MobileAccessibility

Chandrika Jayant
University of Washington, Seattle
Advised by Professor Richard Ladner

motivation

Mainstream cell phones becoming more powerful and sensor-driven

+

Web services becoming more prevalent (human and automated)

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Access & independence for blind, low-vision, deaf-blind users on the go

overview

- Background
- MobileAccessibility Project & HCI Challenges
- Camera Focalization
- Project Ideas
- Getting Started with Android
- Questions

background

Blind, low-vision, deaf-blind users left out of the *mobile revolution*

Need for low-cost assistive services for *mainstream mobile devices*

GOAL: Mobile Phone as Portable Accessibility Tool

improve cost, sustainability, and adoption

motivating scenarios

Which door is the ladies' bathroom?

Am I at my destination bus stop yet?

What brand of cereal is this?

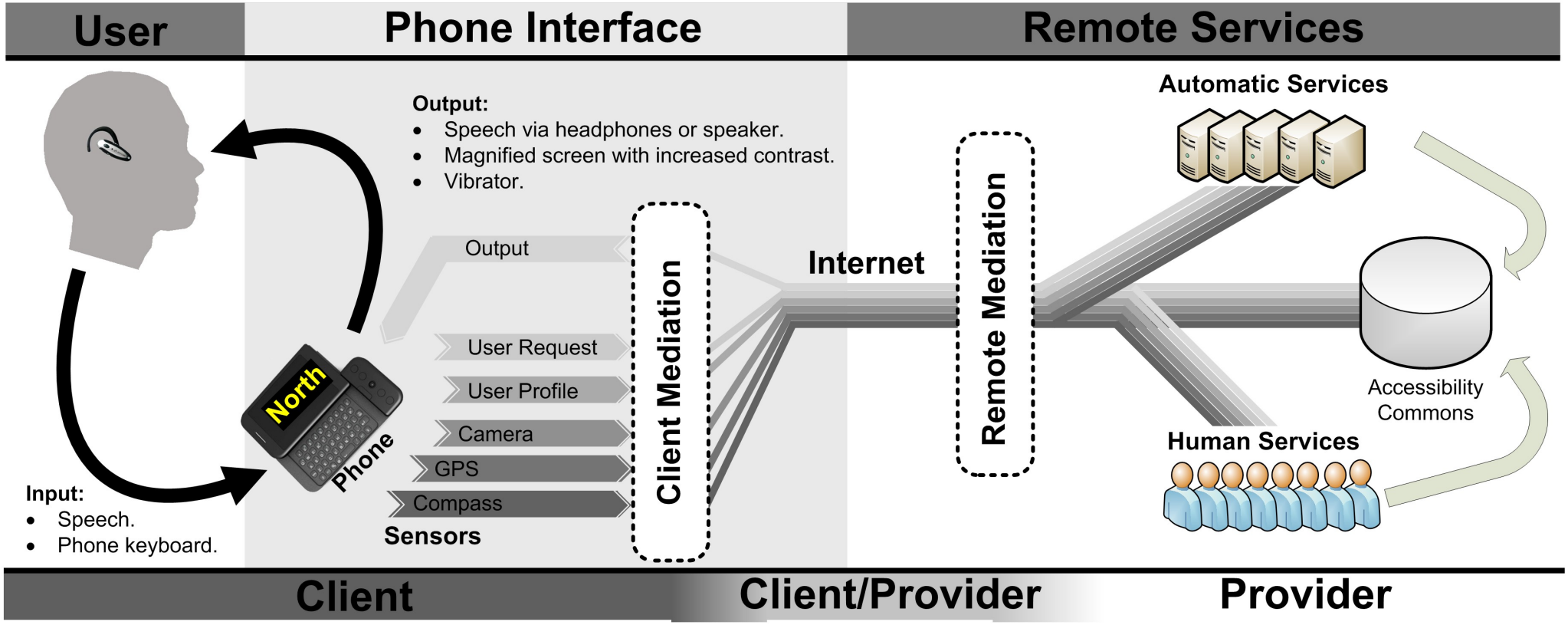
I need to find my other red sock.

What is my thermostat set to?

What appetizers do they have here?

How do I walk to the Suzzallo Library from here?

framework


User
Phone Interface
Remote Services
Output:
• Speech via headphones or speaker.
• Magnified screen with increased contrast.
• Vibrator.
Output
User Request
User Profile
Camera
GPS
Compass
Sensors
Client Mediation
Internet
Remote Mediation
Automatic Services
Accessibility Commons
Human Services
North
Phone
Input:
• Speech.
• Phone keyboard.
Client
Client/Provider
Provider

mobileaccessibility

Design and Evaluate:

(i) intelligent, multi-modal, mixed-initiative client interfaces to the phone

(ii) Intuitive interfaces for human web service providers for adequate latency and quality

(iii) mediating interfaces between clients and remote services

web services

- Mechanical Turk
- Volunteers
- Automatic + Fallback- Hybrid
- Common Repository
- Studies
  - Scope of requests
  - Intuitiveness, speed, accuracy, and feasability
  - Try to find some baselines

platform

- Android G1
  - More phones rolling out (DROID)
  - Open platform
  - Easier to develop on than iPhone
- Text to Speech API
  - Eyes-Free Shell (VoiceOver for iPhone)

prototypes

- Barcode reader (building on zxing)
- Location finder
- Color recognizer/ color scanner
- One Bus Away
- iPhone GPS navigation for low-vision (iWalk)

- Possible benefits from leveraging more vision

my focus

Semi-autonomous focalization + Camera interaction techniques

Allow blind and low-vision people to successfully use their cameras to provide the necessary information to an application/service to reach their goal

related projects

- KNFBReader Mobile
- Prototype for camera for blind
- Sensecam
- Touch Screens
- Talking Signs
- Touch Sight
- vOICe

usage scenarios

- Reading a menu, currency, documents
- Finding a lost object
- Getting product information
- Enhancing travel information
- Reading environmental text in buildings
- Reading street signs
- Taking well-framed photos
- Art
- Alerting user of pre-expressed interests
- Recognizing faces

camera focalization

- Need real-time interaction
- Field of view and location information
- On board computer vision or remote service
- Snapshot or scanning
- Lower resolution (esp. with video)
- Blur
- Perspective distortion
- Complex backgrounds
- Not ok with regular OCR

camera focalization

Development of prototypes and studies

- kNFB Reader
- OCR with human/auto web service
- Barcode reader with remote information
- Find the red ball in the room

interactions

- Template/ pattern matching
  - General
- Object recognition in environment
  - Specific

- Device-driven with interrupts, or
- Actively queried

user-centered design

- Qualitative and quantitative feedback
- Lighthouse for the Blind
- Deaf-blind community classes at SCCC
- National Federation for the Blind

- Students with disabilities recruited to participate in work directly affecting them

value-sensitive design

- Direct and indirect stakeholders- identify
- Benefits and harms for each stakeholder group
- Relationship to corresponding values
- Conceptual investigation of key values
- Identify potential value conflicts

(Friedman et. al. '06)

longer term goals

- Successful and growing repository
- Enlarge user base
- Make easy for developers to add, share, and iterate on applications (that includes you!)
- Sustainability

project ideas

- One Bus Away- detect location on bus route
- Sound sensor for the deaf-blind
- Bluetooth between cell phone & braille display
- V-Braille
- OCR testing in the wild
- Mechanical Turk studies
- Focalization

project ideas

- Walking Directions
- Track travel with google maps and GPS
- Speech recognition for deaf users
- 911 canned messages for emergencies for deaf people.
- Touch screens/ ATMs

android

- Develop! Download SDK.
  - G1 or Emulator
  - Eclipse, Ant
  - http://developer.android.com/index.html
- Text to Speech API
- Native Code (NDK)
- Our Code Repository
  - http://code.google.com/p/mobileaccessibility/
- ADC next year

discussion

http://mobileaccessibility.cs.washington.edu

http://cs.washington.edu/homes/cjayant

email: cjayant@cs.washington.edu