

Incorporating Information from Trusted Sources to Enhance Urban Navigation for Blind Travelers

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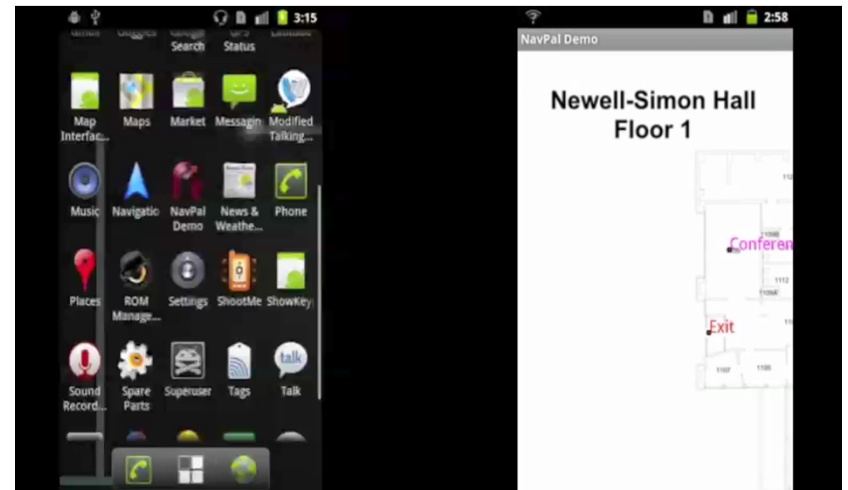
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MOTIVATION

- ❑ 285 million people are visually impaired in the world
- ❑ Dynamic changes in unfamiliar environments can make safe and independent urban navigation a challenge
- ❑ Developing NavPal suite of technology tools



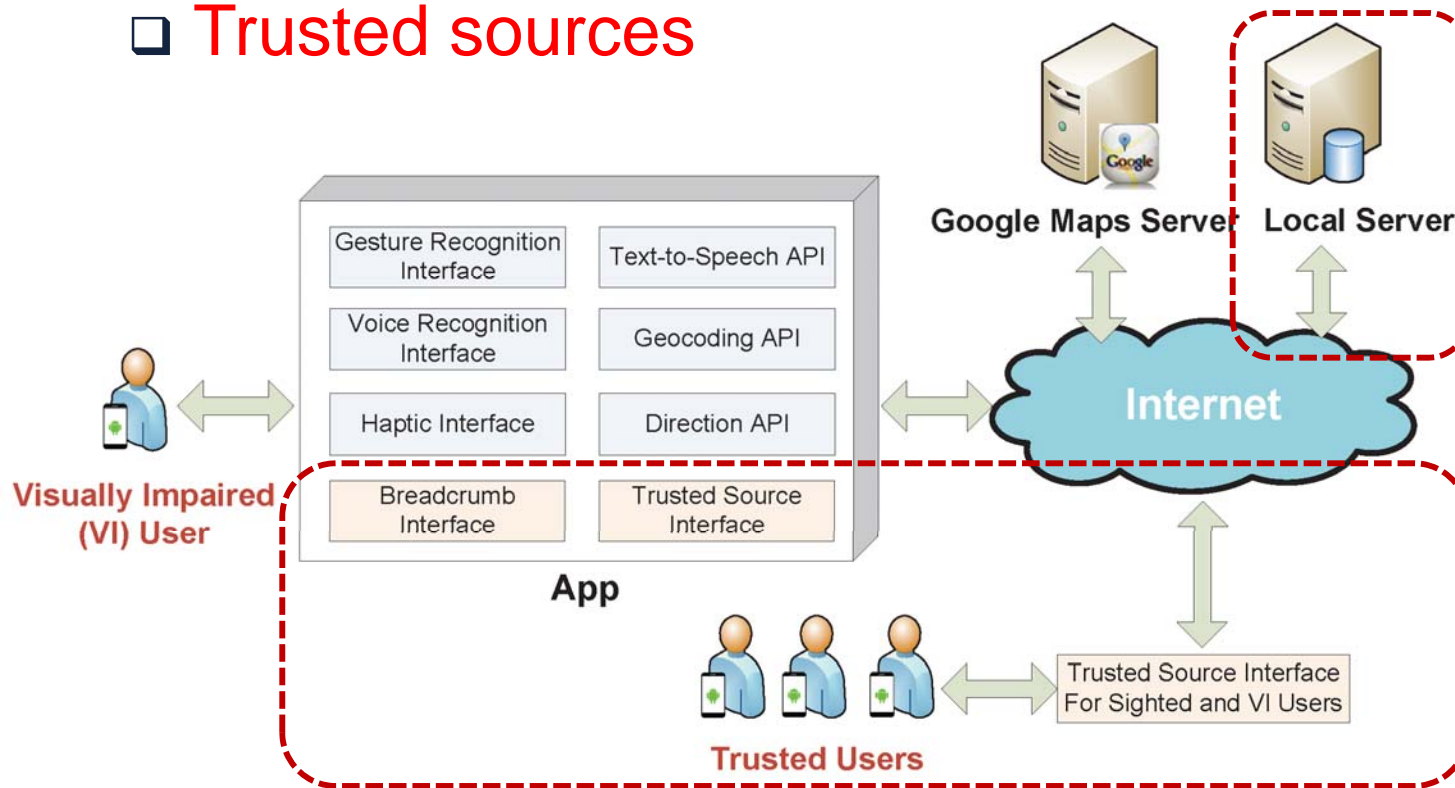
Strategies blind travelers utilize to navigate



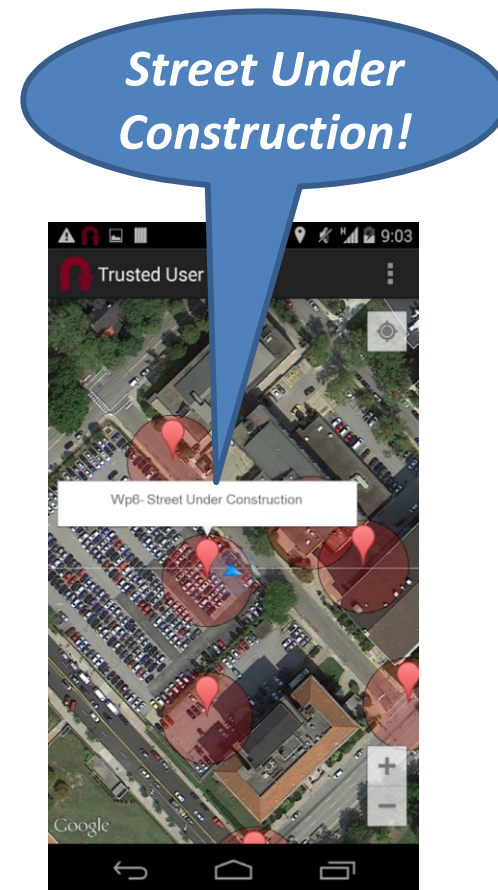
Demonstration of NavPal indoor app

RESEARCH GOAL

- Introduce a mechanism for blind travelers to enhance the performance of a smartphone-based navigation tool by
 - Breadcrumb annotations
 - Trusted sources



System Architecture



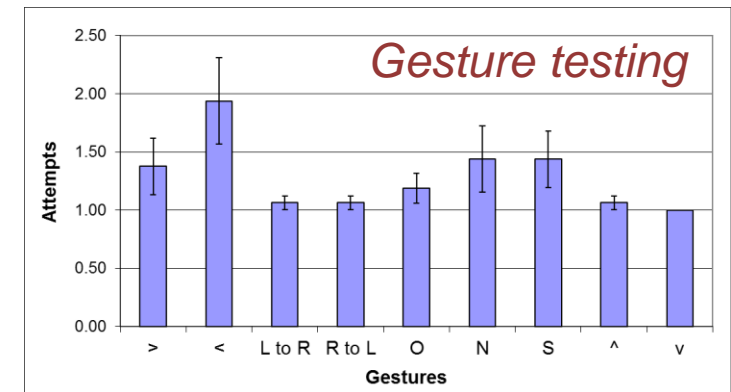
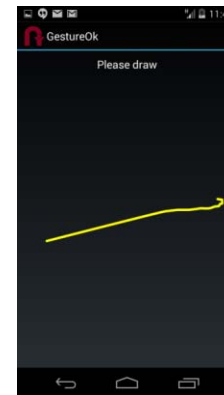
Example of useful annotation added

ITERATIVE DESIGN

- ❑ Developed a prototype Android smartphone app
- ❑ Conducted with 4 participants (3 blind; 1 visually impaired)



Iterative study with a participant who is blind



Participant	Test 1		Test 2 (2)
	(n=3)	(3)	
P1	3	3	2
P2	1	2	2
P3	2	3	2
P4	0	2	-
Average	1.5	2.5	2

Usability studies

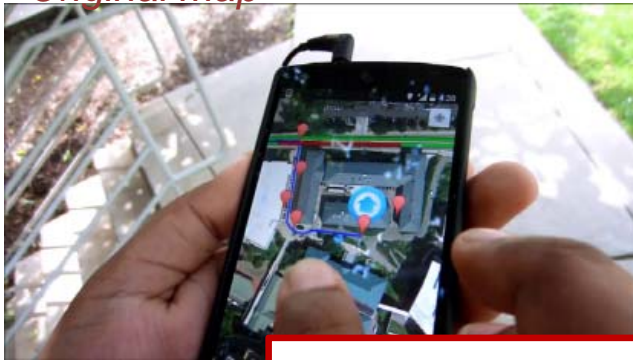
Participant /Item	[a] Speech	[b] Voice	[c] Gesture	[d] Overall
P1	5	4	5	9
P2	5	3	5	8
P3	4	4	5	9
P4	2	4	4	6
Average	4	3.75	4.5	8

User score on the app

USE-CASE SCENARIO

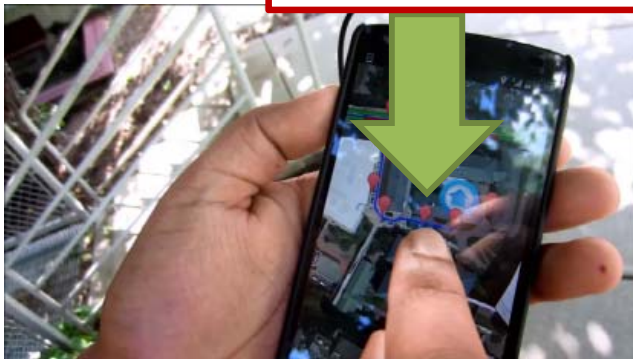
❑ Audio Breadcrumbs

Original map



**Breadcrumb
annotation added**

Updated map



TREES



Demonstration of audio breadcrumbs

USE-CASE SCENARIO

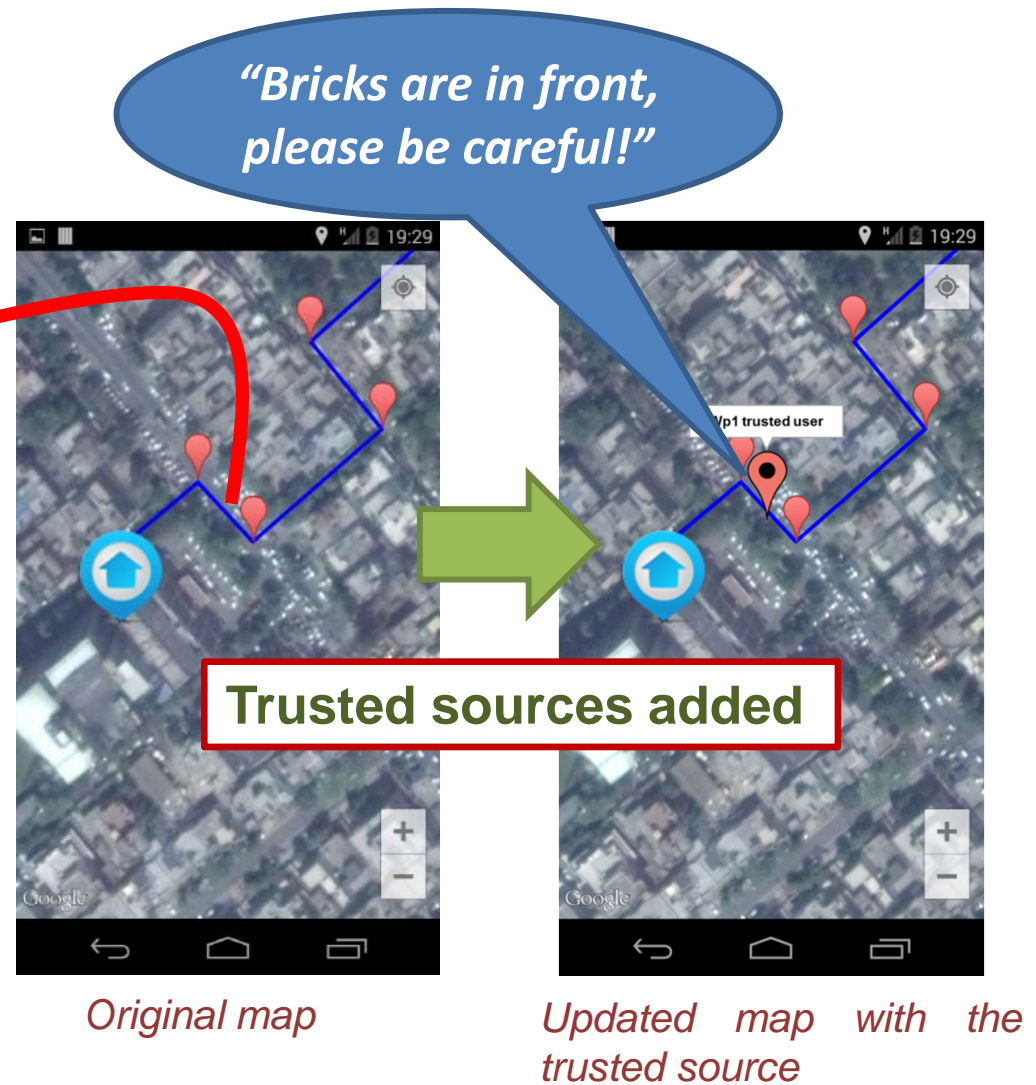
❑ Trusted Sources



Unexpected situation – house under construction



Debris over the sidewalk



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