Point-to-point Data Link, Collaborative Whiteboard, and Voice Conference

MIT 6.111 Project Abstract

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We intend to construct a digital data link using simple LEDs and photodiodes, to implement a communications link in free space. Because of serious contamination from ambient light, the data link will need significant signal processing to reconstruct the transmission, and will ultimately be of fairly low data rate. We intend to modulate the transmission in the frequency domain, using simple amplitude shift keying (ASK), and extract the result with a quadrature demodulator, implemented digitally. The FPGA will handle low-level modulation and demodulation, error correction, and data redundancy. We hope to use a protocol that allows the data rate to adjust to the level of ambient noise.

We will construct a packet engine that dispatches data streams to the appropriate modules. Our first major application will be a full-duplex voice confrerence, necessitating audio buffering, etc. Our other major application will be a shared whiteboard, with PS/2 mouse input. Depending on the achieved data rate, we may try to implement other applications over this data bus.

Given the likelihood that only one labkit will be available to us for the majority of the development time of this project, we intend to develop the system in a way that allows for a "loopback" mode, which still uses the full channel hardware.