The Kwan-Truc: A Digital Wireless Video System

Todd Hummel and Travis Reed
Computer Engineering, University of Utah, Salt Lake City, Utah 84112

Introduction
The Kwan-Truc is not just any video system! It is:

• Wireless: Not tethered to anything.
• Digital: No special receiver needed, just a laptop.
• Compact: Fits in small spaces.
• Lightweight: Perfect for an RC helicopter!

Materials Used and Data Flow

IBM Webcam
• 176X144 interlaced video
• Standard USB 1.1 interface
• No fancy features made reverse engineering simpler

Freescale Microcontroller
• 16KB RAM for video buffering
• 128KB Flash for program
• USB On-The-Go
• Three RS-232 ports

Quatech Transceiver
• Automated RS-232 to 802.11 bridge.
• Ad-hoc capable
• Selectable data rates

Standard Laptop
• Any 802.11-enabled laptop will work
• Simple Java program displays video

System Bandwidth

<table>
<thead>
<tr>
<th>Source</th>
<th>Destination</th>
<th>Interface</th>
<th>Bandwidth</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBM Webcam</td>
<td>Freescale Microcontroller</td>
<td>USB 1.1</td>
<td>480 Mb/s</td>
</tr>
<tr>
<td>Freescale Microcontroller</td>
<td>Quatech Wireless Transceiver</td>
<td>RS-232</td>
<td>115200 b/s</td>
</tr>
<tr>
<td>Quatech Wireless Transceiver</td>
<td>Laptop</td>
<td>802.11</td>
<td>54 Mb/s</td>
</tr>
</tbody>
</table>

As is seen here, RS-232 (UART) is the system bottleneck.

Conclusions
We have created a USB to 802.11 bridge for the IBM Webcam and a GUI capable of interpreting, recording, and playing back the video stream. We tested this wireless link by packaging, powering, and flying it on the Align T-Rex 600 RC Helicopter.

Acknowledgments
We would like to thank Al Davis, L-3 Communications, and Freescale Semiconductor for their support of our project. We also acknowledge Some Dude’s Hobby Shop for answering questions regarding the helicopter and for verifying its proper construction.

For Further Information
More information on this project can also be obtained at www.eng.utah.edu/~thummel/cs3992 or by contacting todd.hummel@utah.edu or twreed83@gmail.com.