

A Matching Test of Task-Gesture on Tablet for Mid-older and Young Adults

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Abstract

Due to the intuitive controllability and easy to learn the tablet is a very popular nowadays. Many touch gestures are introduced to enhance the convenience usage on the tablet. However, how these gestures match with the tasks? Are they understood by the “technological alienation” of the elderly users? Is there difference existing between the elderly and younger people? This study aims to answer these questions. Seven basic gestures and their correspondent tasks were selected from top 3 operation systems. Thirty mid-older subjects including 15 expert users and 15 novice tablet users and thirty young subjects were recruited to do matching test. As a result, we found that the correct rate of the mid-older is significantly lower than the young. Experience in using might affect the correct rate. Certain intuitive gestures including Tap, Swipe, Pinch and Rotation had higher correct rate were considered to be acceptable for both mid-older and young subjects according to the ISO standard. However, only the Pinch gesture for novice mid-older is acceptable. The research suggests that more coaching might be needed for novice mid-older adults on the use of gestures.

Keywords: mid-older, matching test, tablet, gesture

Literature Review

Since 2010 Apple Company launched its first tablet, iPad, the market share of tablet grow up quickly. Tablets compared to desk-top and notebook computers are easy to learn. The size of over 7-inch screen is better than the small screen on the smartphone in usability and portability. It is an ideal device for older people and children.

The market share of tablets has surpassed notebooks at present. In contrast to desktops and notebooks, tablets are easy to learn and carry around which make them suitable for the elderly. Some studies found that the elderly use their eyes and hands straightforwardly and comfortably while using tablets. It does not require any IT knowledge or experience. Thus, the mental loadings of the elderly are decreased in a considerable degree. Consequently, the tablet has been used broadly by the elderly to satisfy their needs in webpage-browsing and entertainment. been used broadly by the elderly to satisfy their needs in webpage-browsing and entertainment.

Caprani et al. (2012) found that seniors using their fingers and eyes in an intuitive way when they using tablet. They do not need any IT products' experiences. The hand-eye coordination is much better. The intuitive operation can reduced seniors' mental load. It can meet their needs for internet and leisure entertainment. Morris (1992) pointed out that “Technological Alienation” of seniors in the application of information science and technology, namely,

operation of an existing computer, peripheral hardware and software interface used, compared with other age groups, seniors are often more difficult to control, causing psychological and physical disorders.

The maturing of the touch gesture control technology in recent years, touch gesture control is applied broadly in GPS navigation, smart phones, tablets, laptops, touch panels and other consumer electronics products. Compared with the previous mouse control device, touch gesture has become a mainstream control method, a new generation of human-computer interface interaction. According many literature, the touch-control is more intuitive, convenient and easy to learn for the elderly. However, what problems will happen when the elderly converts from traditional input interface to a touch-control operation? Will it be easier to use and give a proper feedback to the elderly. It remains a subject worth to explore.

Seven gestures were selected from the three most popular tablet operation systems, i.e. Android, Apple iOS and Windows. Seven gestures include Tap, Tap and hold, Double tap, Swipe, Pan, Pinch and Rotation. They are considered to be basic and used most often. They are illustrated as Table 1.

Table 1 Selected gestures and their corresponding meaning

Gestures	Tap	Tap-and hold	Double-tap	Swipe	Pan	Pinch	Rotation
Illustrations							
Correspond Meanings	Select	Delete	Quick zoom	Turn pages	Move	Zoom in/ out	Spin

Research Methods

Matching test is adopted to see how the tasks match the gestures on a tablet. The method is described as following.

Subjects

Two groups of respondents, 30 mid-older adults (aged 40-70) and 30 young adults (aged 20-30), are recruited for the test. The gender are as evenly distributed as possible. The mid-older group including 15 expert users (who use tablets or similar devices everyday) and 15 novice users (who use tablets or similar devices less than once a week). In this exploring stage, the convenient sampling method is used. A \$200 NT dollars of convenient store coupons was offered to every subject as a reward.

Tools

A laptop computer is used to play back the video clips which shows intended tasks and a questionnaire sheet were used to collect the answer.

Experiment procedure

1. Collect the subjects' basic data including: age, gender, education and experiences in using tablet.
2. Seven questions in video clips are played back to the subject one by one randomly. Subjects are asked to reply respectively until finish all the questions.
3. To prevent the subjects from choosing an answer by try-and-error, tablet was not provided during the test. The subjects were asked to choose an answer intuitively.
4. The answers and reactions from the subjects were recorded by the researcher for analysis.

The following seven questions were asked randomly to avoid the guessing bias.

1. If you want to select an App item, which gesture would you use?
2. If you want to delete an App item, which gesture would you use?
3. If you want to zoom in or out a picture or a web page to its original size quickly, which gesture would you use?
4. If you want to turn a page or read the other part of a page, which gesture would you use?
5. If you want to move around an App item to make your desktop more organized, which gesture would you use?
6. If you want to zoom in or out a picture or a webpage in the size you wanted, which gesture would you use?
7. If you want to rotate a map into a direction you wanted, which gesture would you use?

Data process

The Confusion Matrix (Zwaga and Boersema, 1983), a method to evaluate graphic symbols recognition rate, was used to analyze the data. Touch gestures were looked as an analogue to graphic symbols in this study. 7 gestures were placed on the left column while the responding tasks were placed on the first row. The number of the answers was registered into every corresponding box. The final correct rate is decided by the number of correct answer by the total number of subjects. The ISO standard for acceptable symbol recognition rate 66.7% was applied to judge the acceptable correct rate for the gestures.

Results and Discussion

Thirty young subjects aged between 20-28 years old (18 males, 12 females, 23.0 average, 2.27 S.D.) and thirty mid-older subjects aged between 47-70 years old (12 males, 18 females, 60.6 average, 7.03 S.D.) were recruited to do the task-gesture matching test. Half of the mid-older subjects were novice tablet users (use less than once a week) while the other half were expert users (use every day). All the young subjects were considered to be expert tablet users.

Mid-older subjects vs. young subjects

The results of the task-gesture matching test on young group and mid-older group are shown in Table 1 and Table 2 respectively. Overall, it is not surprisingly that the average correct rate on all tasks for mid-older subjects (52.4%) is significantly less than young subjects (78.6%). Except for “Delete”, all the correct rate of every task for the young subjects are higher than the their counterpart (see Figure 1). Interestingly, among young subjects, two tasks’ correct rates are below 66.7% (the ISO standard for icon acceptable recognition rate) i.e., “Delete” and “Quick zoom”.

16 subjects choose “Pan” to “Delete” an App icon, whereas only 7 subjects choose “Tap and hold”, the correct gesture. Why? In a following inquiry, we found that might be that the subjects are familiar with their own device in which the android system uses “Pan” (tap, hold and drag) as delete function while Apple IOS uses “Tap and hold”. This reveal a usability issue that the gestures for task are inconsistent over different systems. This might takes time for a new user to get used to a new system although a touch controlled tablet is thought to be easier to use. This is a confusing caused between systems.

Only 17 subjects (56.7%) choose the correct “Double tap” for “Quick zoom” task while 12 (40%) subjects choose “Pinch”, a “Zoom in” and “Zoom out” gesture. The functions of these two gestures are so similar that cause confusing caused within system.

In Table 2, four tasks including Select, Zoom-in/ out, Turn page and Spin for older subjects are over or equal to 66.7%. This means that they are acceptable for older subjects. The rest three other tasks’ correct rates including Move, Delete and Quick zoom are far below the 66.7%.

This means that they might be difficult for the older subjects. The Pan (11 selected) may be confused with Swipe (12 selected).

Table 2 Task-gesture confusion matrix for young group (n=30, mean=78.6%)

gesture	task	Select	Move	Delete	Zoom in/out	Turn page	Quick zoom	Spin
Tap		29	0	1	0	0	0	0
Pan		0	25	16	0	1	1	1
Tap and hold		1	5	7	0	0	0	0
Pinch		0	0	0	29	0	12	0
Swipe		0	0	1	0	29	0	0
Double-tap		0	0	5	1	0	17	0
Rotation		0	0	0	0	0	0	29
No answer		0	0	0	0	0	0	0
Correct %		96.7	83.3	23.3	96.7	96.7	56.7	96.7

Table 3 Task-gesture confusion matrix for mid-older group (n=30,mean=52.4%)

gestures	Tasks	Select	Move	Delete	Zoom in/out	Turn page	Quick zoom	Spin
Tap		22	2	4	2	2	5	2
Pan		0	11	7	1	1	2	3
Tap and hold		5	3	9	0	0	0	1
Pinch		0	0	2	21	0	14	2
Swipe		1	12	2	2	22	3	2
Double-tap		2	2	4	2	3	5	0
Rotation		0	0	1	1	2	1	20
No answer		0	0	1	0	0	0	0
Correct %		73.3	36.7	30.0	70.0	73.3	16.7	66.7

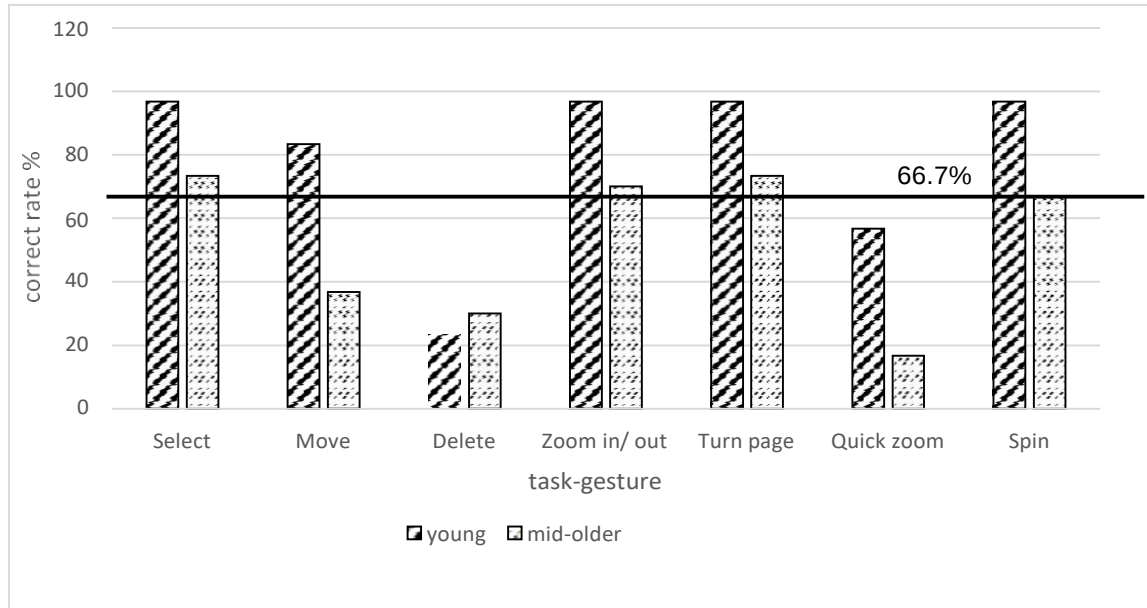


Figure 1 Comparison between young group and mid-older group on gesture matching rates

Novice vs. Expert Mid-older

The difference between novice and expert older subjects are further analyzed in Table 3 and Table 4. The average correct rate of the expert older (60.9) is higher than novice older (42.9). In Figure 2, there is only one task's correct rate, namely Zoom in/ out, for novice older subject is equal to 66.7%. Six out of seven tasks are below 66.7%. However, four tasks for expert older subjects are over 66.7%, namely Select, Zoom in/out, Turn page and Spin.

Table 4 Task-gesture confusion matrix for novice mid-older subjects (n=15, mean=42.9%)

gestures	Tasks	Select	Move	Delete	Zoom in/ out	Turn pages	Quick zoom	Spin
Tap		9	1	4	0	2	4	1
Pan		0	3	3	0	1	1	3
Tap and hold		3	0	4	2	0	0	1
Pinch		0	0	1	10	0	4	1
Swipe		1	9	1	2	9	3	1
Double-tap		2	2	1	0	2	2	0
Rotation		0	0	1	1	1	1	8
No answer		0	0	0	0	0	0	0

Correct %	60.0	20.0	26.7	66.7	60.0	13.3	53.3
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Table 5 Task-gesture confusion matrix for expert mid-older subjects (n=15, mean=60.9%)

gestures	Tasks	Select	Move	Delete	Zoom in/ out	Turn page	Quick zoom	Spin
Tap		13	1	0	0	0	1	1
Pan		0	8	4	1	0	1	0
Tap and hold		2	3	5	0	0	0	0
Pinch		0	0	1	11	0	8	1
Swipe		0	3	1	0	13	1	1
Double-tap		0	0	3	2	1	2	0
Rotation		0	0	0	0	1	0	12
No answer		0	0	1	1	0	0	0
Correct %		86.7	53.3	33.3	73.3	86.7	13.3	80.0

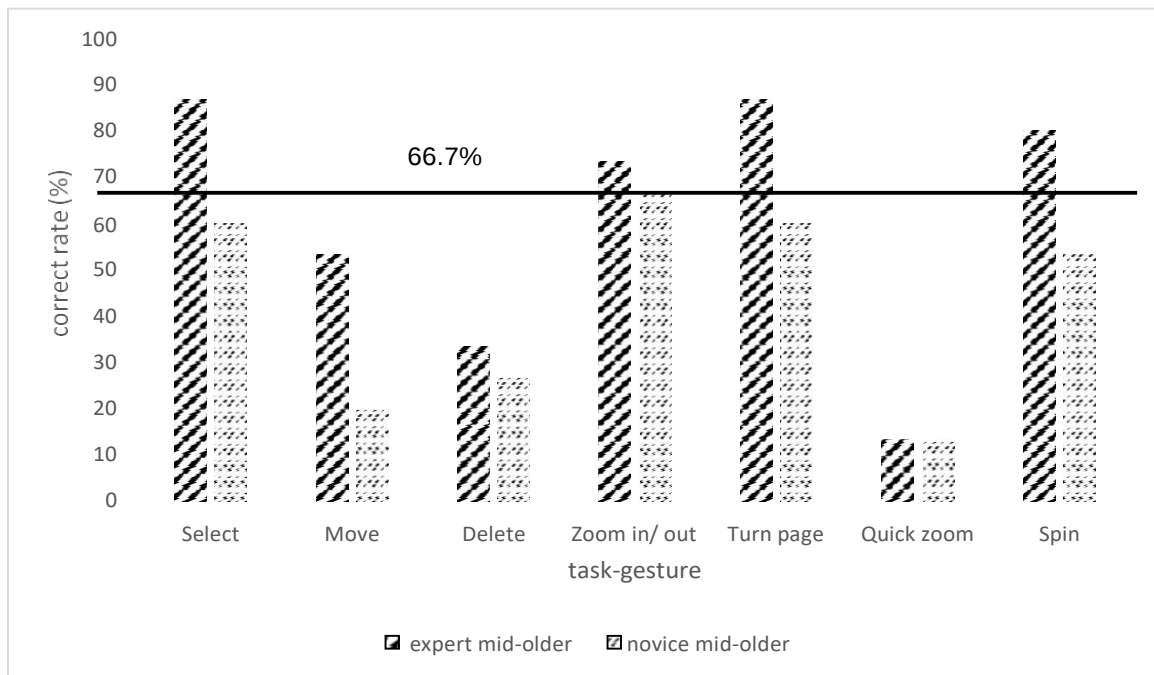


Figure 2 Comparison between expert older group and novice older group on gesture matching rates

Conclusion

Seven basic gestures, namely Tap, Tap and hold, Double tap, Swipe, Pan, Pinch and Rotation, and their correspondent tasks were selected from top three operation systems to examine the recognition difference between mid-older and young tablet users. Thirty mid-older subjects including 15 expert users and 15 novice tablet users and thirty young subjects were recruited to do matching test. As a result, we found that the correct rate of the mid-older is significantly lower than the young. Experience in using might affect the correct rate. Certain intuitive gestures including Tap, Swipe, Pinch and Rotation had higher correct rate were considered to be acceptable for both mid-older and young subjects according to the ISO standard. However, only the Pinch gesture for novice mid-older is acceptable. The research suggests that more coaching might be needed for novice mid-older adults on the use of gestures.

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Author Biography

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