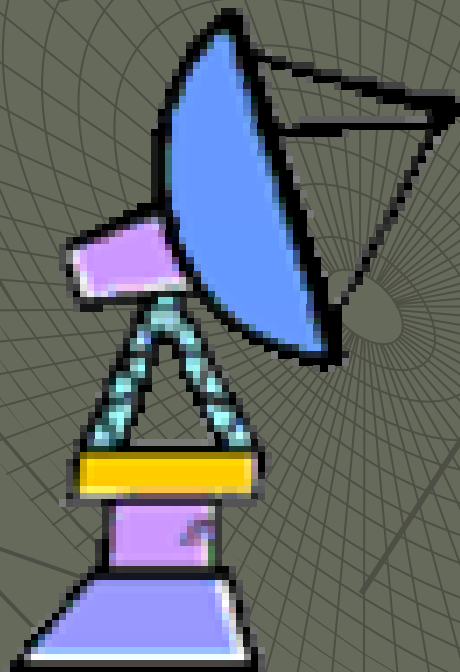


Local Navigation System

Anshuman Panda
Luis Sampedro
Boris Voynik

Group 5
ME 3484



Presentation Overview

- ◆ Objective
- ◆ Introduction
- ◆ Restrictions/Assumptions
- ◆ IC Chips, Sensors, and Actuators
- ◆ Circuits and Maps
- ◆ Demos (5th Floor and Vector Addition)
- ◆ Testing Results
- ◆ PBasic 2.1 Code
- ◆ Problems
- ◆ Cost Estimation
- ◆ Future Plans
- ◆ Conclusion

Objective

- ◆ To build cost effective and reliable local positioning device for blind and elderly. . . .
- ◆ Navigation Aid for blind, elderly, and other groups in:
 - hospitals
 - big buildings
 - campuses
 - museums

Introduction



◆ Underlying Idea

- Vector Addition
- Conversion of Polar to Cartesian coordinates

◆ Concepts

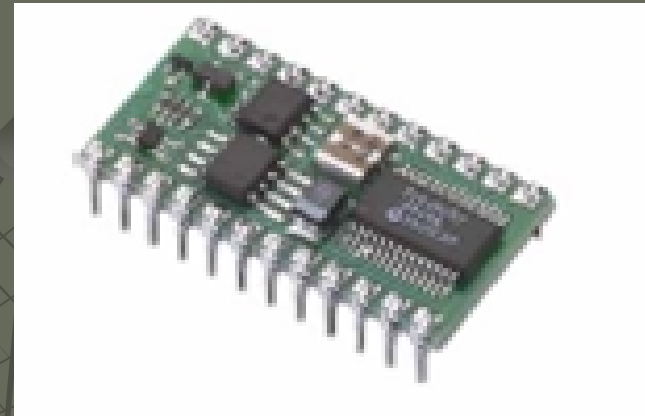
- Position of the user is continuously monitored

Restrictions/Assumptions

- ◆ Shortest path has been calculated and the following data are provided:
 - X-Y coordinates of the check points
 - Referenced Angles
- ◆ Step size of the person is known
- ◆ Path are straight lines
- ◆ Device cannot be operated near any source of magnetic field

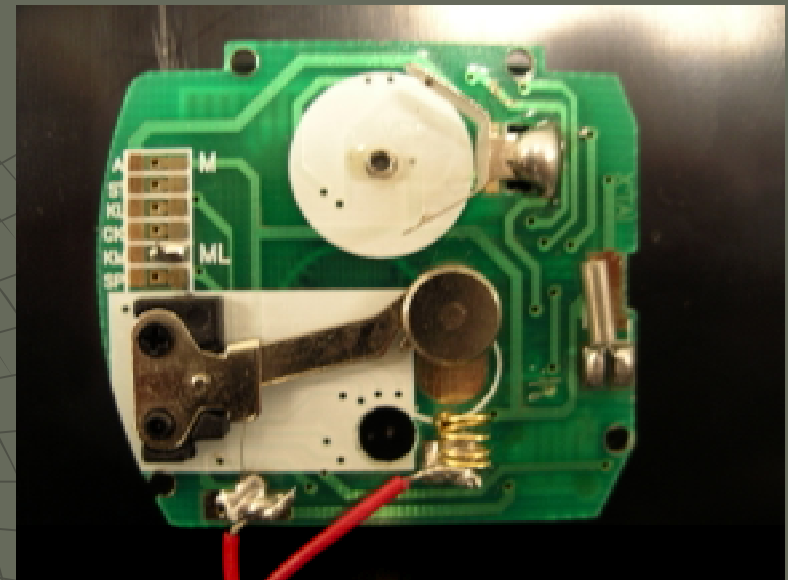
Integrated Circuit Chips

- ◆ BASIC Stamp Module – BS2
- ◆ CMPS03 Compass Module

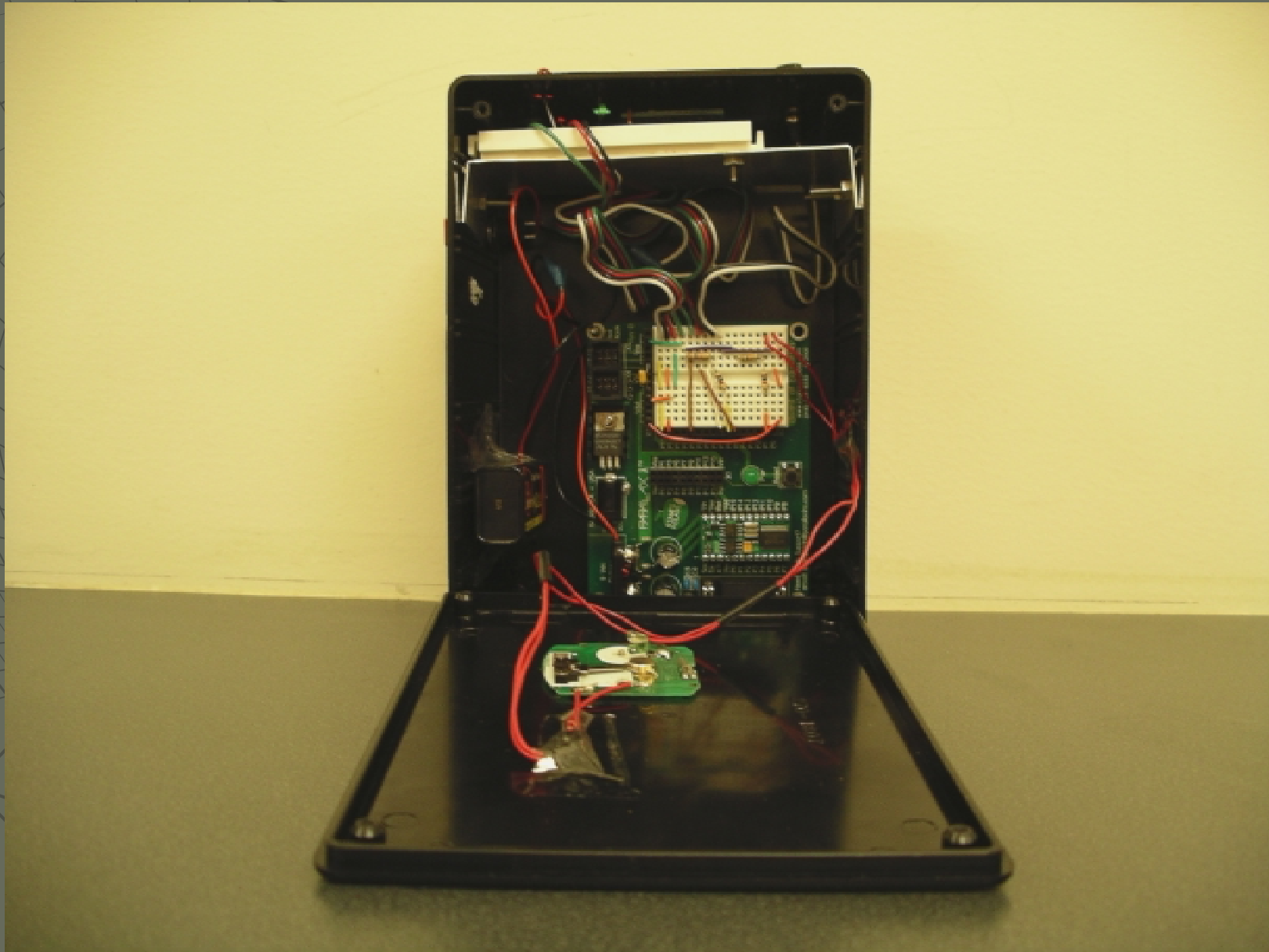


Sensors and Actuators

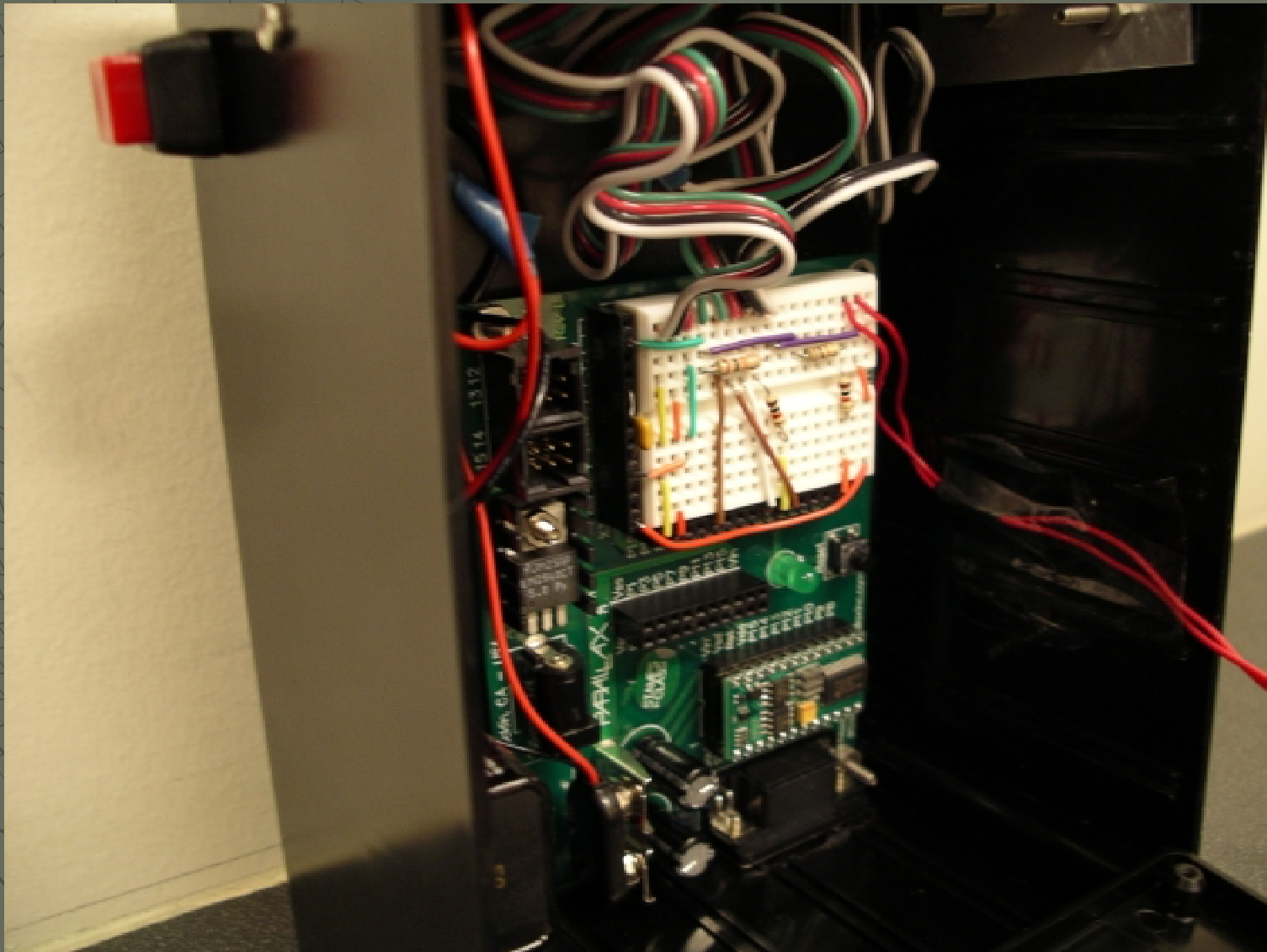
- ◆ Red LED (2)
- ◆ Green LED (1)
- ◆ Piezo-speaker (1)
- ◆ SPST Momentary Button (1)
- ◆ SPST on/off Button (1)
- ◆ Mechanical pedometer (step detector)



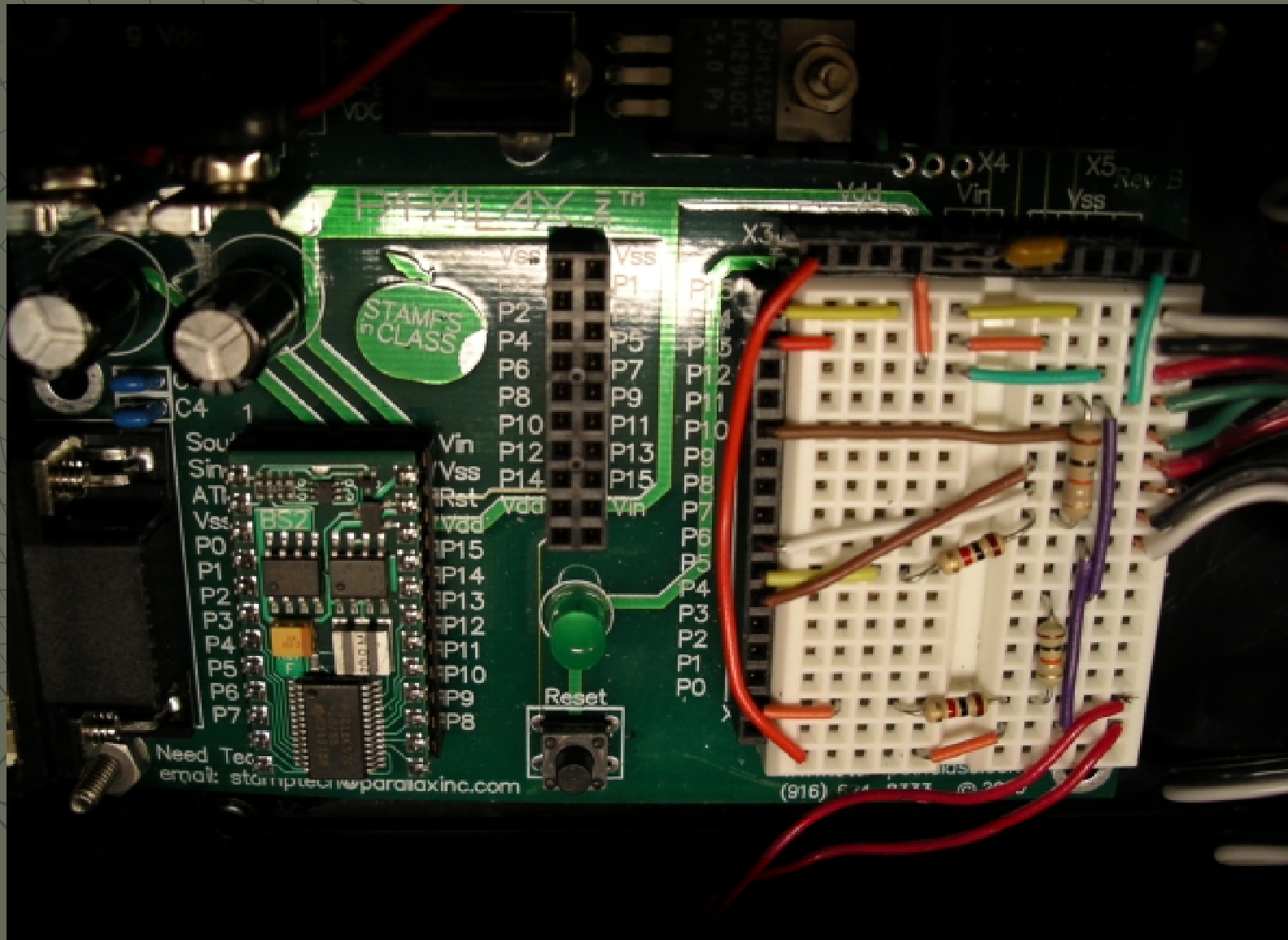
Navigation System Picture



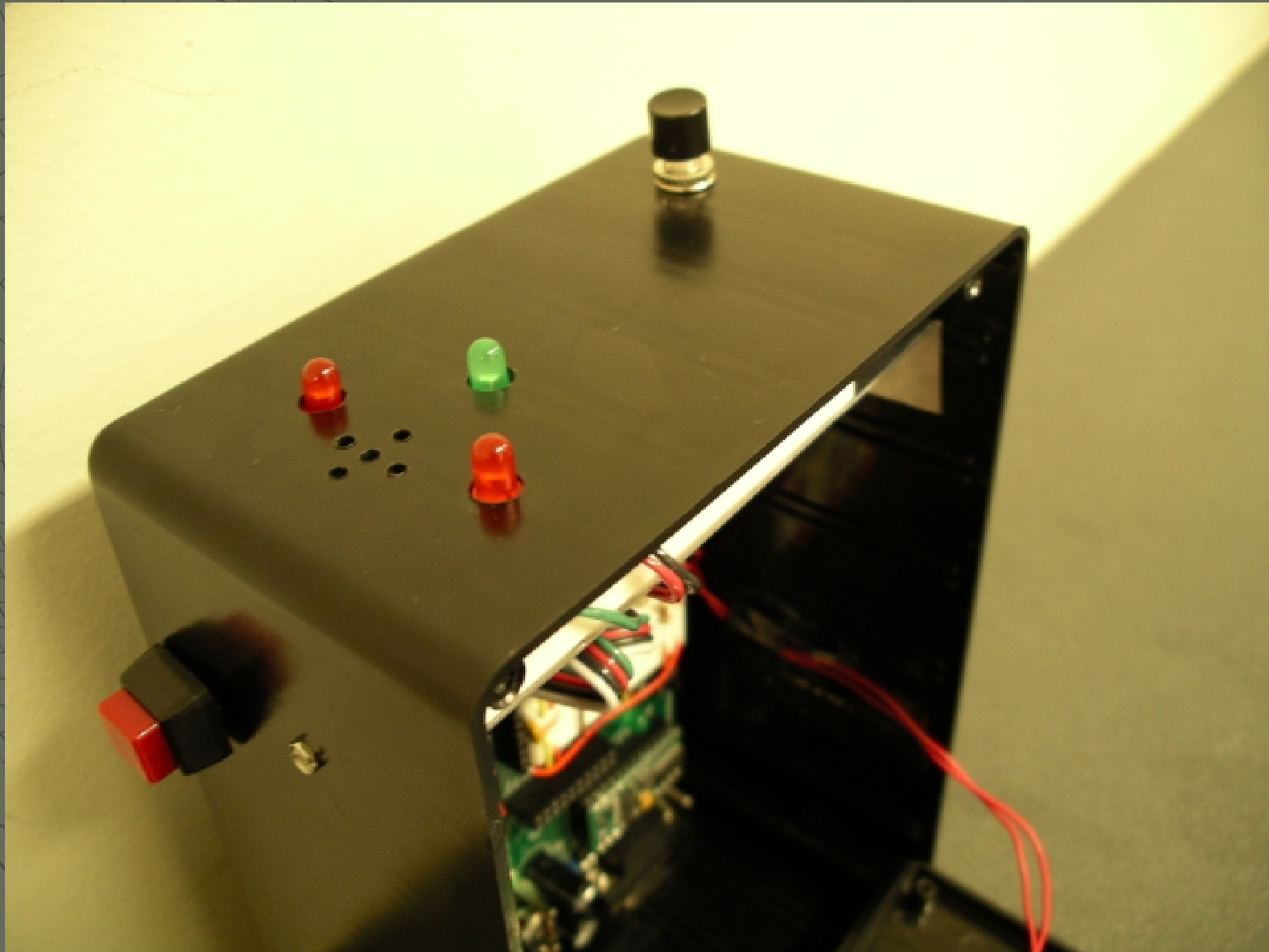
Navigation System Picture



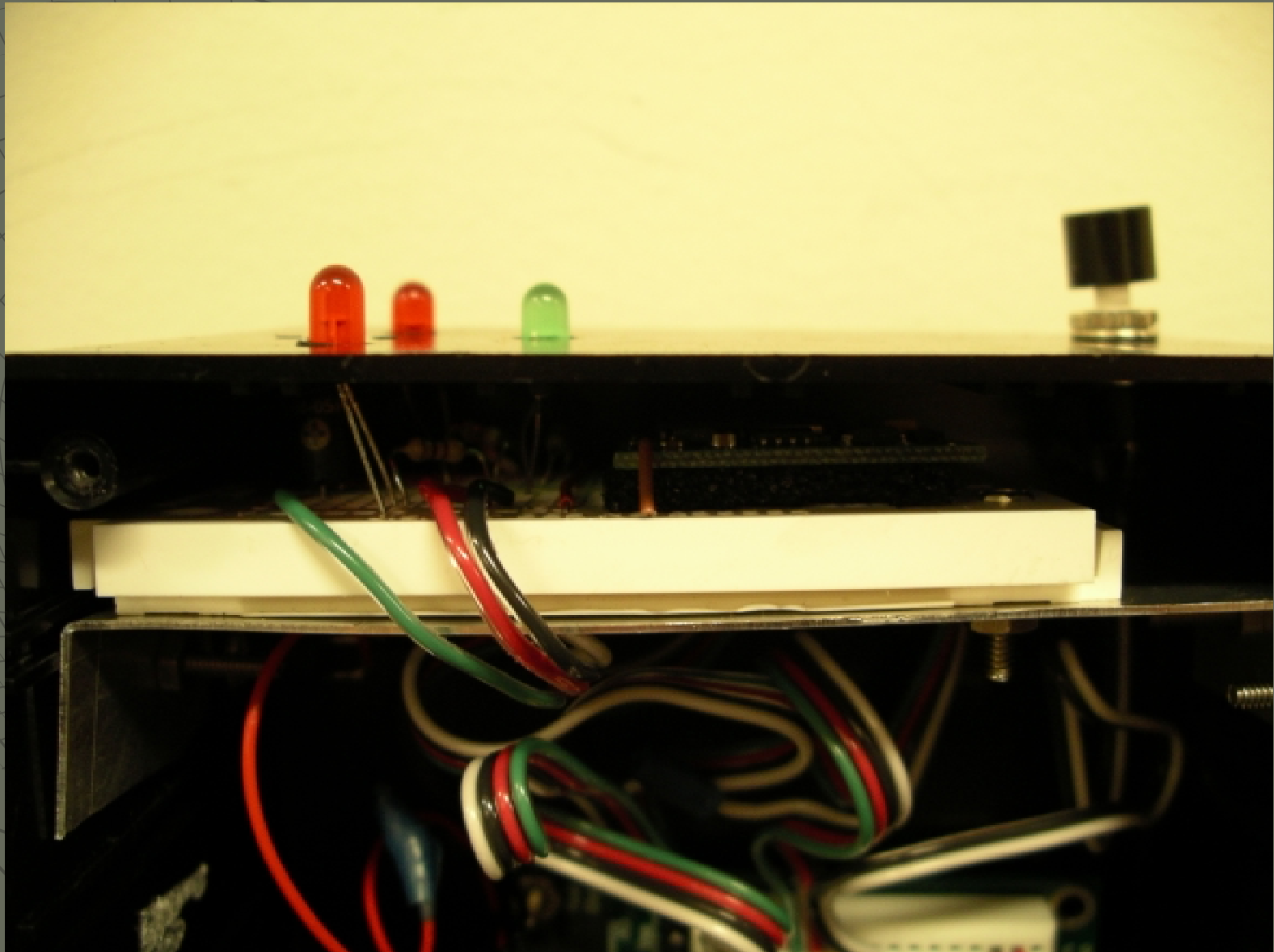
Navigation System Picture



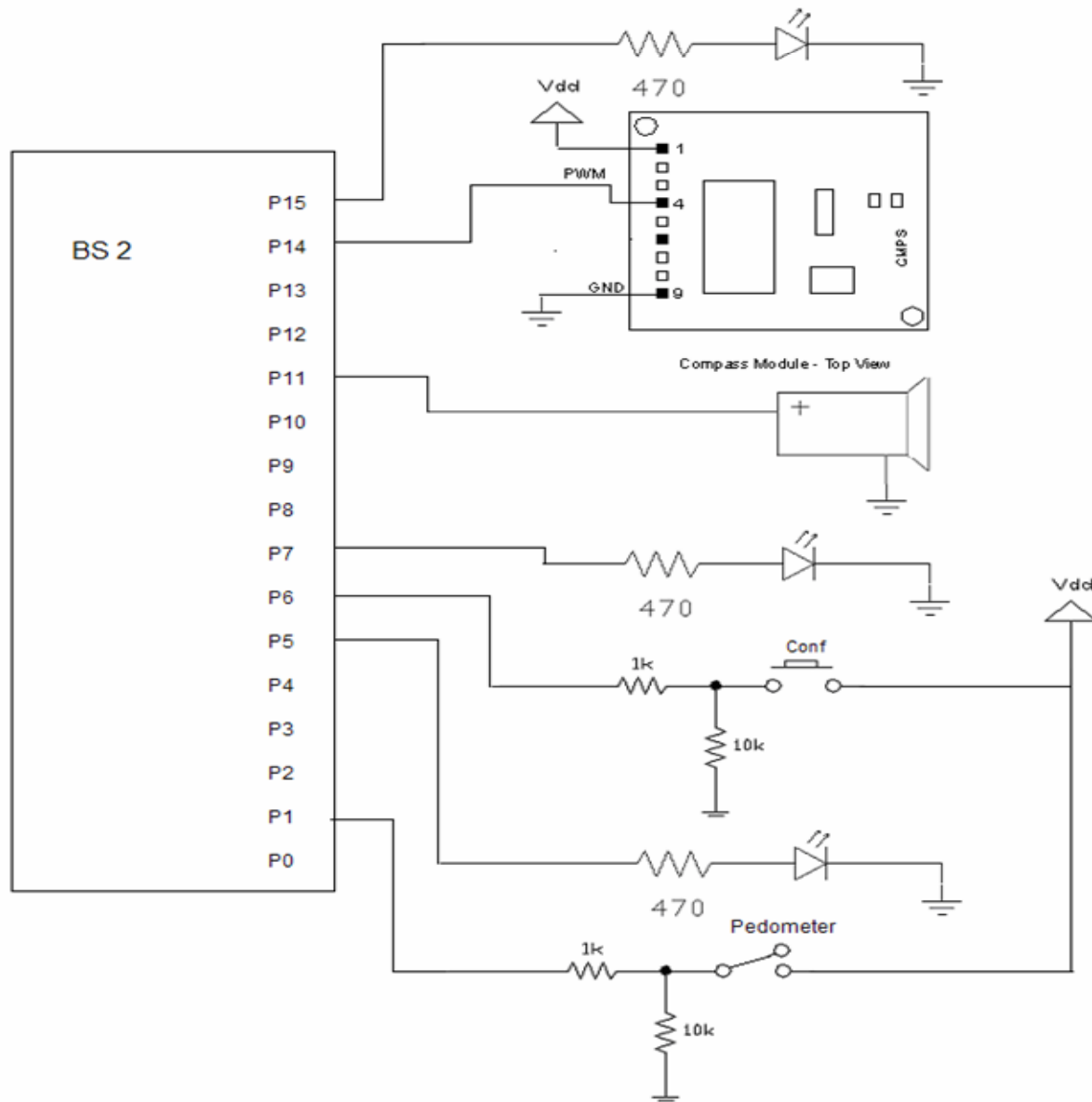
Navigation System Picture



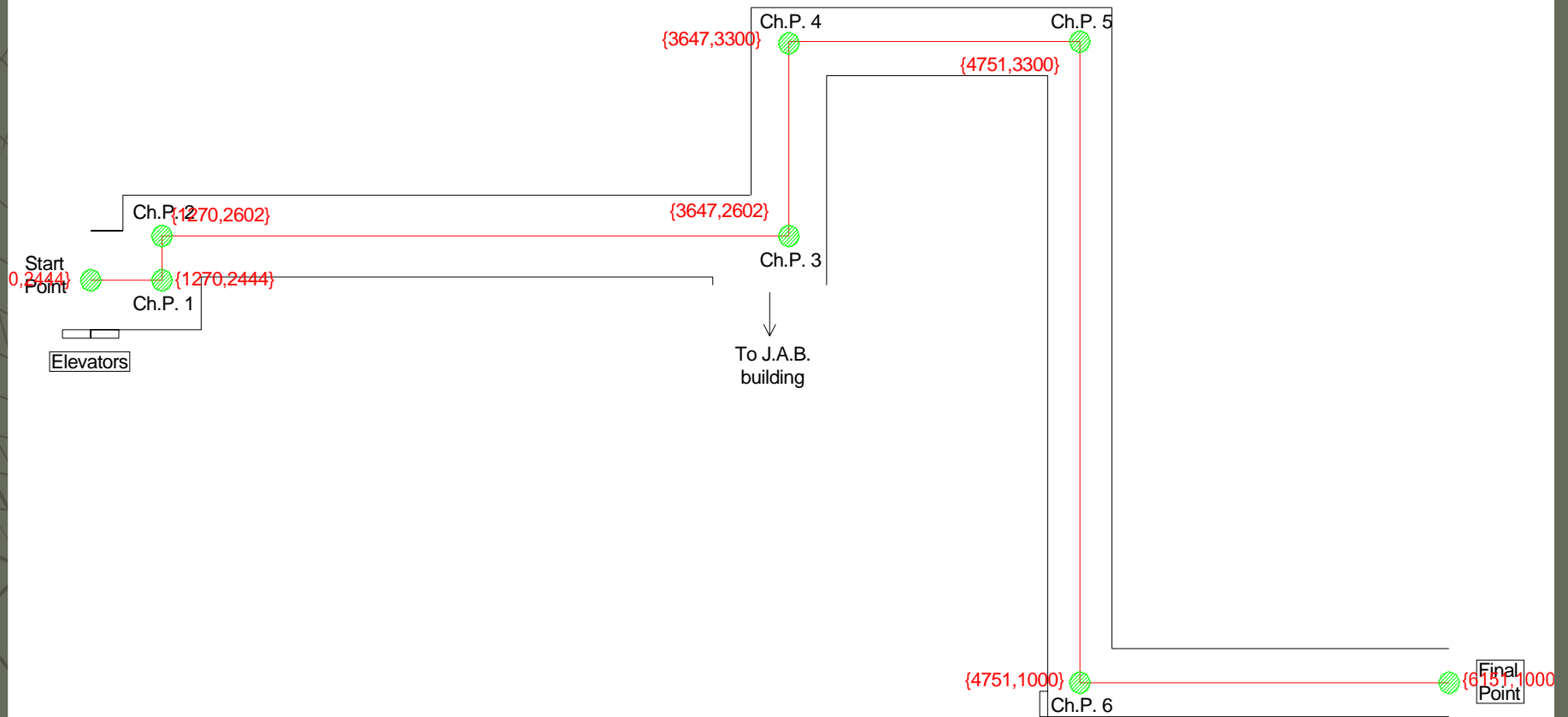
Navigation System Picture



Circuits



AutoCAD Diagrams



5th Floor Demo Video



Video Displaying Vector Addition



Testing Results

5th Floor Testing

- ✌ Detected All the check point locations in the accuracy of 1 step
- ✌ Safely guided from initial position to final position in 8 out of 10 times
- ✌ Success rate 80%


7th Floor Testing

- ✌ Safely guided from initial position to final position in 7 out of 10 times
- ✌ Success rate 70%
- ✌ Note: compass readings are not very accurate due to the presence of electrical wires and devices

PBasic 2.1 Codes

- ◆ Demo in 5th Floor
- ◆ DEMO 7th FLOOR.bs2

Problems

- 1) Wasted a lot of time and money on ADLX202EB IC – accelerometer
- 2) Conversions for trigonometric function
- 3) BS2 doesn't support negative numbers
- 4) Tilt of the compass as person walks 
- 5) Thresholds required for accurate calculations of checkpoint

Cost Estimation



Parts	Cost
BS2 & Board of Education	\$115.00
CMPS03	\$50.00
Pedometer	\$15.00
External Protection	\$8.00
Buttons	\$3.00
Miscellaneous	\$17.00
Total	\$208.00

P.S. Additional \$53.00 was spent on the ADX202EB chip (not used in the final model)

Future Plans

- ◆ Replace mechanical pedometer with Accelerometer chip
- ◆ Develop the code to calculate path itself when the map is provided
- ◆ More efficient error handling
- ◆ Better user interface
- ◆ Develop the model to work for Larger Areas

Acknowledgements

- ◆ Alessandro Betti – assembly
- ◆ Hong Wong – first volunteer to test the device

Conclusion

- ◆ The outcome of this project - Local Navigation System (LNS) is:
 1. simple to use
 2. not expensive
 3. and in future miniature device
- ◆ It's the best possible solution for local navigation where global positioning system is not applicable.
- ◆ The LNS is designed for diverse groups of people and is especially useful for Blind and elderly.