Blind Assist – Intel Cup 1

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Background – The competition

- Cornell Cup
  - Based upon very successful Intel Cup China (attracts 26,000 students)
  - College-level embedded design competition
  - Teams of 3-5 Students
  - Atom board and $2500 provided to teams with successful applications
- Task
  - Design, build prototype and present any innovative application of embedded technology

Background

- 284M people visually impaired, 39M blind (World Health Organization, 2011)

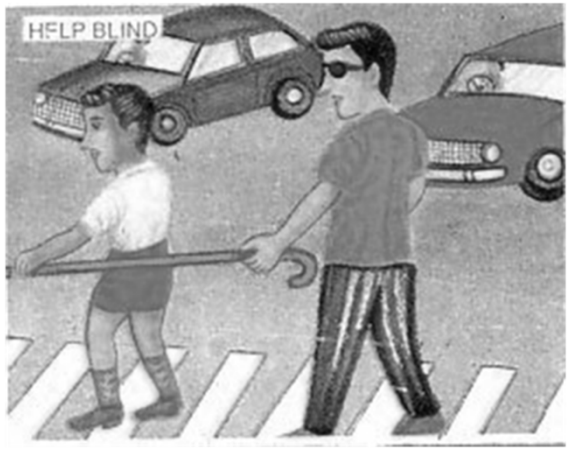
- Limitations and challenges of blind individuals
  - Lack of surrounding awareness (safety concerns)
  - Lack access to information

- Primary focus
  - Navigation assistance
  - Obstacle avoidance

MORE INDEPENDENCE, BETTER LIVING!

Background

HOW DO THE VISUALLY IMPAIRED GET AROUND?



WHAT ARE THE POSSIBILITIES?

Problem Definition

- Visually impaired individuals lack the ability to completely perceive their immediate surroundings which has potential safety concerns and lowers quality of life when they try to get around.

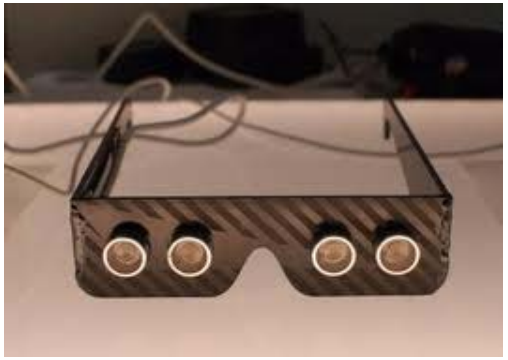
Design Needs

- An appropriate solution will be:
  - A portable device that assists blind individuals with navigation to new locations and helps avoid obstacles in their path
- Device should be able to:
  - Provide turn by turn directions to locations
  - Alert user of obstacles in their path and increase alert as user gets closer to obstacle
- The device is not designed to:
  - To be used indoors
  - Replace a guide dog or walking cane

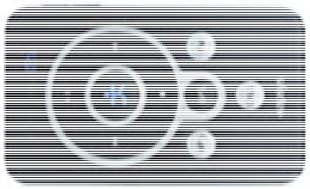
Current Status of Art

- Trekker – Talking GPS ($929)

- Wufu – sensors on glasses



- Kapten Plus GPS $299 (talking GPS) MP3, voice recorder



- HandGuide $79
  - Talking Compass
  - Obstacle detection

- **Draw back with devices above**
  - None of the devices performs both navigation and obstacle alert

Design Requirements

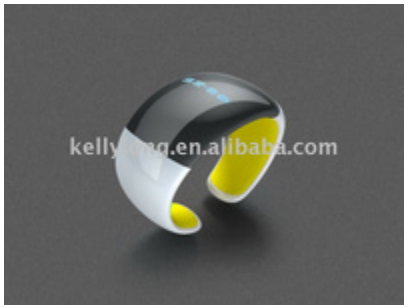
Function	Requirements
Identification of drop zones/topography	• Alert when change in height is 5 inches or more Standard staircase: 7.5 – 8.7inches, Curb: 5-7inches
Upcoming hazard/obstacle alert	• Alert user once upcoming object is 3ft away
Direction to location	• Device should provide directions to the location and user within 40ft of the location (GPS accurate to 10meters (33ft) 95% of the time)
Power	• Battery should last at least 5 hours on continuous use • Standby power should be 2 days
Portability	• Main device should weigh less than 5lbs • Main device must be less than 12 x 8 x 4 inches

Proposed Solution

Distance sensors on glasses

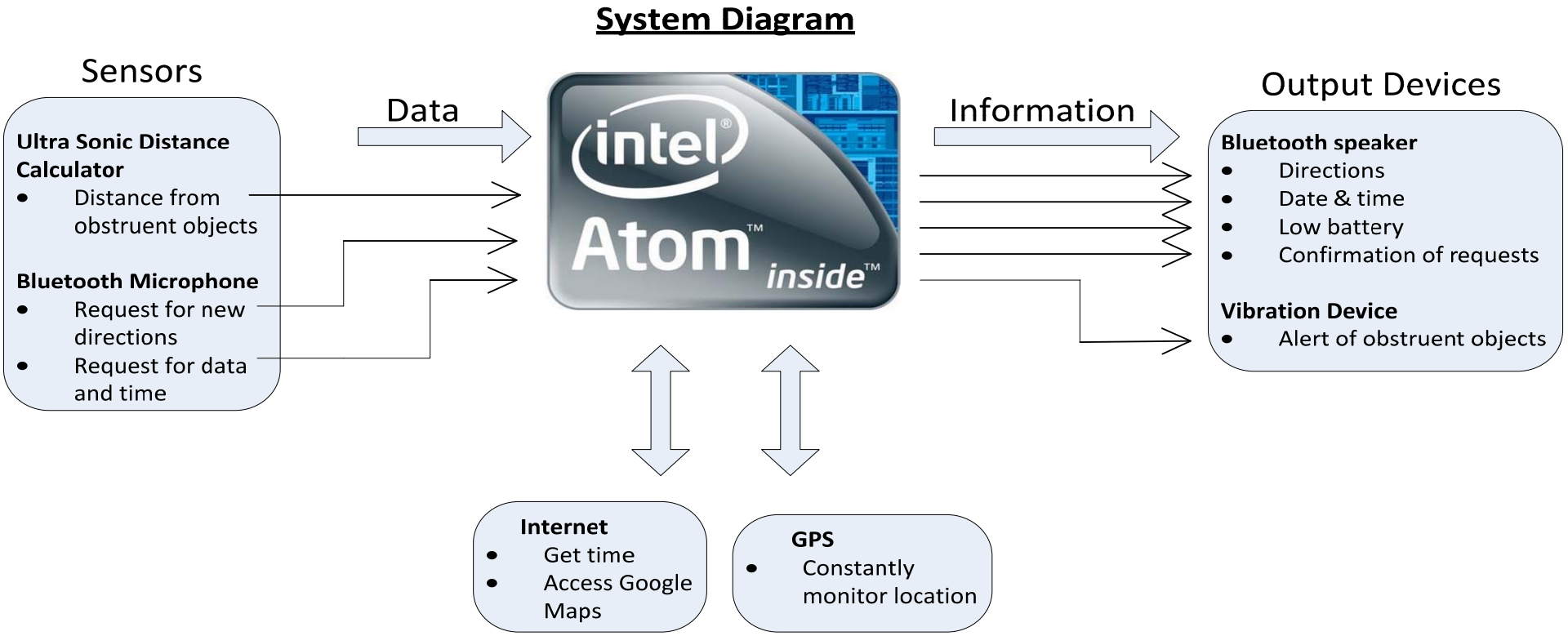
Bluetooth transceiver

Device and battery in backpack



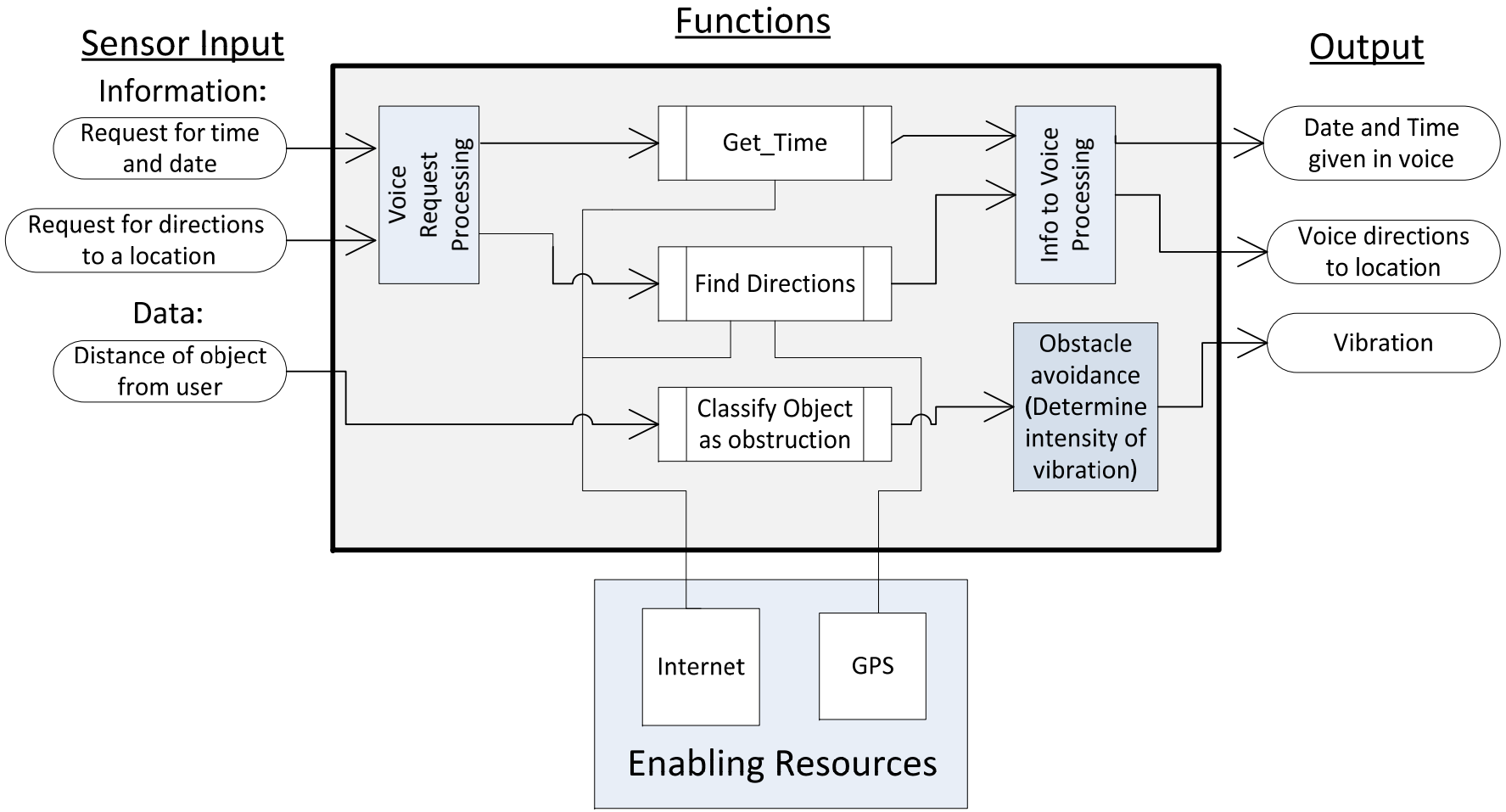
Wrist vibrators

Proposed Solution



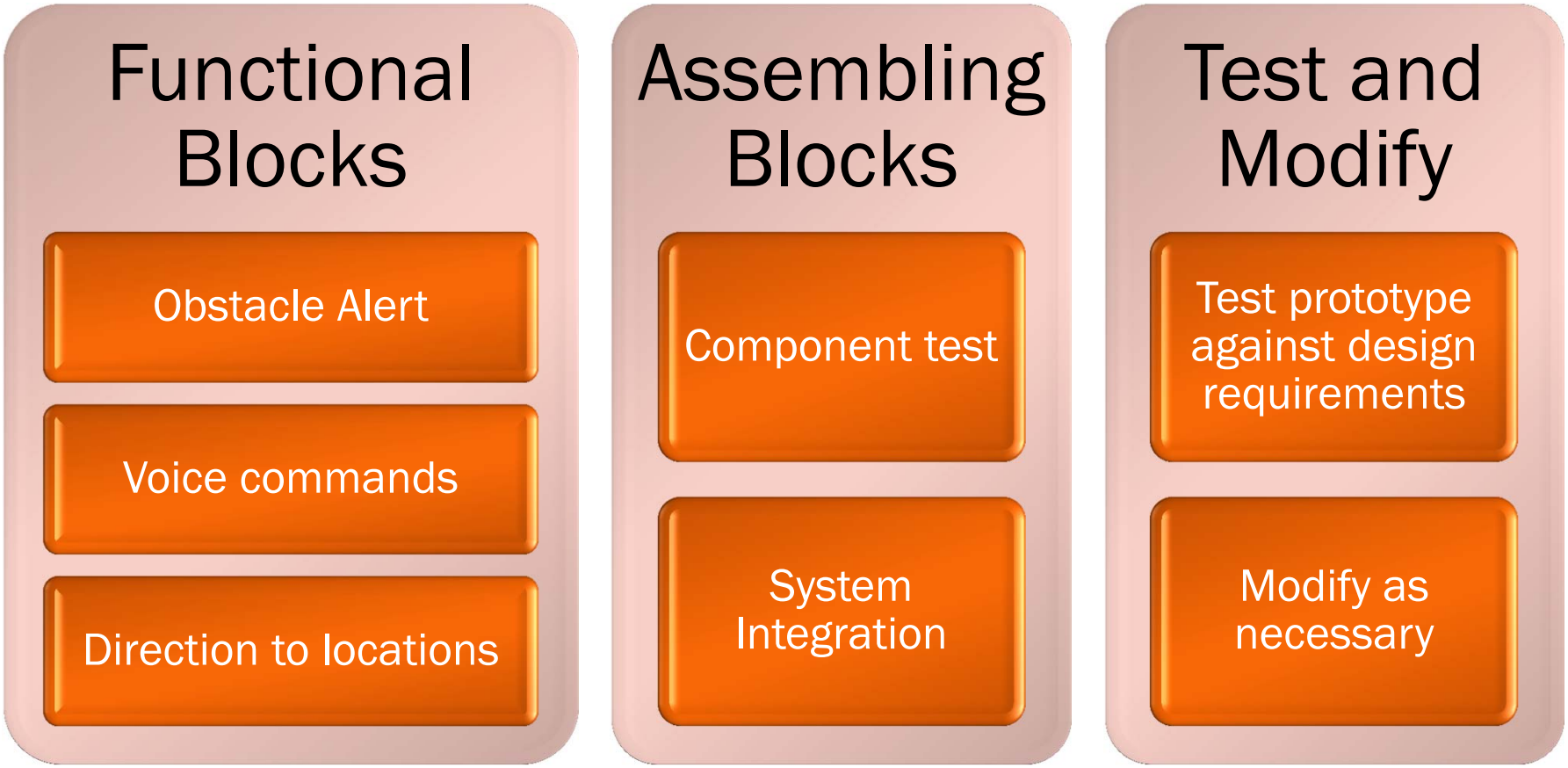
Proposed solution

Atom Software Functions



Systematic Approach

- Explore and learn about ATOM processor



Tasks and Project Management

Time Period	*Tasks*	*Deliverables*
November 2011	Learn atom processor	Know strengths, limitations, compatibility
December 2011 and January 2012	Commence in formulation of functional blocks	Obstacle Alert. Voice commands, Directions to Locations
February 2012	System Integration	Plan and assemble for synchronous operation after component test
March 2012	Test prototype	Test subsystems and device meet requirements
April 2012	Modify device	Make changes for satisfactory performance
April to Mid May 2012	Develop final report and presentation for Intel Cup	Present at competition and EECE day

Costs and Resources

Parts

Intel Atom Board - $200 (supplied)
High Quality Sonar Ranger - $40
Bluetooth Headset - $80
Vibration Modules - $20 (4 units)
GPS Receiver - $40
GSM Transceiver - $50
Assembly components - $200

Total Required - $430

Resources

Voice synthesis software

Programming language

(C/C++/Java)

Open GPS Software

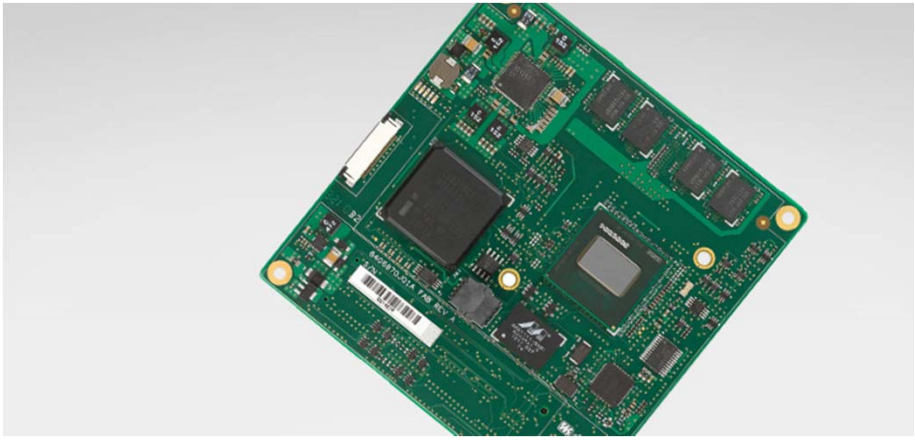
Conclusion

- Developing a blind assistant device is definitely feasible as long as we stick to our timeline, so that if/when we run into an unexpected issue we will have enough time to work through it and still deliver our product to the Cornell Cup expo.

Questions

Appendix

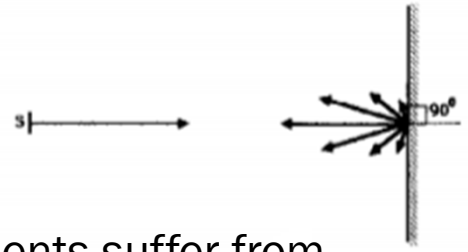
- Intel Atom is brand for ultra low voltage microprocessors
- Fabricated in 45 nm CMOS
- Used in embedded applications; IP techs
- I/O port with HT technology enabling
- Tunnel Creek of 2nd generation Intel microprocessor
- 95x95 mm

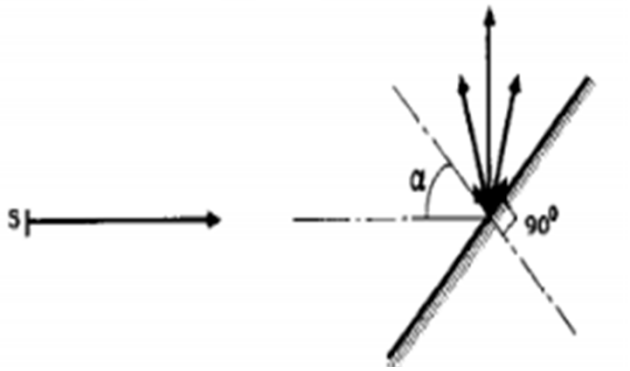


Appendix – Sonar technology

A Sonar sensor emits a sonic pulse and then waits for the returned echo reflecting off an object. The pulse is emitted by a transducer which converts between electrical, mechanical, and sonic energy. The time between the sent pulse and the returned echo is used to calculate distance.

Distance = Elapsed-Time x Speed-Of-Sound /2





Ultrasonic range measurements suffer from some fundamental drawbacks which limit its usefulness and accuracy. These disadvantages are not related to a specific model or manufacture but limited by the nature of their wavelengths and materials interactions. From figure 6, the reflections of the sound waves on a smooth surface perpendicular to the wave's direction results in full reflection of the sound waves back to the unit. [7]