LASER RANGE FINDING AND GAME BOY PRINTING

DEFCON 20 HHV

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GRAND IDEA STUDIO
LRF-to-Game Boy Printer

• Parallax Laser Range Finder module (#28044) meets old school Nintendo Game Boy Printer

• Inspired by furrtek's GBP reverse engineering

• Write-up @ http://forums.parallax.com/showthread.php?136293
LRF Module: Front

- 635nm Laser Diode w/ APC
- Arima APCD-635-02-C3-A
- 640x480 CMOS Camera
- OmniVision OVM7690
LRF Module: Back

- Prop Clip
- Unused GPIO
- Propeller
- Bi-Color LED
- Laser Diode Driver (LDO)
LRF Module: Triangulation

\[ D = \frac{h}{\tan \theta} \]

http://sites.google.com/site/todddanko/home/webcam_laser_ranger/laser_ranger.Drawing.gif
LRF Module: Cogs

- Spin Interpreter (Cog 0)
- Auto-Baud Detection (start-up only)
- Full-Duplex Serial (JDCogSerial)
- Floating Point (F32)
- I2C for OVM7690 SCCB communication (pasm_i2c_driver)
- OVM7690 Frame Grabber (on request)
LRF-to-GBP: Details

- LRF: 160 x 128 greyscale image @ 8bpp
- GBP: 160 x \( \infty \) @ 2bpp
- Modified version of original LRF firmware
  - Only need camera interface, frame grabber, and serial communication functionality
  - LRF grabs single frame when button pressed
  - Frame processed and sent to GBP via SPI
- Created Game Boy Printer Interface object for Obex (Spin): http://obex.parallax.com/objects/814/
LRF-to-GBP: Image Processing

- Need to rearrange all the pixels and downsample
  - LRF frame stored in a linear format
  - GBP expects image data in a series of tiles (blocks)
- Each tile = 8 pixels * 8 pixels
- 20 tiles horizontal per band
- 2 bands per buffer
- 640 bytes per transaction

www.atomicvpp.com/wpblog/2012/03/04/gameboy-printer-project/
NOTE: RESISTORS ARE IN OHMS +/- 5 AND CAPACITORS ARE IN MICROFARADS, X7R UNLESS OTHERWISE NOTED. SEE BOM FOR ACTUAL VOLTAGE AND SPECIFICATION.
LRF-to-GBP: Back
LRF-to-GBP: Demonstration
LRF-to-GBP: Results
END OF TRANSMISSION