

Grocery Shopping Assistant for the Blind/Visually Impaired (GroZi)



By: Grace Sze-en Foo

TIES Intern (Summer 2009)



“....The real problem of blindness is not the loss of eyesight.

*The real problem
is the misunderstanding and lack of
information that exist.*

*If a blind person
has proper training and opportunity,
blindness can be reduced to a physical
nuisance....”*

What is GroZi

- 10 million blind and visually impaired people live in the U.S (*American Foundation for the Blind*)
- Goal:
 - empower blind/visually impaired individuals to shop at their own convenience and privacy using computer vision.



Previous Work

- Winter 07
 - Creation of blind-accessible web interface that allows users to create a shopping list.

Previous Work



Remote Sighted Guide (RSG),
audio commands

ion and

rs

Previous Work

- Winter 08
 - Replaced Fall 08 prototype with wristbands with motors attached.

Previous Work

-



- Fall 08 & winter 09

-



ot



ors

Grid. C
or label



base and

Previous Work

- Winter 08
 - Replaced Fall 08 prototype with wristbands with motors attached.
- Fall 08 & Winter 09
 - Creation of Soylent Grid. Customized database and user interface (UI) for labeling products.

Previous Work

- Winter 08

- Rep
 - atta



- Fall 0

- Cre
 - use

th motors

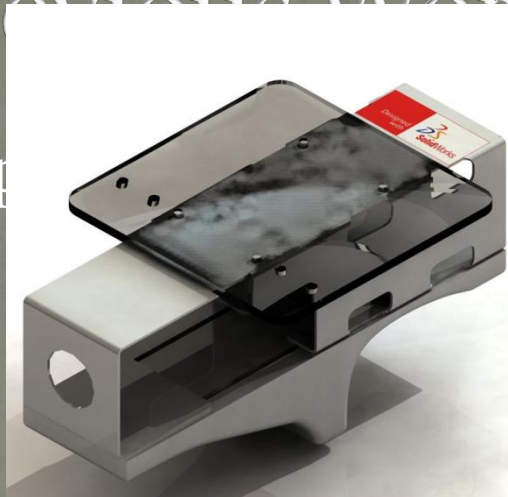
se and

Previous Work

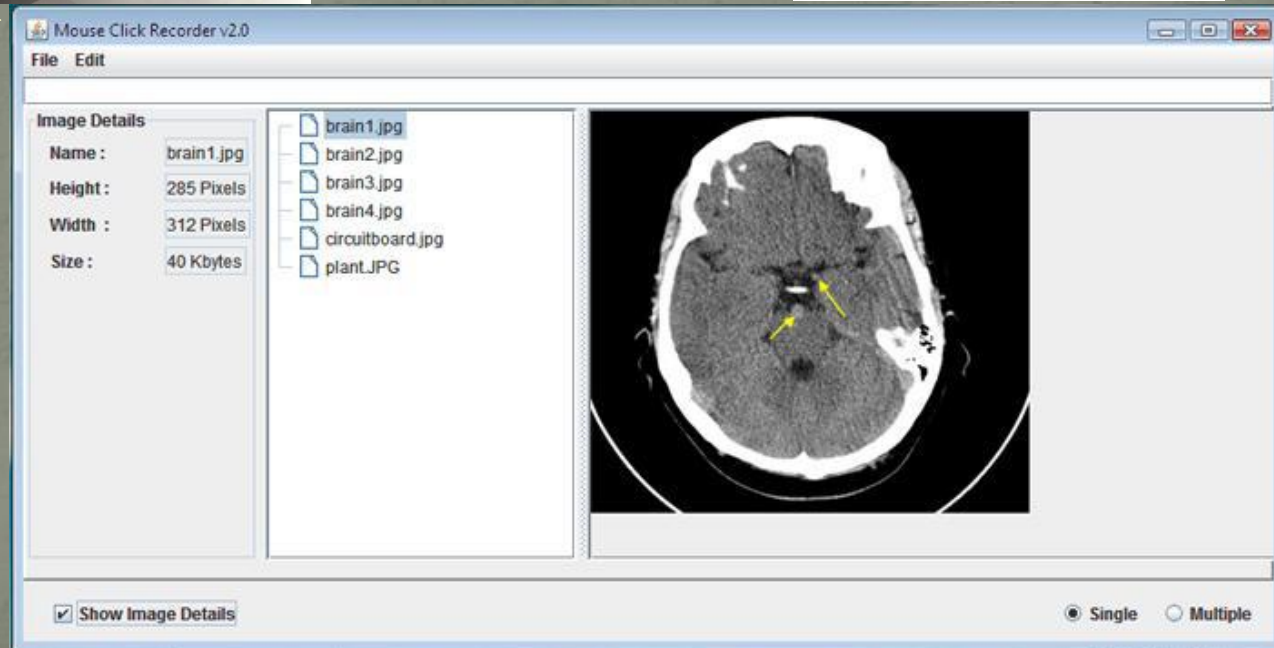
- Spring 09
 - Mechanical design & creation of software to control wiimote.
 - Mouse-Click Recorder Program that allows review of digital images.

Previous Work

- Sp



digital



Summer 2009



The Team



Supervisor:
Dr. Serge Belongie



Client:
Dr. John Miller



Grace Sze-en Foo



Masaaki Kokawa



Jeffrey Wurzbach



Tommy Mueller

Goals for Summer

- Implement a Remote Sighted Guide (RSG)
 - Audio
 - Haptic (Vibration)

No.	Stage	By	Using
0	John walks into store		
1	Aisle	Reading aisle signs	Audio/Speech Synthesis
2	Locate Product Shelf	Object detection	Audio/Tactile Alert
3***	Approximate product location	Object detection*	Spatial Audio
4	Detailed product location	Object tracking	<u>Haptics</u>
5	<i>Cue to stop moving</i>	<i>Object detection</i>	<i>Audio Alert</i>
6	Product Confirmation	Bar code or detailed object recognition	Audio/Speech Synthesis

* Assumes that the participant is standing still, in front of the product shelf.

*** Stage where the experiment takes place.

Set Up



CAMERA

WIIMOTE

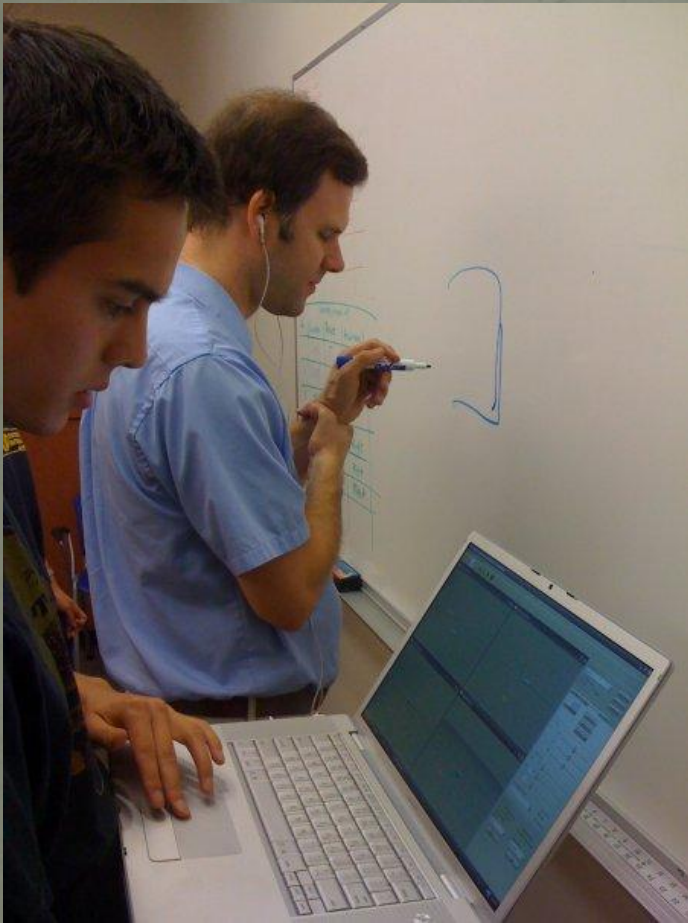
GLOVE WITH IR LED



REMOTE SIGHTED GUIDE
(RSG)



Spatialized Audio



- Sound processed to give the listener the impression of a sound source within a three-dimensional environment.
- Relatively new technology.
- Used in Stage 3 to provide approximate location of product on the product shelf.

Cameras



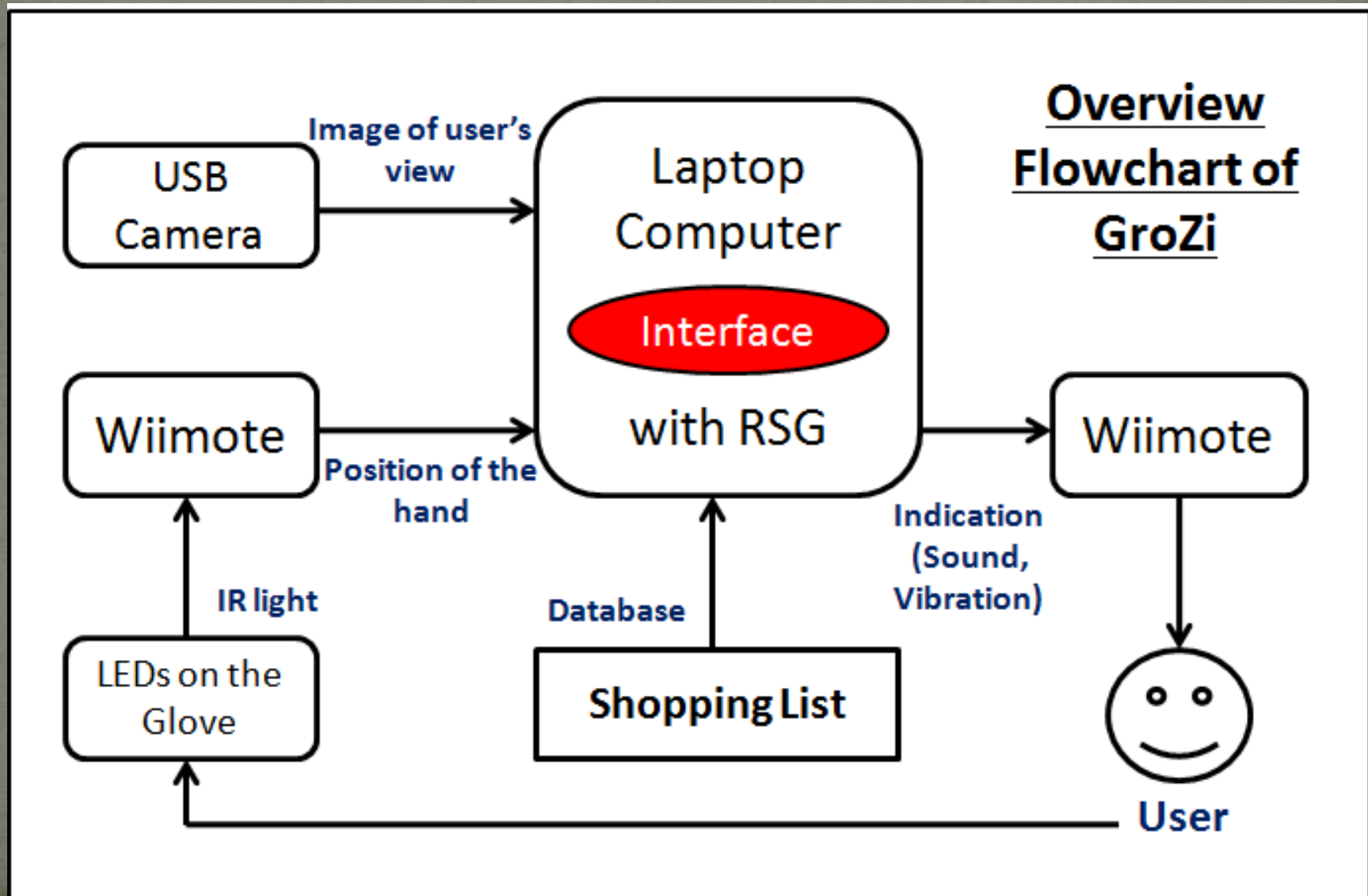
- Initially
 - Wireless analog camera
 - Radio frequency (RF) transmission.
 - VGA/RCA feed.
- Finalized camera
 - Microsoft LifeCam VX-6000
 - OpenCV compatible
 - Stable USB connection
 - High resolution

Wiimote

- Primary functions harnessed by GroZi :
 - Vibration
 - IR Sensor
 - Basic Audio
- Tasks:
 - Audio Sampling Rate (Audacity)
 - Created software implementable by the Remote Sighted Guide interface
 - Provided audio cues for the 7 stages.



Remote Sighted Guide (RSG)



John @ GroZi's store * TIME: 18:18:21 * DATE: 2009/09/02



Interface of Remote Sighted Guide (RSG) @ GroZi

Ver. 0.32
Programmed by
Masaaki Kokawa
09/02/09

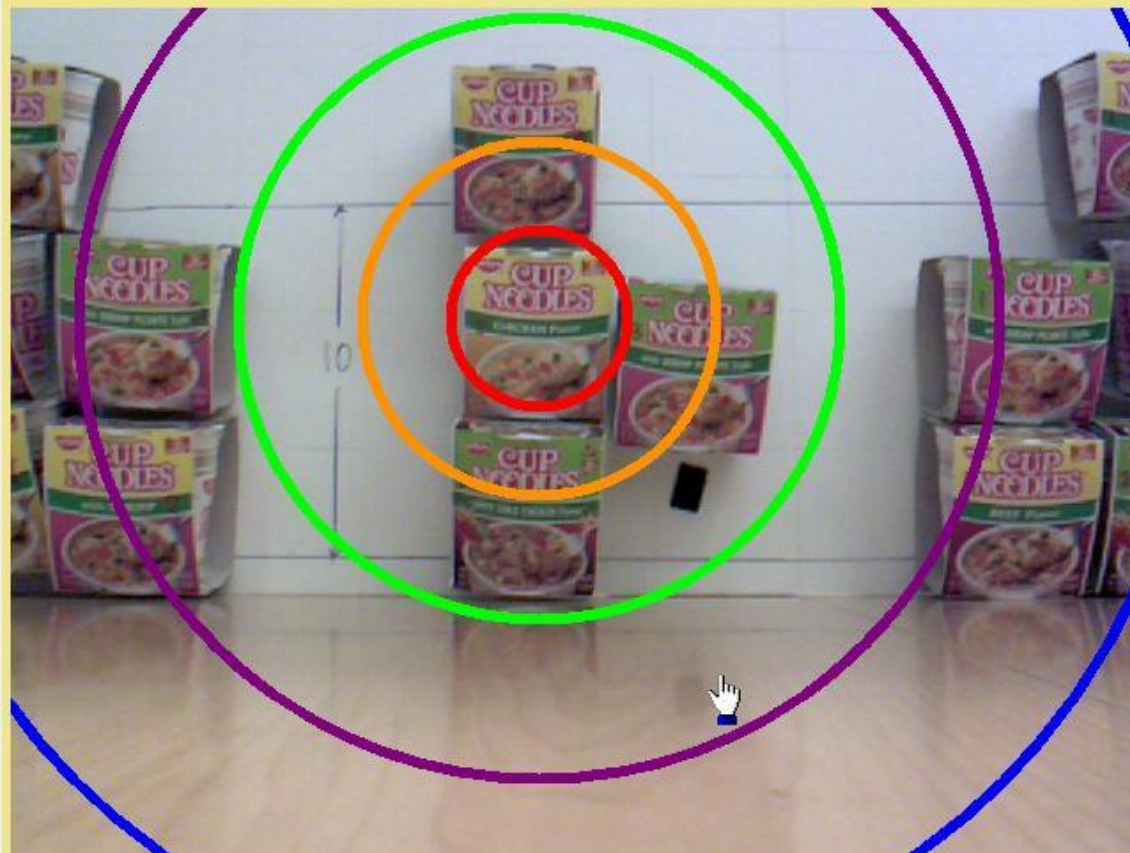
**Push
Start!
Button**

Start!

Target
Setting

Clear

John @ GroZi's store * TIME: 18:20:23 * DATE: 2009/09/02



Ver. 0.32
Programmed by
Masaaki Kokawa
09/02/09

Target:
303,
260

Upper Left

Start!

Target
Setting

Clear

Personal Touch

- Been working on the project since January
- Learnt a tremendous amount
- Gratifying to see progress of project
- Motivation and cultivation of a heart for service engineering
- Immensely impressed with TIES program and would love it if I could bring it back with me to Australia/Malaysia.



Summary

- GroZi is an innovative shopping assistant designed for the blind/visually impaired.
- Summer accomplishments:
 - Investigated feasibility of using spatialized audio.
 - Packaged wiimote functions for easy integration in the RSG interface
 - Finalized choice of camera
 - Implemented an RSG interface

Demos

- Spatialized Audio
 - ❖ <http://www.qsound.com/demos/london-tour.htm>
 - ❖ <http://listenwithyourownears.com/3d-audio-demo-showdown/>
- Wiimote functionality
- Remote Sighted Guide (RSG)