Topography Mapping

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Goals

- Create a device that measures the topography of a surface.

- Samples the degree of inclination over a surface.

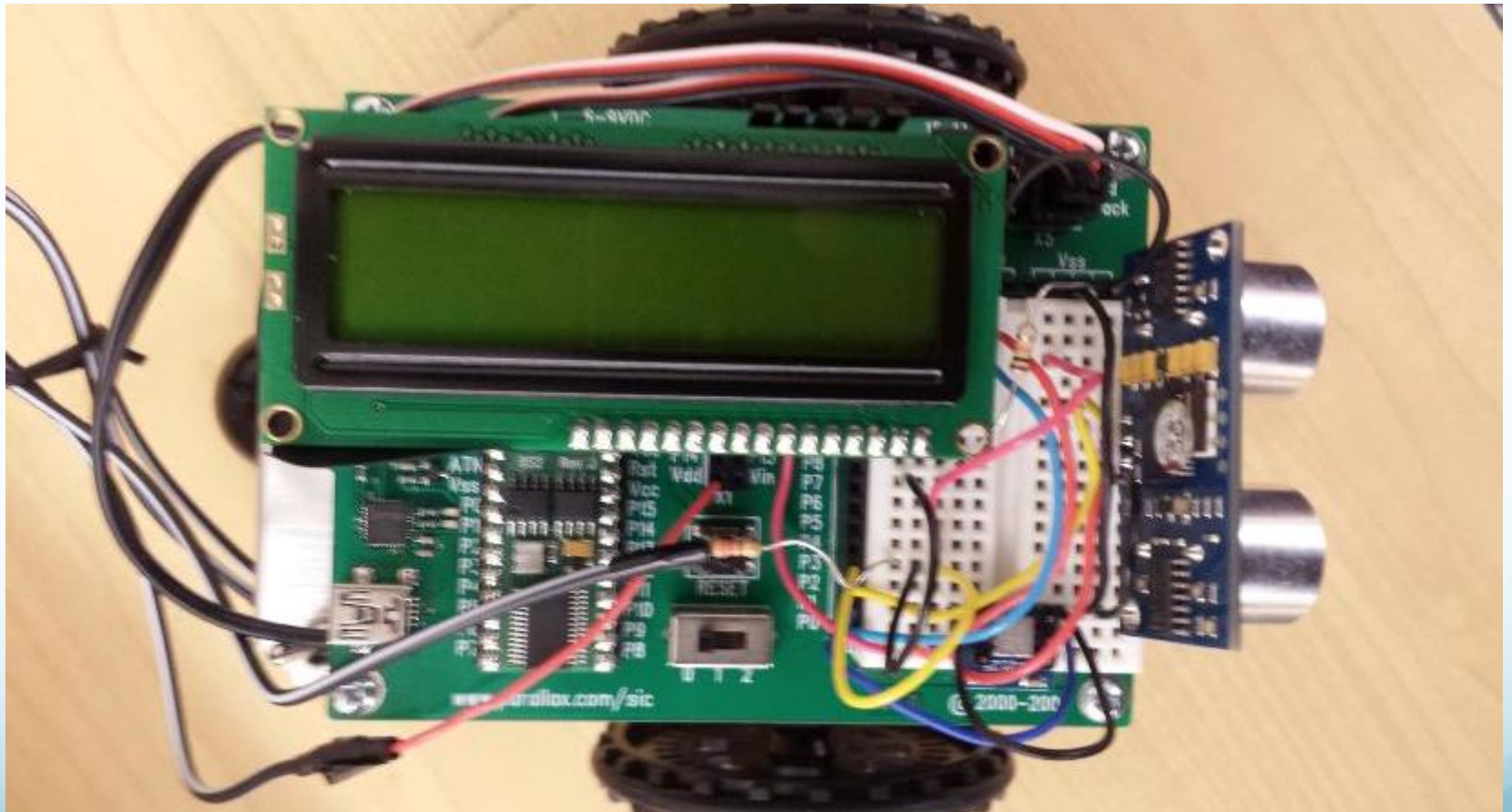- The height of different points can be measured.

Features

- Autonomous.

- Kill Switch in case of emergency

- Variable sampling rate.

- External storage device.

- LCD for the output.

Parts List

- Basic Stamp- 2

- Board of Education

- Ultra Sonic Sensor

- Accelerometer

- LCD

- Toggle Switch

- Servo Motors

- Resistors

Electrical Design

Working

- The BOEBOT will start from a reference point and goes along the surface and measures the g-force acting on the accelerometer.

- The BOEBOT will avoid driving into the wall by turning around with the help of ultrasonic sensor.

- The g-force readings are stored in EEPROM.

- From EEPROM we collect all the data and calculate the height at the sampling points to map the surface by using Python.

Programming Flow Chart
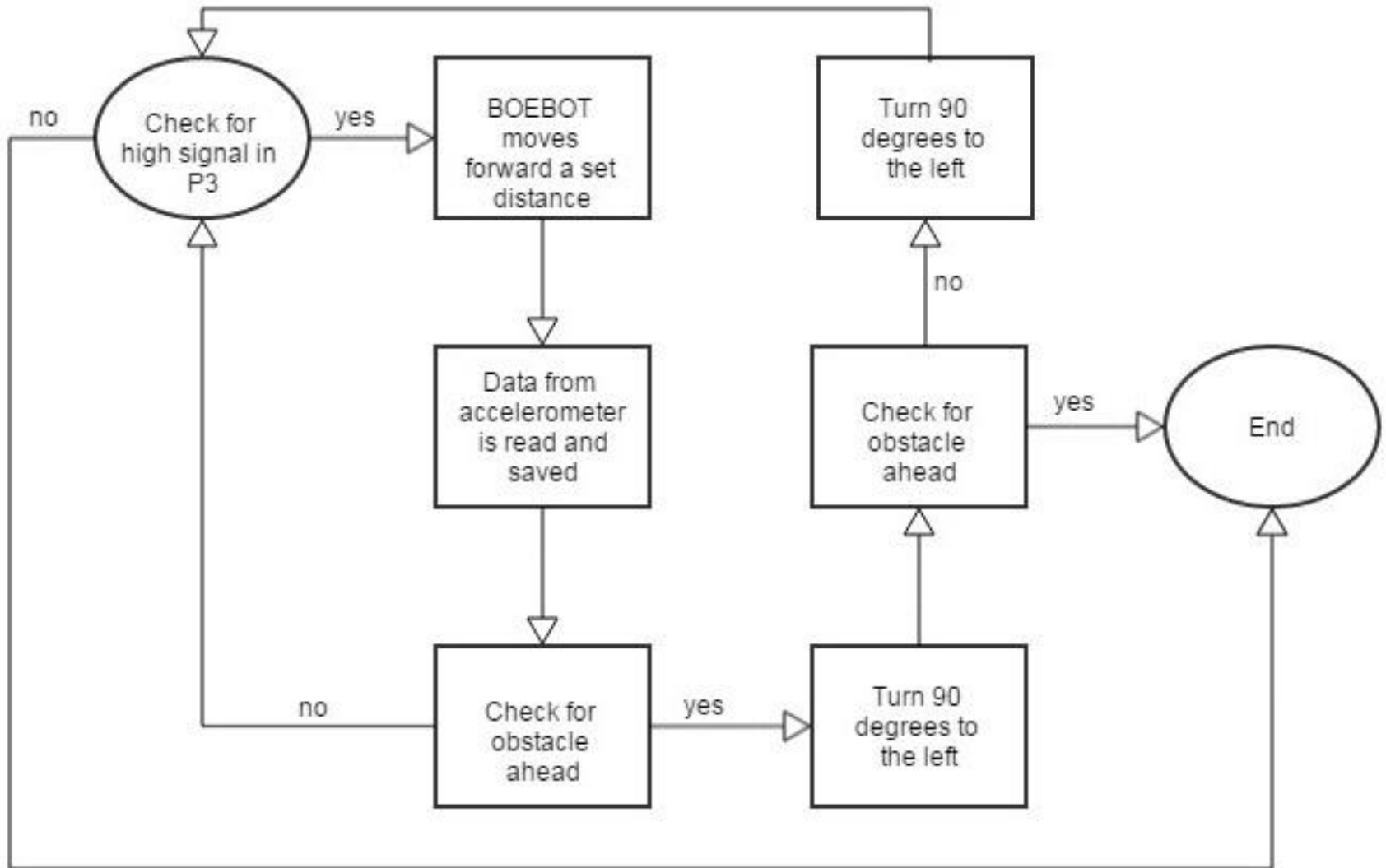
Height Calculation
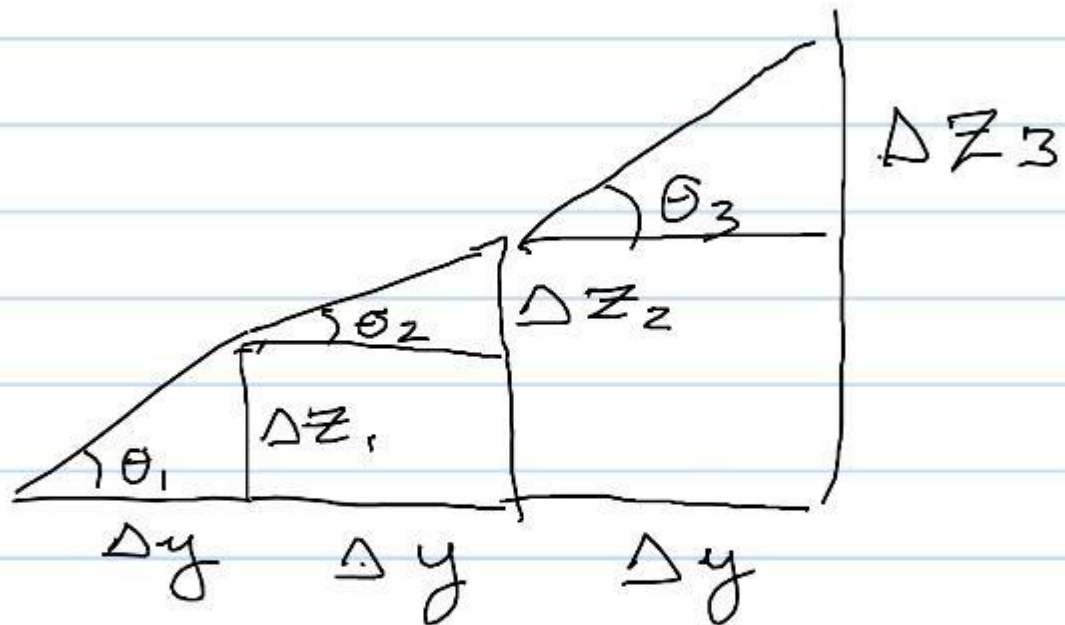
$\Delta y \equiv 1 \ inch$
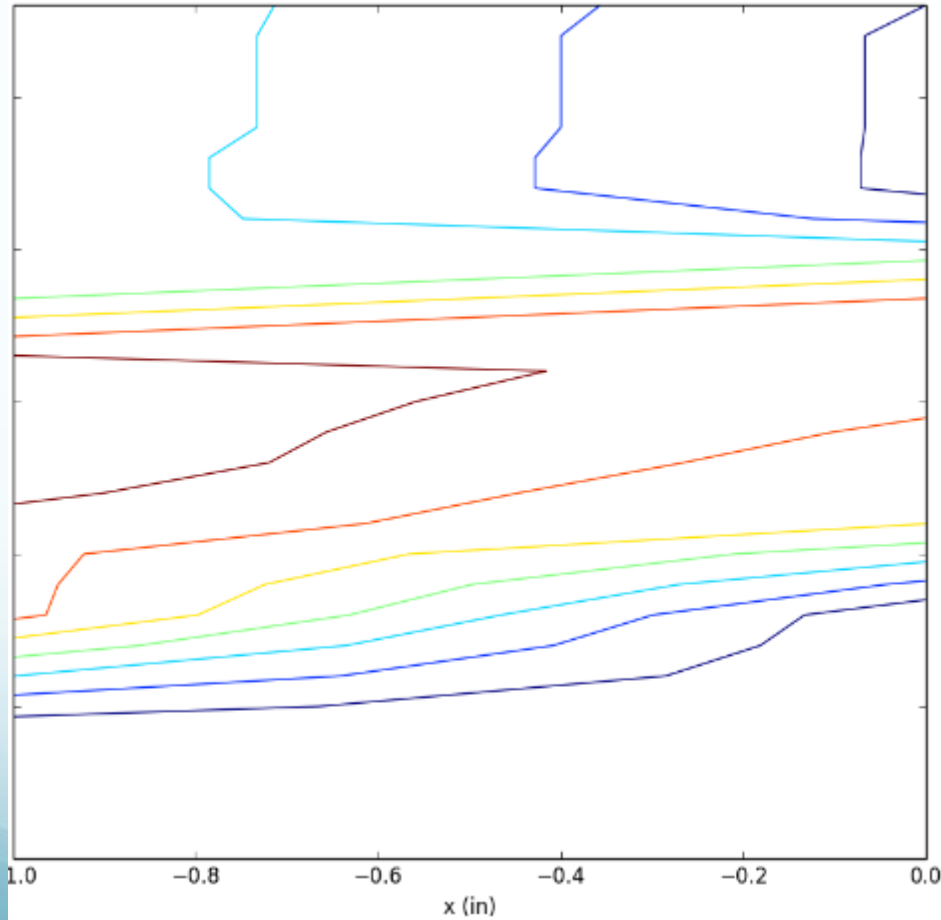
$tan(\theta_n) = \Delta z_n$
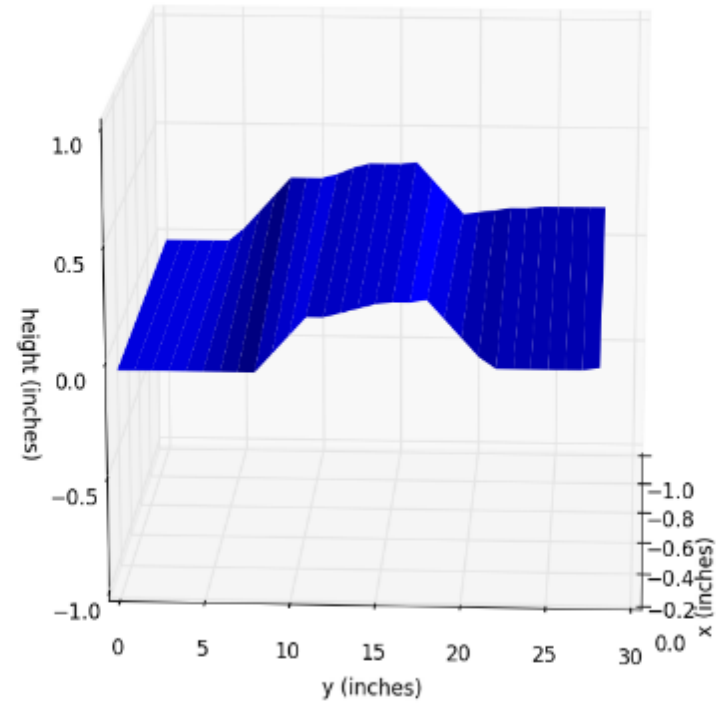
Result & Conclusion

- We tested our device by creating uneven surfaces along the path so that we could measure the topography.

- The device produced an accurate map based on comparisons with measured changes in height of the surface.

Test Result

Future Improvements

- Two more wheels in the back with better grip.

- More accurate sensors.

- Microcontroller with more memory.

References

- Parallax Inc, What's a Microcontroller? Student Guide version 3.0

- Parallax Inc, BASIC Stamp Syntax and Reference Manual version 2.2

- Parallax Inc, Robotics with the Boe-Bot. Student Guide version 3.0

- Parallax Inc, Basic Analog and Digital .Student Guide Version 1.4