

Mobile Wireless MP3 Player
Group: 9
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We pledge our honor that we have abided by the Stevens Honor System

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I. Abstract

The scope of this project is to design and build a wireless in-car mp3 player. Current typical car mp3 players are limited in terms of how files are transferred to them as well as in the user interface. Our project addresses these issues by using wireless networking to provide an easy way to communicate with the device. By using an external antenna, the range can be extended so one need only to park in front of the house to transfer files. The second issue is display. Typical units only use 2x40 characters display which limit functionality. Our unit will use a 6.4-inch LCD panel with a touch screen interface with simple and intuitive buttons. This project will consist of three major components: the home unit, the central processing unit (CPU), and the front end. The home unit consists of the wireless network hub which interfaces with the home computer, the CPU will consist of a PC104 embedded computer running Windows CE for Automotive (WCEfA), and the front end consists of the LCD panel and the associated software for the user interface. At the end of the project we should have a completed processor ready for demonstration.

II-a. Introduction

The Mobile Wireless MP3 Player (MWMP) will be an exciting addition to the mobile multimedia experience. The MWMP will enhance the experience of the user by allowing them to access their libraries of mp3 on the road. Our project adds to the existing products by providing a simple way to get the files to the car and also an easy and straightforward user interface.

By using windows networking and 802.11 protocols the player will easily interface with the home user's existing equipment. Using the antenna the range of the product will be enhanced to provide maximum convenience. Since this technology is readily available the development of the project will be accelerated.

The graphical interface will be a major improvement over the current standards. Currently the products on the market use 2x40 character display and awkward controls to interface with player. Our design will use a 6.4-inch LCD touch screen interface. This allows the display of a lot of information while providing an intuitive and dynamic interface.

II-b. Design Requirements

For the user interface this product must be simple and easy to use while not being distracting to the driver. In order to be approved for use in an automobile in the United States the unit must employ only minimal graphical animation. It must also be small and thin for ease of mounting. Because of the small screen the design of the interface is crucial: it must be clear and simple so one can minimize the time needed to look at it while driving and the actual control (user interaction) should be limited by software while the car is in motion. The touch screen is ideal for this application, since complicated functions such as play list and title editing etc would be sped up, and the controls on the bottom would control play, stop, next track, previous track. The unit will also have an interlock so that while the car is in motion, only the simple functions will be enabled.

The main unit must be rugged and compact. The control unit will be mounted in the trunk or under the seat, so it would likely experience much abuse. Because this unit will use a hard drive to store the songs, it will have to have some sort of shock-absorbing frame to prevent damage. This unit will also have to have several connectors, one for the monitor, one for the antenna and one for power/interlock. All the parts of the unit have to stand up to temperature extremes and shock from motion of the car. The unit will also have to only operate only on 12 volts and perform all power conditioning and conversion internally. To enable the unit to operate while the car is parked, we will implement a WOL (Wake On LAN) feature. This will limit the MWMP's activity to conserve battery power.

The home unit should be easy to interface with the users computer. The unit will have an antenna on it in order to ensure that the files will transfer at greater distances. Communication between the home unit and the car will possible up to at least 500 ft.

II-c. Design Approaches

The core of the MWMP will be the control unit. It will consist of an embedded pc running Windows CE for Automotive (WCEfA), a wireless network card, 20GB hard drive and all associated hardware required for the pc to run. The board that we are currently reviewing is the Aaeon PCM-6898. This board seems particularly suited to our project because of its small size and versatility. It has a composite out, VGA and digital video for interfacing with any monitor, 4 COM ports for the touch interface, USB for the wireless networking and 4 TTL inputs for the buttons for play and stop. This board supports a 288 MB Solid State Disk to hold the operating system and other mission critical applications, while the IDE controller will be used to manage the 20GB hard drive. The control unit will be mounted in a shock-absorbing frame. It must also withstand certain temperature extremes, which would be tackled by some type of insulation.

The monitor will be a 6.4-inch LCD by Nebtek. This monitor is mounted and setup for quick accessibility. Over this we will put a touch sensitive panel to provide the user control interface. Below the touch screen, the playback buttons are mounted. These will all be assembled in a manner that is intuitive to use while being aesthetically pleasing. Most importantly, their location will be carefully placed to minimize driver interaction with the device while maintaining maximum functionality. Although this prototype would be cumbersome if mounted as-is into the car, future developments may solve this issue by including a system to automatically store the unit into the dashboard.

An alternate approach to the front-end control interface is to not include a touch screen display, which would render the unit more compact. The unit will only be controlled via standard playback buttons. The downside of this approach is the significant decrease in convenience and ease-of-use.

II-d Financial Analysis

The costs involved with this design project are relatively low. The estimated primary costs are summarized in Table 1.

Part	Manufacture	Part Number	Description	Price
Monitor	Nebtek	NEB64B PRO	6.4" Black with PRO Box	\$879.00
Touch Panel	TBA	xxxx	6.4 Serial Out	\$95.00
System Board	AAEON	PCM-6898	FC/Socket 370 Media PC with LCD, Ethernet, Audio, AGP 4X, DVI/DVO,& 4 USB Ports	\$289.00
Processor	Intel	Pentium 3 850	Processor for System Board	\$120.00
RAM	Generic	256 Megs	RAM for System Board	\$25.00
Enclosure		TBA		\$300.00
Cables		TBA		\$150.00
Carside TRX	Linksys	WUSB11	Wireless USB Network Adapter 802.11B	\$100.00
Homeside	WDT11	TBA	Wireless Network PCI Card Adapter for Desktops	\$50.00
Shipping				\$300.00
WCEfA	Microsoft		Windows CE for Automotive	\$200.00
Phone and Travel			Cost of calls and visits to vendors	\$50.00
Total				\$2,608.00

Technical testing equipment is already available.

II-e. Project Schedule

III. Conclusion

The design team strongly believes that this unit has the potential to be an economic success. No other product on the market offers the convenience and features that the MWMP will provide. Its particularly suitable graphical user interface combined with its notable wireless communication implementation offers a unique innovation in the car audio systems industry.

The engineering aspect of the project should produce positive results. As this project is based on existing technology, support and documentation on the related technical fields is readily available. The team will be able to put together a system using industry standard parts and protocols. At the end of the design period, the product should be better than its competitors in terms of ease of use and overall system integration. Using the parts listed above, the team should be able to have a fully finished and functional product ready for presentation.

The engineering novelty in this product is the much-desired enhancements of similar products already on the market. It is expected that the approaches described in this proposal will effectively achieve the goals set forth. The carefully planned and thought out design route will prove to be a successful one.

IV. References

AAEON Technology Inc.

http://www.aaeon.com/product/product01_2.asp?model=PCM-6898&%20#123

Microsoft Corporation

<http://www.microsoft.com/windows/embedded/ce/guide/default.asp>

IEEE 802.11 Standard

<http://grouper.ieee.org/groups/802/11/main.html>

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Costing

Part	Manufacture	Part Number
Monitor	Nebtek	NEB64B PRO
Touch Panel		xxxx
System Board	AAEON	PCM-6898
Processor	Intel	Pentium 3 850
RAM	Generic	256 Megs
Enclosure		TBA
Cables		TBA
Carside TRX	Linksys	WUSB11
Homeside	WDT11	TBA
Parabolic Antenna		TBA
Shipping		
Windows XP b2	Microsoft	
Total		

Description	Price
6.4" Black with PRO Box	\$879.00
6.4 Serial Out	\$95.00
FC/Socket 370 Media PC with LCD, Ethernet, Audio, AGP 4X, DVI/DVO,& 4 USB Ports	\$289.00
Processor for System Board	\$120.00
RAM for System Board	\$25.00
	\$300.00
	\$150.00
Wireless USB Network Adapter 802.11B	\$100.00
Wireless Network PCI Card Adapter for Desktops	\$50.00
External antenna for extended range	\$150.00
	\$300.00
BQR7C JGMBB 4GGJF MXKDC JBWHY	\$150.00
	\$2,608.00