Robotics Platform Development

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Purpose
To design and investigate a platform that is:

• Cost effective
• Capable, Flexible, and Durable
• Easy to build, use and modify
• Worthwhile
Critical Technologies

- Microcontroller System
  - Hardware
  - Language
  - Protocols
- Navigation
- Perception
- Locomotion
- Structural Components
TubeBot Solution

- Two Wheel Platform
  - High Maneuverability
  - Reduced complexity
  - Reduced part count

- Poster-tube Construction
  - Low cost
  - Easy to modify
  - Protects interior electronics
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Experiments with Platform

- Object Centered Development
- LED, Bluetooth and Audio Feedback
- Integration of GPS and Compass
- Object Detection and avoidance
- Mixed terrain performance
- Way-point navigation
Simple Object Diagram

BB_MAIN.spin
- BB_Drive (0)
- BB_Nav (3)
- BB_Sensors (2)
- AT_SevenSeg

BB_SENSORS.spin
- Servo32v3 @
- Ping.spin

BB_DRIVE_HB.spin
- CJ_HB25_014
- AT_SevenSeg

BB_NAV.spin
- DynamicMathLib (@@)
- HM55B Compass Module Asm (@)
Key learning areas

- Propeller Microcontroller
  - Language
  - Difficulty
  - Abilities
- Dynamic GPS Navigation
  - Compass variances
  - Latitude, Longitude scale ratios
- Mechanical Issues
Moving Forward

- Lessons Learned
  - Many issues are electrical, not code.
  - Many issues are timing, not electrical.
  - Reinventing the wheel is detrimental to investigation of robot algorithms

- Commercial Platform Development
  - Possible career opportunity
  - Practical Application of lessons learned
  - Greater fulfillment of original goal set
Conclusion and Thanks

For the opportunities, guidance and resources provided by the Hood College Computer Science Program
Literature

• The Robot Builder’s Bonanza
  ‣ Covers mechanical and programming for simple robotics platforms
  ‣ Includes information on basic fabrication with few specialized tools
  ‣ ISBN: 978-0071413572

• Computational Principles of Mobile Robotics
  ‣ Covers detailed mechanical design issues like rotation speed at various turn radii
  ‣ Includes method and theory for object detection, mapping, navigation, and perception.

• Manuals and Technical Specifications from:
  ‣ Parallax
  ‣ BaneBots
  ‣ Dimension Engineering
  ‣ Trossen Robotics

• Internet Forums
  ‣ Parallax
  ‣ Sparkfun Engineering