1. Executive Summary

Many remote control products already exist for computer applications, but they are all either limited to a single application or they only send information in one direction. The usefulness of a remote is limited when information only travels in one direction since the user cannot see any information about what is being controlled without also being able to see the monitor. This forces users to stay near their computers, which in many cases makes it pointless to use a remote in the first place. The objective of this project is to create a device and protocol that can be used with a variety of applications to allow a user to remotely send instructions to the application while also receiving and viewing information sent to the remote by the application. Possible applications for such a remote include remotely controlling music while viewing Winamp®-style song and play list information, checking and reading E-mail, receiving instant messages, performing database and inventory functions, playing handheld video games, launching programs, and providing control of any hardware normally controlled by the computer. The remote will use RF instead of infrared, allowing all of these functions to be performed while the user is in a different room than the computer.

2. Technical Description

2.1 Project Claims

1. A wireless, RF remote control with a programmable display showing the button functions so that different applications can assign different functions to the same button.

2. A wireless, RF remote control with a programmable main display that can show any information sent to it by an application.

3. A software protocol that allows simple integration of the remote's functions into applications, allowing the application to define what buttons the remote should have and what should appear on the display

4. An interactive remote that allows the user to interact with and receive feedback from their computer while in another room.

2.2 High-Level Design

In general, the device can be conceived as shown in Figure 1. The computer sends data to the transmitter, which then sends the data wirelessly to the transceiver in the remote to be displayed in the remote's main window. The remote control provides instructions for the computer by telling which buttons have been pushed while the computer tells the remote what text to display next to the buttons. The programmable buttons allow the remote to be used for almost any application the user desires, and can be easily defined with the remote's software. The addition of a scroll-wheel allows easy navigation of lists and pages of data. Further details of the design can be found in the Detail Design section of the appendix.
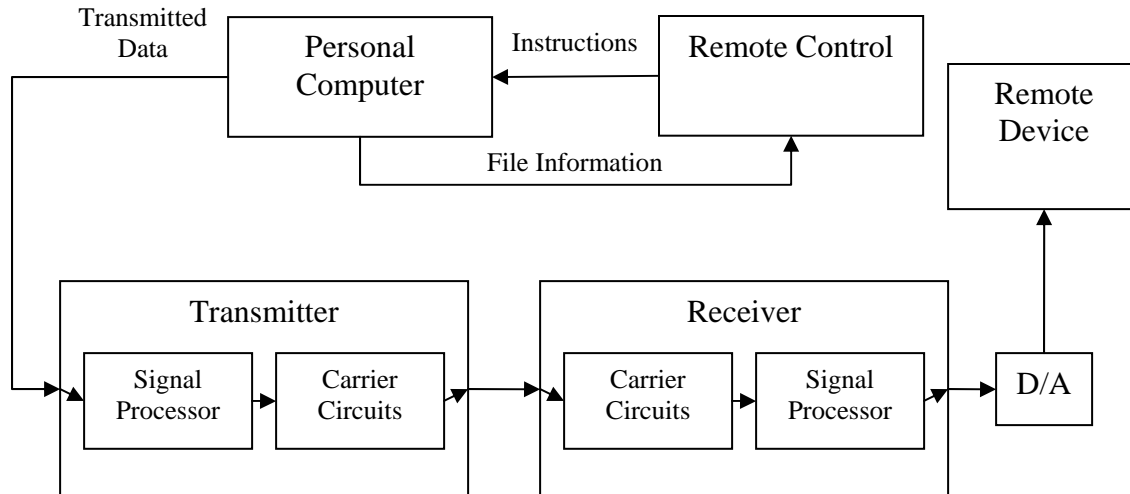
Figure 1: High-Level Design Diagram

3. Market Analysis

We performed extensive research using the EBSCO Host database. From our research we determined that a market does exist for wireless transmission devices that use a remote as a means of communicating with one or more of these devices. The reason that this market is so viable is the fact that people have a lot media stored on their PCs but they are not able to transmit them to TV and stereo where entertainment is mostly enjoyed. A few companies named below have already begun to capitalize on that market. The products currently available, however, do not offer the flexibility of our proposed design, and most only control audio and video.

A few of the competing products available are as follows:
- RCA's Lyra Wireless, which was just released, transfers digital music from the PC to the stereo, over a distance of up to 100 feet, for $99.99.
- The D2730 from SonicBlue's Go Video division is a DVD player that connects to your TV and existing wireless network systems and allows you to stream video, audio and photographs to the TV, and makes them accessible via remote control. Product will be released in March 2003 for $250
- Hewlett-Packard's HP Digital Media Receiver 5000 is a set-top box that plugs into the TV and stereo. Product will be released in February and sell for $199 for wire connections or $299 for a wireless unit.
- Newcomer cd3o just released a product recently that plays MP3 music stored on a PC through a home stereo. What separates this product from competing products is its user-friendly remote transmission system. The remote allows the user to select audio through the use of a voice guide, which makes navigation through the play list easy. Three different models currently exist at prices of $149, $199, and $249.

Our product will be viable in the wireless transmission device market. However, we will face competition from these other companies, some of which provide features our remote is lacking, such as the cd3o's voice guide. We should have an advantage because of the simplicity and adaptability of our remote, which allows it to be used for almost any application a user could

conceive of instead of being confined to a single use as the other options are. Many of these products also confine the user to line-of-sight operation, giving our product another significant advantage.

4. E-Team Members and Skills

XXXXX – Rose-Hulman Institute of Technology, Computer Engineering Undergraduate
With a background in digital design and communications systems, XXXXX will be able to help with the transmission of data. He will also help write the necessary software.

XXXXX - Rose-Hulman Institute of Technology, Electrical Engineering Undergraduate
XXXXX has experience designing digital circuitry with GALs and FPGAs using ABEL and Verilog programming languages. The digital design experience gives him the skills necessary to create the remote's circuitry. He has additional experience with C++, which will allow him to assist with the software aspect of the project.

XXXXX – Rose-Hulman Institute of Technology, Electrical Engineering / Optical Engineering Undergraduate
XXXXX has a background in digital and analog design. As a double major, XXXXX has the hard work ethic that is needed for a design project of this magnitude. He is on a Co-op assignment during the spring and summer of 2003 where his main focus will be on hardware testing and design. This will enable him to come back during the next school year with additional skills that will prove to be beneficial to the group as a whole.

XXXXX - Rose-Hulman Institute of Technology, Computer Engineering Undergraduate
XXXXX has taken classes in digital design and processor architecture. He has experience working on digital projects and completing them under time constraints. He also has experience working with different programming languages including assembly.
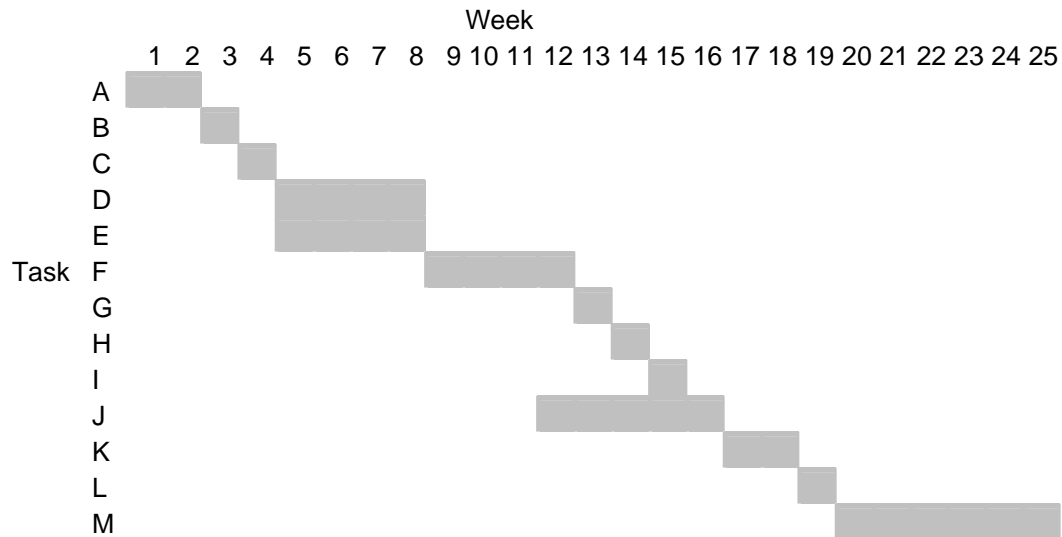
XXXXX - Rose-Hulman Institute of Technology, Department of Electrical and Computer Engineering, Professor
XXXXX has a PhD in Electrical Engineering and extensive knowledge of communication systems. His experience with electrical systems and transmission formats will provide the group with an expert to consult with if problems are encountered.

5. Project Schedule

The project will be performed during the 2003-2004 academic school year as a senior project in the Rose-Hulman Electrical and Computer Engineering Department. We will have twenty weeks to complete the project with five additional weeks to complete our project documentation. A schedule and sketch of our timeline is presented on the following page.

	Task	Deliverable	Due Date
A	Finalize development plan	Development Plan	Week 2
B	Finalize product specifications	Product Design Specification	Week 3
C	Finalize technical design	Design Review	Week 5
D	Order parts	Parts Received	Week 8
E	Refine product design	Design Review	Week 8
F	Design interface between computer and our device	Functional Prototype	Week 12
G	Enable remote control of computer	Functional Prototype	Week 13
H	Enable remote control to display file information	Functional Prototype	Week 14
I	Integrate to form final prototype	Critical Design Review	Week 15
J	Research patent	Completed Patent Search	Week 16
K	Test and verify design	Functional Prototype	Week 18
L	Complete device implementation	Final Prototype	Week 19
M	Complete project documentation	Final report	Week 25

6. Equipment and Services

The following will be provided by Rose-Hulman Institute of Technology:

- Laboratory space
- Laboratory test equipment (multimeters, spectrum analyzer, etc.)
- Faculty Advisor
- Computer
- Software
- Phone and Copying privileges
- Internet

7. Budget

Below is our projected budget for the project. A more detailed breakdown is presented in Appendix A.

$600	Patent Search
$1500	Provisional Patent Application
<u>$1824</u>	Prototyping parts
Total: $3924	