

# Advanced Concept of User Interface for On-board Information Systems

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## 1. Abstract

On-board information systems are increasingly used in combination with large-capacity HDD units and portable music players as the volume of various data handled is increasing: not only map data but also images, music, and general data such as telephone information. Drivers and passengers increasingly wish to enjoy entertainment such as music and video in the car.

However, as data volumes have increased and device operating procedures have become more complicated, there have been complaints about the difficulty of operating devices or unsatisfactory image quality.

Manufacturers must solve these problems and create a safe and comfortable on-board environment.

Mitsubishi Electric has therefore developed a user-centered control interface that helps drivers and passengers operate on-board information systems easily and safely through the optimum combination of operating devices (control devices) and sound/image devices.

The typical features provided by this control interface are:

- (1) Optimal interface for customized contents and operating environment based on passenger identification
- (2) Safe and reliable operating interface that allows the driver to safely choose data from a huge selection, even while driving
- (3) LCD touch-screen interface for simplified operation from the front passenger seat
- (4) Personal audio system and simplified music search

function

- (5) Highly-legible display interface that can display map information or meters at the optimum ratio in accordance with the operation status of the vehicle (running/stop)

## 2. Introduction

The increased volume of contents such as images and music and the complexity of operating devices due to many switches and the like to allow each passenger to control such devices, are major challenges for the development of on-board information systems. A safe and comfortable on-board environment that solves these challenges is needed.

We have developed the industry's most advanced control interface (design specifications related with operability) for safer and more comfortable operation of on-board information systems by optimally combining the operation devices and sound or image devices.

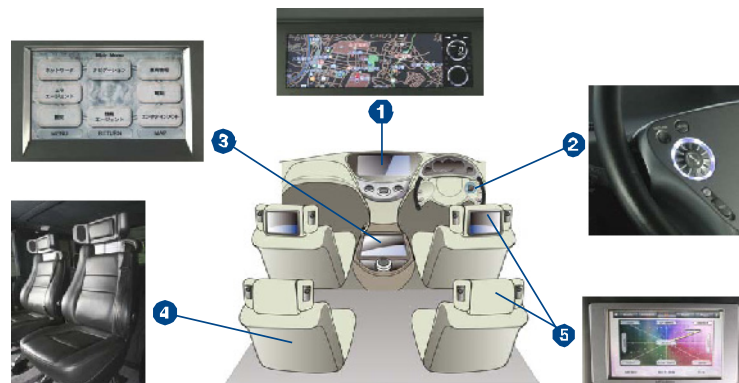
This report discusses the features and outline of these user-centered interfaces.

## 3. Contents of Development

3.1 Provision of optimum contents to individual passengers by passenger identification

Noncontact passenger identification to identify passengers in the respective seats can be made when each passenger with an IC tag, which is built into their cellular phone or key-less entry system, gets into the vehicle.

After authentication the individual personal meter is



### Additional suggestions

- ① Passenger identification system that can provide optimum contents to the respective passengers
- ② Safe and easy-to-use operating interface remote control installed on the steering wheel
- ③ LCD touch-screen that allows the passenger beside the driver to operate the system easily while looking at the screen
- ④ Personal audio system and simplified music search screen
- ⑤ Wide LCD display screen with improved legibility in accordance with the operation status of the vehicle

displayed automatically with driver's preferences (Fig. 1), music contents, and telephone directory data.

This system to automatically set up devices for different users as soon as a user sits in a particular seat can be applied to various devices in the future.

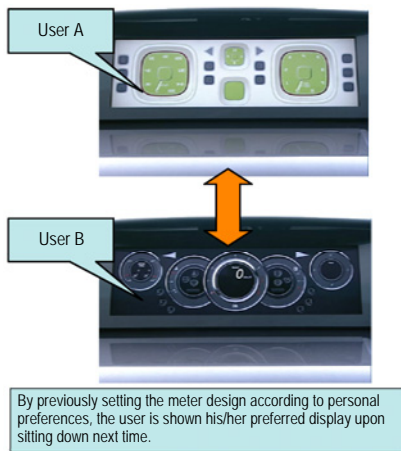


Fig. 1 Design interface meter adapts to the user

### 3.2 Safe and reliable control interface by remote control on steering wheel and talkback function

Equipped with a remote control on the steering wheel (Fig. 2) and talkback (audio response) function for safety, the driver can operate the on-board information system safely through a click-feel on the fingers and audio guidance without having to keep looking at the screen.



Fig. 2 Steering-wheel mounted remote control

A typical application is a surrounding area search while driving. When the driver wishes to stop at a particular place, the driver can operate the remote control on the steering wheel to call up the surrounding facility menu and select a menu item by using the rotating dial and talkback (audio response) function. The candidate facilities are displayed in a spiral pattern with the cursor position on the map as the center. The driver can search the facilities outward by rotating the dial.

Thus, with the audio guidance and a quick glance for checking, the interface is safe for the driver to oper-

ate, minimizing the need to look at the screen.

### 3.3 LCD touch-screen interface easily accessed from the front passenger's seat

An LCD touch-screen that can be operated while looking at it is located at the most convenient location for the passenger sitting in the front passenger seat (Fig. 3). Our newly developed interface provides each individual passenger with the optimum control method.

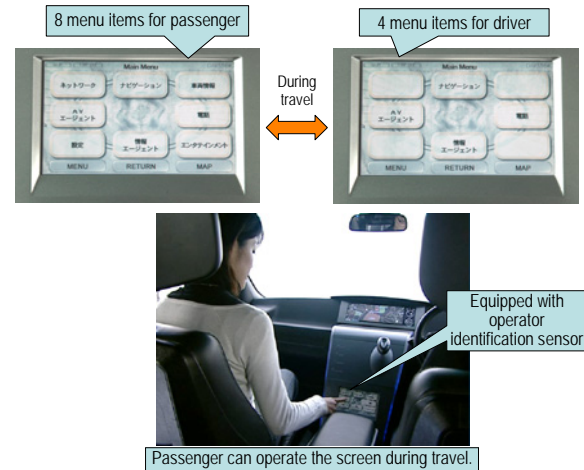


Fig. 3 LCD touch screens

Since it is dangerous for the driver to keep looking at the screen while driving, the current systems restrict the operation of the screen by the driver while driving. This means that a passenger seated beside the driver cannot operate the screen.

We have developed a touch-screen display which can be actuated only by the passenger seated beside the driver. With this display, the passenger can always operate all the menu items, while only limited menu items that do not affect safety can be operated by the driver.

With this display, both the operability for the passenger seated beside the driver and safety for the driver have been secured simultaneously.

This technology is expected to contribute to greater convenience and safety for both the passenger and driver in the future.

### 3.4 Development of personal audio systems

In order to be able to provide each passenger with their favorite music, we have created a personalized audio and image rendering system with a speaker and touch-screen display unit installed on the headrest of every seat (Fig. 4).

We have also developed a system for each passenger in a different seat in a vehicle to enjoy their preferred music and images which are output via individual speakers and display unit interlocked by IC tags (Fig. 5).



Fig. 4 Personal audio system

### 3.5 Wide screen for improved legibility of navigation map and the like

With 15-inch wide LCD screens installed (Fig. 6), the legibility of large-screen maps and entertainment quality of the system in a stopped car have been improved.

When map display is not necessary, the screen displays the meters fully. On the other hand, when map display is necessary the meters are displayed in a small screen and the map is displayed in the remaining larger space for improved legibility.

When the car is parked, images can be displayed full screen for enhanced entertainment.

### 3.6 Music search interface

An enormous amount of music data can be stored in today's hard disks, but this makes it difficult to search the music efficiently. To solve the problem, we have developed a music search function (Fig. 7) and automatic music recommendation system (Fig. 8). With the music search function, the tune components of music

data such as genre and tempo are analyzed, and automatically classified and registered on the basis of lightness or darkness (horizontal axis) and fastness or slowness (vertical axis), so the driver can select the music. With the automatic music recommendation system, the most appropriate music contents are automatically recommended to the driver based on a combination of the driver's history and preference and external environment information, such as vehicle position, time, weather and road conditions (including traffic congestion, expressway and general road information) provided by the car navigation system. As a result, much quicker operation is possible.

## 4. Conclusion

IT technologies will increasingly be implemented on vehicles as information services are enhanced using IT communications such as music and video delivery as well as map-updating information, in addition to a huge volume of music and image data which drivers and passengers themselves upload to the system, as data capacities increase in the future.

An interface is needed to support various types of information, music, and images, while ensuring safe operation and providing a personalized environment for handling the increased amount of information available.

It is important to verify the types of input/output devices on actual operation environments (in vehicle compartments), accelerate R&D on control interfaces for such on-board environments, and improve the environment for safely and easily using on-board information systems.



Fig. 5 Personal audio seats

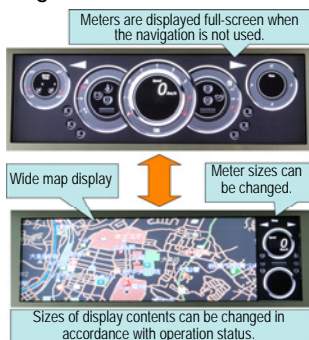


Fig. 6 Wide-screen display

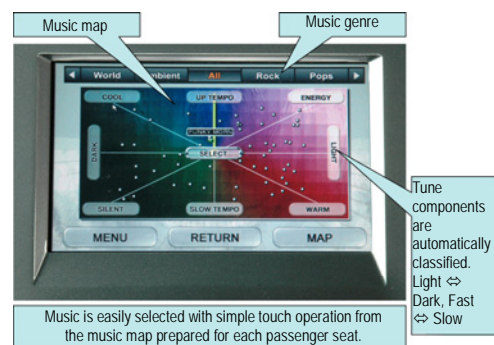


Fig. 7 Music search screen

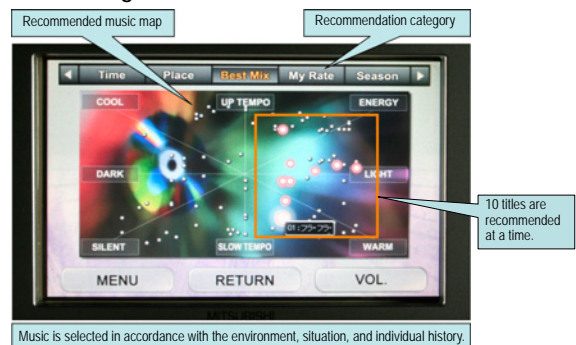


Fig. 8 Image type music recommendation screen