Electronics for Autonomous Construction Robots
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Summary
Updates of electronics for robots capable of autonomous collective construction [1], including:
- dsPIC33F microcontroller
- IR sensors and digital signal processing (digital filter, improved SNR ratio, fabrication time, volume)
- Wireless communication
- Motor drivers

Power Circuit
- Two 7.2V batteries power motors, IR circuits and dsPIC33F
- Buck converters generate 3.3V and 5V

Actuation
- Dual motor driver
- 2.7-5.5V logic supply
- Up to 15V motor supply
- Up to 1.2A constant current
- 3.2A stall current
- 3 Brushed DC motors
- 100:37:1 metal gearbox
- Up to 320 RPM at 6V
- 120 mA with no load
- 1.6A stall current at 6V

Wireless Communication
- Send Command to MCU
  - Sends command to XBee
  - Receives command and transmits 9 bits of data to RX module
- Send Acknowledgement to User
  - User receives the Ack
  - TX module receives Ack and sends it to user/PC

Sensing
- IR sensors for navigation
- Six pairs under robot
- PWM (DC 20%)
- Sensitive to black/white surfaces and distance
- Output voltage level increases with increase in distance
- Black surface absorbs IR light, no reflection, small output voltage

Digital Signal Processing
- FIR filter specifications:
  - Sampling frequency: 10 kHz
  - Passband frequencies: 1000 Hz, 1200 Hz
  - Stopband frequencies: 950 Hz, 1350 Hz

Printed Circuit Board Design
- Board Dimensions: 1.749 x 2.332 in. Includes IR sensors, motor drivers, dsPIC33F and XBee receiver module

References

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