

# In-vehicle HMI Programmability

## About

An in-vehicle computing system has been implemented using Windows XP Embedded. It does not use of a keyboard, mouse or touch screen. Instead it uses limited set of buttons and dials for user input. This requires a different approach to HMI.

## HMI

The HMI is implemented using the fascia buttons and dials. The main buttons choose the functionality. There are 6 buttons just below the screen that tend to be used to choose 1 of 6 menu items or options. An icon or simple description can be displayed just above the screen for each. There are some [Next] and [Previous] buttons for moving through larger lists, for example a list of music tracks. There is also a menu dial that can be coupled with list control on a form. The list could be a list of name-value pairs, where the names get displayed and the values actioned (eg web page URLs) upon selection.

## Screen Resolution

Of note is the limited screen resolution (Wide Quarter VGA: 420 x 200). The system runs at a higher standard VGA video resolution (eg 1200x768). There is a hardware converter that converts between the two video formats. Forms typically run in full screen so it is important that for any application, that forms trap the rescale event and resize form components, including fonts, in proportion.

## System State

The system uses a hibernation feature available in Windows XP Embedded which enables an hibernated state to be repeatedly re-used every time the system reboots. Normally the hibernation file can only be reused once. This way the system always starts in a known state with application/s already loaded and running.

## Application software

The system runs by launching an "over-arching" .NET (V2) application at start-up. Some of the .NET forms implement animation through Flash (Flash Player plug-in installed). Other forms use .NET controls. These can be customised to consume remote web services and display the results. Alternatively there is an Internet Explorer control that can be used to display web sourced content.

## Web Browser

Forms have been implemented to display web content. With these the program actions the IE control to navigate to a given URL. This could be from 1 of 6 (buttons) list or from a menu driven list. The list could be fixed in code, or part of an XML document that the program loads at start-up. The lists would typically change with context. Alternatively a mechanism could be implemented to dynamically download a list of descriptions and URLs for display and action (navigate to). JavaScript embedded in downloaded web pages can also be actioned by the program. The Flash and Windows Media player plugins also work within the browser. The web control would typically display in full screen or with a menu list at the bottom.

## Networking, GPS and other

The system has wired networking for development purposes. For in car use, it has WiFi as well as a 3G modem for local and wide area mobility respectively. The system is able to get GPS NMEA data as well as Latitude-Longitude for mapping and tracking use. The system has an interface to the vehicle CAN Bus and so can garner information about the vehicle state such as speed, RPMs etc.

## Other operating system issues.

- We typically implement Taskbar auto hiding so that forms cover the full screen.
- We hide the mouse cursor as its not needed and detracts from what is displayed
- We hide desktop items so that if no forms are showing the screen appears blank (black).

## Contact

For further information on VPAC's HMI & Telematics capabilities, please contact [engineering@vpac.org](mailto:engineering@vpac.org). To view case studies of our work on HMI, Telematics & Embedded Systems, visit [www.vpac.org](http://www.vpac.org).