

Reflection on Intuitive Interfaces Operating of Products — a Facilitation or Obstacle?

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Abstract: Touch panel has been a new trend. It is an intuitive interface design based on human actions and feelings from life experiences. However, when designing the interface, the incomplete investigation and design may lead to the incorrect cognition and obstacle for users. From operating mode of existing touch panel products and intuition investigation of respondents, the research discusses each group has different cognition and response to intuition under various cultural backgrounds and life experiences. The research discovered that respondents have significant differences on holding style of middle-sized multipoint touchscreen, intuitive operating modes of object zoom in or out, and object spin. The results of the research can not only establish the correct intuitive operating concept and avoid the operating troubles caused by different ethnic groups but also be great helps for internationalizing the products and designs.

Key words: *Intuitive Interfaces, Touch Panel, Lifestyle, Operation Feedback.*

1. Introduction

Intuitive interface is an interface design based on actions and feelings from daily life experiences or from control of gestures, languages, touching, and olfaction. It is easy to interact with the system and learn how to use it. After the input device changes into touching system, the intuitive operating helps lower operation difficulty and decrease the trouble in learning. It also shows the influences of various lifestyles, referring to various cultural backgrounds and life experiences, each group has quite differences on cognition and responses of intuition. If the designers and producers do not have well-structured investigation before design, it may lead to Human-Machine Interface (HMI) problem. Therefore, the research focuses on literature review, multipoint screen selection sequence of existing products, task operating modes, user's intuitive operating, and assigned operation modes by designers. The comparisons are to receive the best operating mode for the users.

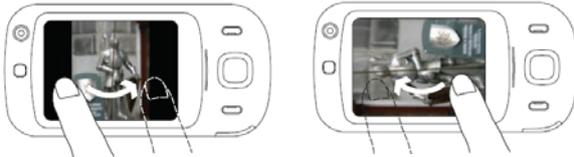
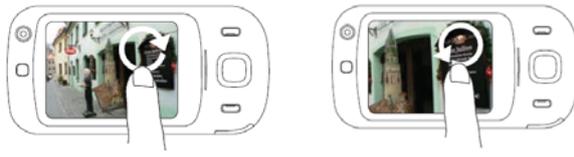
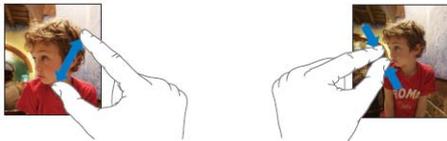
2. Existing Product Analyses and Literature Reviews

The iSuppli Company indicated though resistive touchscreen cannot last long, it is the most common touchscreen technology on markets. However, start from 2008, till now, the technologies of cellular phones has turned into sensor-in-pixel and in-cell touch [1].

2.1 Existing Product Analyses

From investigation of existing product function and operation mode, it is not hard to discover though the functions of products are the same, there are still differences among products due to their designers and the company developments.

Table 1. The operation difference of decreasing and enlarging between HTC Touch Mobile and Apple iPhone (Figures was used from manual through HTC and Apple)

HTC Touch Mobile		Apple iPhone	
			
Rotate in circle from right to left can make the photo rotate 90° according to the operating direction.		Rotate iPhone sideways. The photo automatically reorients and expands the page.	
			
Rotating in hour-hand direction or against hour-hand direction to operate enlarging or decreasing function.		Pinch to zoom in or out.	

The above problems, except for technology factors like Apple's multipoint touchscreen, others are limited to designers' design cognition and subjective consciousness. Why there's a difference? What's the principle for the operating mode design? And what objective operating mode should be like? These are the issues the research needs to explore.

2.2 Touch Panel Technology and Interactive Interface Design Principles

Cushman and Rosenberg (1991) proposed touchscreen operation and space flexibility is another advantage like software usages in the sense area can be easily defined, so that different designs can be produced from various demands [2]. In *Designing Gestural Interfaces: Touchscreens and Interactive Devices* by Dan Saffer (2008), it presented the common touch style sensors have 7 categories: pressure, light, proximity, acoustic, tilt, motion and orientation. Therefore, the characteristics of touch interactive gestures are proximity, duration, width, height, orientation, pressure, including objects, number of touch points and combination [3].

Nielsen (1993,1994) proposed that usability has five characteristics: learnability, efficiency of use, memorability, Few and Non-catastrophic Errors, and subjective satisfaction [4,5,6]. Therefore, usability should not be solely defined at interface design. ISO 9241(1995) tried to solve this problem at a high level: it defines usability as a concept of quality in ergonomics by integrating the aspects of effectiveness, efficiency and satisfaction [7].

3. Research Methods and Analyses

There are 60 (39 females, 21 males) assigned subjects. All of them are college students and the age range is from 18-24 years old. They are all right-handed users, can operate touch panel system independently and they never use multipoint touch screen products like iPhone, HTC Touch Mobile.

The equipments include 30"(large), 8"(middle), and 3.5"(small) three sizes touchscreen models, digital video and camera stand to record of research procedures. Categorize the previous survey of multi touch interactive screens and literature reviews. These are for operating method's design and planning. In the research, three main variables are screen size, operation task and gestural operating mode. The experiment is divided into two parts. First, address respondents' subjective cognition on holding styles and operating directions for different standards of touch screen. Second, take the image records of imitated operating three sizes of touchscreens for analyzing respondents' subjective operating movements under various tasks. During the recording, respondents' subjective cognitions are carried out and the facilities are excluded. The only thing needs to be taken care is the operation has to be executed on the interface of the screen.

4. Results and Discussions

4.1 Different Size of Touch Screen Operating Modes

During imitated operation for three sizes of whole touchscreens, through tabulated statistics, there are no significant differences for genders on holding screens. Only when holding small-size touchscreen, sixty percent of respondents would operate in vertical styles spontaneously while others use horizontal styles. In addition, with the increasing screen size, the operating mode would become horizontal style. In the meanwhile, with the holding style of middle-size touchscreen changing into using it on the table, the rate for horizontal holding would increase.

4.2 Tasks and Intuitive Operation of Screens

Delete unidentified data of ambiguous movements and through One-way ANOVA, the findings showed in Table 2.

Table 2. The compares of tasks and intuitive operation of screens

Operation Task	Sig.	Screens size and holding styles		Sig.
		Style 1	Style 2	
selecting object	0.015	holding small screen	putting middle screen on the table	0.003
executing object	0.001	holding small screen	putting large screen on the table	0.000
		putting middle screen on the table	putting large screen on the table	0.001
moving object	0.000	holding small screen	putting large screen on the table	0.000
		holding middle screen	putting large screen on the table	0.000
		putting middle screen on the table	putting large screen on the table	0.000
rolling layout	0.000	holding small screen	putting large screen on the table	0.000
		holding middle screen	putting large screen on the table	0.000
		putting middle screen on the table	putting large screen on the table	0.000
object zooming in or out at will	0.024	holding small screen	putting large screen on the table	0.004
		putting middle screen on the table	putting large screen on the table	0.027
object rotate at any angles	0.000	holding small screen	putting large screen on the table	0.000
		holding middle screen	putting large screen on the table	0.000
		putting middle screen on the table	putting large screen on the table	0.000
object rotate at same rate	0.000	holding small screen	putting large screen on the table	0.000
		holding middle screen	putting large screen on the table	0.000
		putting middle screen on the table	putting large screen on the table	0.001

From different sizes of whole touchscreens and operating tasks, the movements of changing page, object zooming in or out at same rate, and keying in words, are not influenced by the screen size.

4.3 Gestural Operating Mode

In the operating mode of selecting object, executing and moving object, rolling layout, changing pages, and rotate operating mode, the single hand and finger are used the most. It's more common to use fingers to tap the screen while in small size; thumb would be used instead in the operating mode of selecting object. In rolling layout, the exact intuitive directions can not be identified. Many users would use two fingers of a hand to pinch and even use palms to operate in large-size touchscreen. Users use hands to write on screens more.

5. Conclusion

During experiments, task of object zoom-in or out and spin among eight tasks appear many intuitive operating modes. After interviewing respondents on executing tasks, it is found that due to the stereotype of MicroSoft system, respondents would use single finger in selection or in dragging; others though never use iPhone, but because of the advertisement, they would use thumb and index finger to pinch zoom in or out. Therefore, this influences the accuracy of the experiment but it shows experience and habit would affect one's judgement. Moreover, the experiment explores the intuitive operating mode of horizontal and vertical style for small, middle and large size of screen, the results indicate even there are no significant differences in statistics, when operating small size of touch screen, the respondents use vertical style naturally while in larger screen size, the rates for using horizontal style enhance.

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