

# Analysis of Automotive Smart Touch Interaction Scheme Based on Driver Usage Scenario

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**Abstract:** With the advancement of information technology and the market's changing demand for in-vehicle presentation, entertainment and driver assistance systems, cars are becoming more and more electronic, button-based and even screen-oriented. The glass cockpit is no longer an unreachable dream. The prosperity of the car has driven the development of related industries, and the display screen as an indispensable part, coupled with the successful application of small and medium-sized panels, the car display will become another important market segment for the fierce competition of global panel manufacturers. The intelligence of the car, the touch screen and the system are all indispensable parts. The car touch display market can be said that the world is vying for the competition. Europe and the United States main attack system, the Asia-Pacific region to seize the high ground of the car touch screen display. The core of the world's display technology is located in the Asia-Pacific region, with major manufacturers in South Korea, Japan, Taiwan and mainland China. Japan's JDI has already begun to compete in the car display market while producing mobile phone screens. South Korea's LG Display's current market share is still relatively low, but with the strength of the IPS panel, the development momentum is still very fierce. Taiwan's Innolux and China's Guanying and AUO and other panel companies also occupy a large market share. This article will explore the automotive smart touch interaction technology, analyzing the car smart touch interaction scheme by the user's usage scenario.

## 1. Introduction

The touch screen is a device that makes multimedia information or control a new face. It gives the multimedia system a new look and is an attractive new multimedia interactive device. System designers in developed countries and system designers who are the first to use touch screens in China have clearly understood that touch screens are no longer a dispensable thing for computers in various applications, but are essential equipment. It greatly simplifies the use of computers, and even those who know nothing about computers can still be able to make their computers more attractive. Typically, the touch controller is a small microcontroller chip that sits between the touch sensor and the PC/ or embedded system controller. The chip can be mounted to the controller board inside the system or to a flexible printed circuit (FPC) attached to a glass touch sensor. The touch controller will extract information from the touch sensor and convert it to a PC or embedded system controller.

The touch screen "sensor" is a transparent glass plate with a touch-responsive surface. The sensor is placed over the LCD so that the touch area of the panel covers the viewable area of the display. Most touch screen systems are used on conventional LCDs. The LCD selection method for touch products is basically the same as in conventional systems, including resolution, resolution, refresh rate, cost, and the like.

The touch screen driver software can come from the original manufacturer (such as the embedded OS in the mobile phone), or it can be installed later (like adding a touch screen to a traditional PC). The software should enable the touch screen to work with the system controller. It

tells the product's operating system how to resolve touch event information from the touch controller.

As the definition of the car changes, the car interaction design has also undergone tremendous changes. The car interaction is the link between the user and the car. Through it, the user can experience, understand and feel the car, and establish a wonderful relationship between man and machine. At this stage, the mainstream trend in the industry is multi-modal and multi-channel fusion interaction of smart cars, which is almost the same as button, touch, voice and body. With the development of intelligence, the ultimate touch experience brought by new electronic devices is gradually changing the user's usage habits. The traditional automotive electronics field is also being affected by the trend of intelligence and visualization, and with the increasing functions of the in-vehicle electronic system, the traditional button operation can no longer meet the needs of users. It is becoming the focus for current mainstream automakers and leading auto electronics manufacturers of how can it better improve the human-computer interaction mode.

## **2. The user's usage scenario determines the touch interaction mode**

The Theoretical basis based on the scene design:

The use scene is derived from the concept of "scenario", which refers to the synopsis of a dramatic scene or literary work. In the field of HCI (Human Machine Interaction) design, John Carroll first applied the scene-based design approach to the design work. C. Rolland divides the situation into "form, content, goals, and life." "Form" refers to the characteristics of various styles when setting the scene. Depending on different style, the scene will show different expressions when it is set; The "content" refers to the user's diverse behaviors or activities based on the user's basic characteristics, opinions, requirements, and desires. The "target" refers to the visualization of the target, and the context setting can effectively reflect the problems at the current stage of the product and the problems that need to be improved in the future; The "giving life" means that the set scenarios and products need to be constantly updated.

Different usage scenarios of the car lead to differences in the interaction requirements, so the touch interaction needs to be adaptively adjusted. The following are three types of scenarios, specifically analyzing the possibility of car touch interaction — car stationary state, car travel state, remote control of the car.

## **3. The interactive scene division of touch interaction technology in car use**

Designing the user's demand behavior from the user scene is one of the more common design methods in the Internet field. Let's analyze the use of touch-intersection technology in different scenarios in the car.

### **3.1. Touch Interaction Analysis of Car Static Scene**

Compared with the traveling state, the stationary state is more secure, so it can meet the user's longer and more precise operation requirements, including touch interactive games, chat and watching video. How to make the driver and the car coexist in perfect harmony has always been the main direction of car interaction and even the whole industry research. The car's central control is replaced by a huge touch screen. The head-up display system HUD makes driving no longer in a hurry. Auto-driving liberates the driver's hands and brain, and paints a beautiful future for people. However, the dazzling new technology that has been introduced has neglected the real needs of drivers.

In contrast, the design of most car center consoles, the number of buttons far exceeds the user's cognitive ability. Although the traditional buttons are excellent in hand, they cannot give users quick and effective feedback and information prompts. The user does not know what role each button can play. Through the visual touch operation, the touch screen can let the user intuitively understand the result of the operation through the action or text prompt, and display the body in the

form of a high-precision model, the user can control where the point is, that is, what you see is what you get, which makes the user's experience more intuitive and accurate. Give the driver a better visual experience and a richer experience in the car.



Figure 1. Visual vehicle control technology.

The digital car body rendered by the car host in real time can not only perform dynamic rendering of the viewing vehicle, but also realize the operation control of the car body.

### 3.2. Touch Interaction Analysis of Car Travel Scene

For the reason of driving safety, the user's focus time is short in this scenario, which requires more streamlined and more lenient interactions, even using voice interaction. At this time, it is necessary to apply the car suspension touch technology, simple multi-touch. For example, two-finger touch zooms and zooms in the proportion of the map. When driving a smart car, the driver holds the steering wheel with both hands and looks at the road ahead with both eyes; the driver's hand is from time to time. Touching the blind operation on the surface of the smart interior, the voice will feedbacks the result of the operation; the driver only occasionally licks the screen when he is not sure how to operate.



Figure 2. BMW brings HoloActive touch technology Virtual interface replaces physical contact.

In addition to steering, braking and shifting, smart cars can continue to use steering wheel, pedal and handle control. Various mechanical liquid and gas devices, electronic and electrical equipment, and information communication facilities will be uniformly touched on the smart cockpit smart interior surface. The driver's finger is on any smart interior surface that is easily accessible, and the touch operation is originally performed with various functions of buttons, knobs, switches, and joysticks. The smart interior surface of the smart cockpit is equivalent to a touchpad.

### 3.3. Remote Control Car Scene Touch Interaction Analysis

At present, the Internet of Vehicles products have entered more and more different platforms, and users will be free to switch between different platforms in the future, including mobile phones, Pads, and smart wearable devices as future trends. At the same time, with the development of technology, the human-computer interaction has become more and more diverse, including visual, auditory, language, tactile and so on. The pressure touch technology means that a force sensor is arranged at the

four corners of the screen, and the pressing force can be perceived, thereby performing the action feedback of the three-layer dimension by tapping, tapping, and re-pressing. This allows the touch interaction to extend from the long-pressed "time" dimension to the stressed "strength" dimension, opening up a whole new space for human-computer interaction. Then, the future car networking products will have to consider the cross-platform multi-channel user experience when designing.

First of all, it is necessary to clarify the scenarios and usage purposes of different operating platforms, different human-computer interaction channel modes, and the transformation and combination between cross-platform and multi-channel interaction modes, including operational behavior of different channels like watching, listening, voice, gesture, touch, etc. Secondly, it is necessary to systematically analyze the driving behavior of the user, establish a behavior information base, and sort out the appropriate operation and use platform of the user in various scenarios in the actual driving scene, the most suitable human-computer interaction mode for each task flow and the coordination between each interaction mode.

#### **4. Conclusion**

Intelligent and electrified push up the global automotive electronics industry. With the continuous improvement of people's safety, comfort, energy saving and environmental performance requirements, the proportion of automotive electronics in a single car has been increasing, and automotive touch technology has become the most critical factor in the automotive industry innovation. The touch screen makes the car the next smart mobile terminal. The car network is the fastest growing segment of the automotive electronics market, with the car touch screen being its core carrier. We believe that the car touch screen will promote the car to become the next most important mobile intelligent terminal after the smart phone. The car touch screen will replicate the growth mode of the smartphone touch screen and grow rapidly.

The touch technology for automobiles is much more complicated than the electronic products in terms of research and development. It not only needs to integrate with the whole vehicle, but also considers a series of problems such as temperature, humidity, vibration resistance, etc., at least to complete the vehicle development stage of three high test (high temperature, high altitude, high corrosion). Indeed, for these IT companies, it is not difficult to provide a touch technology solution for a mobile phone, but as far as the car is concerned, there are still many unknowns to be verified. Touch interaction technology is still the most important means of car interaction at this stage, and it is also in a period of vigorous development, which is expected to further develop and mature.

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