Automotive Computing Using Game Console Hardware: Proposal

Pat Suwalski
pat@engsoc.carleton.ca

September 23, 2004

1 Introduction

The Microsoft Xbox is a modern gaming console built from partially proprietary, but mostly standard x86 hardware. Because of this, its main strength is its price and compatibility with common third-party hardware. While its BIOS is designed to boot into a gaming console that understands the Xbox game disc format, it can be re-flashed to accommodate a Linux bootloader, which allows the unit to function as a standard computer.

With its relatively cheap hardware and ability to do more than it was designed to do, the Xbox is a good candidate for automotive computing. It has four USB ports, a network interface, an optical disc reader, a hard drive, as well as video output. From a hardware perspective, the Xbox has all of the components needed to allow for user interaction, as well as data collection from the vehicle.

At this point in time, Xbox hardware has been well documented. A working Debian-based Linux distribution specifically for the Xbox is available.

DashPC is an open-source suite of tools with a common interface, designed specifically for automotive purposes. It is designed to be easily operated with a touchscreen. DashPC runs on Linux.

2 Objectives

The goals of this project are as follows:

- Port DashPC to work on Xbox hardware
- Contribute to refinement of Xbox Linux
- Expand DashPC software and contribute changes back to the project
- Install unit in vehicle as proof of concept
- Evaluate ergonomic/safety issues of having a computer interface in the dashboard

3 Module Design Ideas

Aside from providing the driver stored information and entertainment, it is possible to interface a PC with the vehicle's On-Board Diagnostic System (ODB-II). This system provides information about the state of the engine. Examples of information it can provide are speed, engine revolutions, and emissions control numbers. Using this information, it should be possible to track gasoline usage in ways more interesting than a pen-and-paper solution can provide.

Until the display module is purchased and installed, it would be convenient to have a way of controlling the computer wirelessly from a unit such as a laptop or a PDA. The computer unit could have a wireless access point attached to it via the network port. This would allow for easy communication with the Xbox, as well as a convenient way to link with the unit to upload files. A wireless solution would be simpler than running ethernet cable to the garage.

Alternatively, a USB wireless card could be used in access point mode. This would allow for use of open access points to automatically update weather and traffic information while driving.

While all of these ideas are currently implementable, few have useful user interfaces. A large part of the project will be proper integration, so that everything "Just Works" when the engine is turned on.

4 Methods

Much of the work of porting Linux to the Xbox has already been done. As such, there will be a heavy reliance on open-source tools and processes. Much of the technical help will be derived from a book by Andrew Huang called *Hacking the Xbox*. This book also outlines all of the hardware modifications that will need to be made in order to use standard peripherals. These are minor, and consist mostly of soldering on extra connectors.

Once the unit is properly bootstrapped and running Linux, porting of software should be trivial, as the hardware is comprised of fairly standard x86-based components.

5 Timeline

October 31st: Linux running on Xbox, with full support for USB ports and network.

November 30th: Unit running with peripherals such as GPS and wireless network.

December 31st: DashPC interface running, initial integration of software. New interface programming starts.

January 31st: All software runs acceptably.

February 28th: Installation into vehicle and testing of running system.

March 31st: Report complete.

6 Special Requirements

There are no foreseeable special requirements for this project.