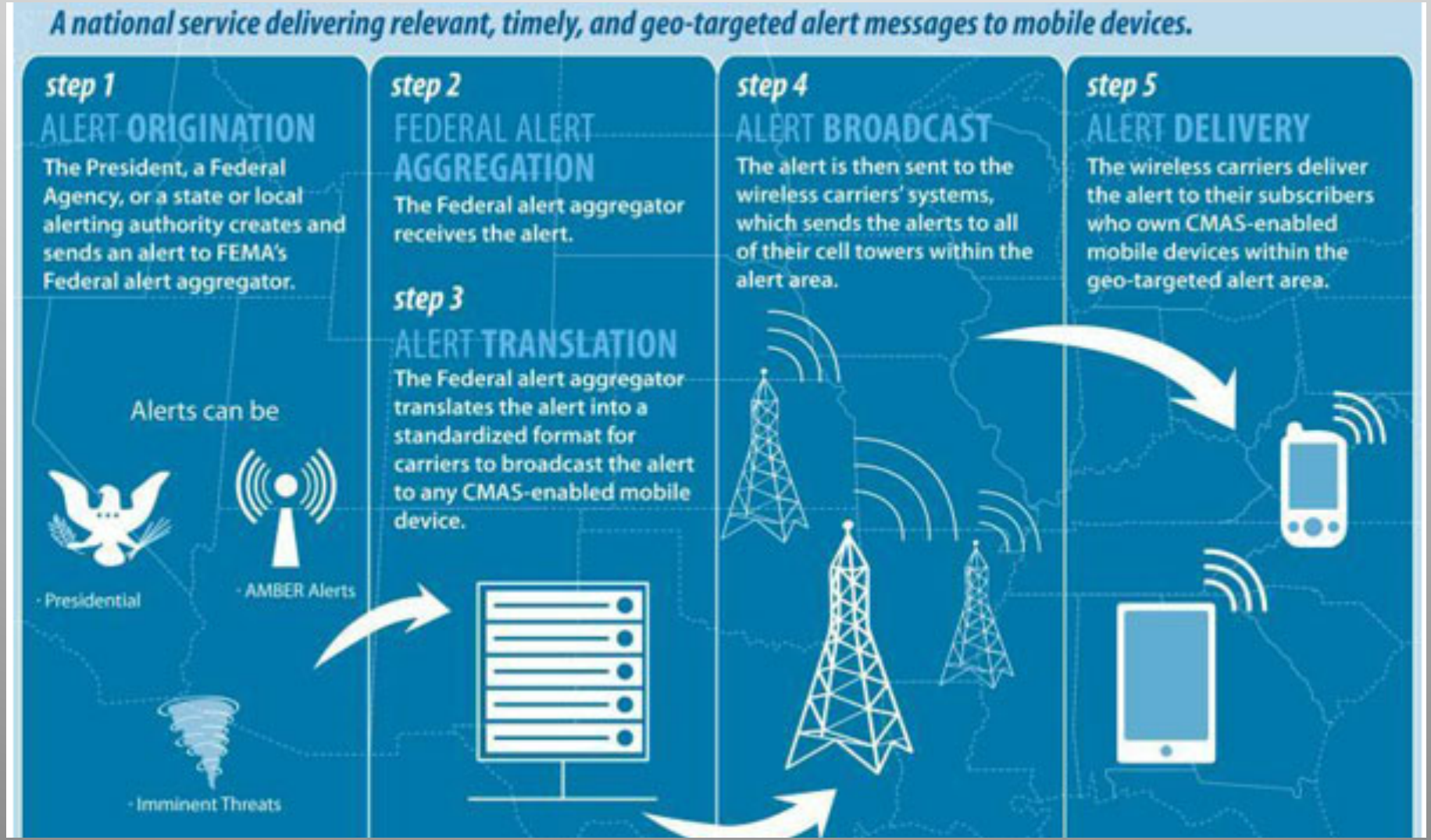
Donna Platt
Emergency Education Program Manager
Seattle, WA
dplatt@hsdc.org

- Access to emergency warning and information is important for the general population as well as for people with disabilities. People are concerned for their safety and rely on siren, television, radio, and telephone for information whenever a crisis or emergency occurs.
- Deaf, Deaf-Blind and Hard of Hearing people are more concerned for their safety due to limited access to emergency warning systems, which are announced audibly.

Current Issues being worked through

- Voice-only emergency warnings
- Limited or no text version websites
- Limited wireless devices with adjusted font size and Braille features
- Limited text-to-voice feature for wireless devices
- Out of geographical boundaries (registered or non-registered)
- Delayed SMS (Short Message Service) delivery
- Text messages being cut off due to limited characters

Wireless Emergency Alert system launched in May, 2012



Wireless Emergency Alert System

now widely deployed in the US

Having secured the participation of all four major carriers and smaller regional operators, the US federal government's Wireless Emergency Alert system, (live in May of 2012), initially is covering nearly 97 percent of active mobile users.

Using a "point-to-multipoint system" that *targets at-risk subscribers*, the National Weather Service, FEMA, FCC and Department of Homeland Security-backed initiative works by sending location-based messages of 90 characters or less to nearby handsets in the event of an imminent meteorological threat. The mostly opt-out service will also accommodate AMBER and Presidential alerts, although you won't have that flexibility for missives sent from our head of state.

‘Take Home’ Message

It’s usual to start a presentation with an abstract definition. I’m bringing this in at the last in order to show the incredibly wide range of uses and meanings.

Gazillion Definitions

A sign can be a simple noun, as in “stop sign,” or a verb, as in “sign off.” It can indicate a specific physical object, such as the sign on a government building reading “Post Office,” or it can be abstract, such as its meaning in the phrase, “It’s a sign of the times. When used as labels, signs tell us not only “What” but also “Where”.

Noun 1. **sign** - a perceptible indication of something not immediately apparent (as a visible clue that something has happened); Clue

2. **sign** - a public display of a message; Poster
3. **sign** - any nonverbal action or gesture that encodes a message; Drumbeat
4. **sign** - structure displaying a board on which advertisements can be posted; Sandwich board
5. **sign** - (astrology) one of 12 equal areas into which the zodiac is divided; Zodiac
6. **sign** - (medicine) any objective evidence of the presence of a disorder or disease; Vital sign
7. **sign** - having an indicated pole (as the distinction between positive and negative electric charges); Polarity
8. **sign** - an event that is experienced as indicating important things to come; Omen
9. **sign** - a gesture that is part of a sign language; Signing
10. **sign** - a fundamental linguistic unit linking a signifier to that which is signified; "The bond between the signifier and the signified is arbitrary"--de Saussure
11. **sign** - a character indicating a relation between quantities; Plus sign

What this diversity means.

This presentation has given a look at the very broad range of strategies used to communicate public information with people having a very broad range of disabilities. Given the very broad standard definitions of “SIGNAGE” or “SIGNS generally meaning:

> *graphic designs, as symbols, emblems, or words, used especially for identification or as a means of giving directions or warning*.” To this list can be added: “information, orientation, regulations, or restrictions”

and the present demonstration of the very diverse developments of signage for the benefit of people with disabilities, isn’t it rather artificial to divide signage up as if there were two of three categories suitable for everyone?

Bottom Line….

Disability is just another dimension under which people can be classified.

And as long as there is no regulation to require accommodation for people who cannot read graphical text signs, in reality what having the class “Accessible Signage” does is allow consideration of implementation to be deferred - excused as an afterthought (“if we have the money left over, but right now we are over-budget and so it might have to wait…”)

That is, we should not have the concept of “a separate kind of signage” for people with disabilities; we need to be lined up behind the broad definitions we already have in order to maximize the number of people benefiting from this public accommodation. Here I’m building the case that “Accessible Signage” is just one of hundreds of different kinds of signs.

End