The user requirement analysis of GPS navigation voice prompt

Chaoshe Jia [a], Cao zhong

School of Beijing University of Civil Engineering and Architecture, Beijing100044, China

[a]chaoshejia@163.com

Abstract. Growing popularity, in recent years, GPS navigation has become an indispensable means of transportation. GPS navigation workflow is that user input the information of the starting point and destination, and then navigation output most routes through the calculation and analysis for the driver. There are two ways of Navigation outputting that are the navigation interface and voice prompt. The driver can see route and direction information clearly through the navigation interface. If the driver takes the attention of the navigation interface too much in the process of travel, the driver maybe distraction, and maybe cause potential safety hazard, so the voice prompt subsequently and produce. Voice prompt is whole to broadcast on the route and the concrete road, and have little impact on the driver's safe driving. So it is a kind of safe and convenient way to the output. However, according to the drivers' reflection currently that there are some problems in the voice prompt, such as complicated information, information accurate enough, etc. It is because there is no real to understand the needs of the driver. So in this paper, we analysis the demand for the driver through the experiment, and find out the real demand of drivers for improve the level of the voice prompt.

Keywords: GPS navigation; voice prompt; the user's needs; the navigation interface.

1. The introduction

In recent years, automobile industry has exploded in our country. Data published in 2009 show that China has been the largest market of car in the world. The national bureau of statistics statistical bulletin shows that: at the end of 2012 the national civil car ownership of 120.89 million vehicles, an increase of 14.3%. 59.89 million vehicles, including civil car 20.7% growth, private cars, 53.08 million, an increase of 22.8%, private cars have gradually popular. Meanwhile, the traffic infrastructure is also developing rapidly in our country. At the end of 2012, our country road traffic total mileage will reach 4.1 million km. As popularization and the development of transport infrastructure, the vehicle driving become a life skills from a survival skills. Driver will be face to strange and complicated road system and changing the traffic. Drivers often encounter many problems in the road, especially the urban road, such as don't know which way to go, takes the wrong course, and into the side lane not in time, etc. These problems greatly interfere with the normal driving for the driver and Cause traffic chaos, even lead to traffic accidents.

GPS navigation can solve the above problems to a great extent. Navigation can plan out the optimal route and the direction for drivers, and feedback to the driver the traffic situation in the process of driving by means of navigation interface and voice prompt. So it can guide the driver to make the right operation. Voice prompt can give the driver a lot of help that it does not affect travel safety and not only give the driver the correct instructions. In order to improve the voice prompt, this paper is mainly concerned with the experiment exploration of the demand of the driver.

2. GPS navigation

Car GPS navigation is the use of GPS to provide services for vehicles. By using GPS global positioning function and electronic maps, it can plan the best route to the destination, and equip with voice and image text navigation information. The working process of the navigation is shown in figure 1.
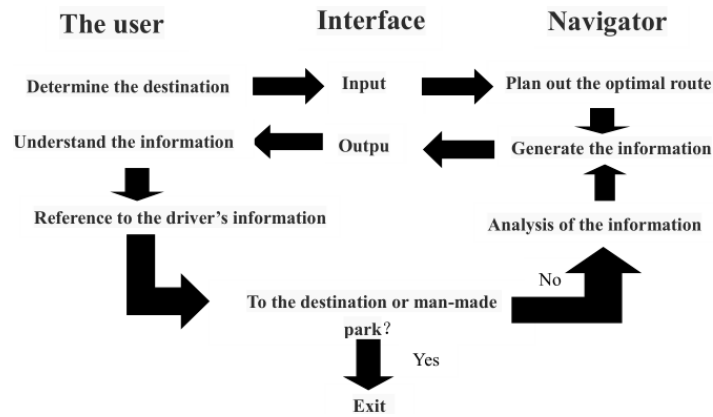
Fig. 1 The working process of the navigation

The output of the GPS navigation mode has two kinds: the navigation interface of graphic information and voice prompt. Drivers can make the output of the corresponding operation when the judgment analysis of navigation information. Drivers need spirit highly concentrated in the process of driving and can't distracted, so drivers can't take long time on the graphic information. So the navigation voice prompt is particularly important, because the voice prompt greatly reduces the interference with the driver. But voice prompt is not the more the more detailed, the better. It needs according to the needs of the driver, so we must to know that what information is needed in the process of driving for driver. In this paper, we experiment explored for it.

3. The experimental method

This test asks the driver without navigation to drive experiment on unfamiliar roads. Before leaving the driver can know the route by browsing map, and then drive from origin to destination. In the process of driving, the drivers can ask any doubt or uncertainty questions, and the researchers need to answer the questions and record the driver's problem.

3.1 Route selection

The experimental route needs including the highway, urban main road, urban road and city road in this experiment. Finally we select three sections: Section one, form Da Wang Road to Dong Zhimen (including urban main road and urban trunk road), it is shown in figure 2; Section two, form Dong Zhimen to Beijing normal university (including urban trunk road and urban and rural road), it is shown in figure 3; Section three, form Bei Tai Ping Zhuang to Da Tun road (including urban trunk road and highway), it is shown in figure 4. Travel time is 30 to 40 minutes.

Fig. 2 Da Wang Road to Dong Zhimen

Fig. 3 Dong Zhimen to Beijing normal university

Fig. 4 Beitai Ping Zhuang to Da Tun road

3.2 Personnel selection

This experiment selected 10 drivers (It is shown in figure 5).They are respectively 4 women and 6 men and the ages of them is between 25 and 45, that the age is the most of the driver's age. Eight of them have used a GPS navigator. Each driver will be made in the above three sections respectively experiment, so the experiments are conducted to 30 groups, convenient in comparison with each other.

Table 1 The experimenter information

Number	1	2	3	4	5	6	7	8	9	10
age	25	27	29	33	35	36	39	41	43	45
gender	male	male	female	male	female	female	male	male	female	male
Been driving	2	4	4	6	10	7	11	20	18	25
Whether to use GPS	yes	yes	yes	yes	yes	yes	no	yes	yes	no

4. The experimental data

Table 2 The experimental records

location	road condition	The driver's questions	answer
Dongzhimen	the start of the journey	Where to? How do I get?	Go to Beijing normal university, Don't walk the main road
Dongzhimen	Start at Dongzhimen north street	remind me when turning	Ok, on the front left to AnDingMen east street, then turn right to XiTuCheng Road
Dongzhimen north street	30 meters before the fork of An Ding Men north street	How to get the front?	The front left
An Ding Men	Former Dong Tu Cheng intersection	Turn right here?	Yes, turn right
Dong Tu Cheng Road	start at the Dong Tu Cheng Road	When turning tell me in advance	Ok, first go straight
Dong Tu Cheng Road	50 meters before alley mouth	Go straight ahead?	Yes, Go straight on
DongTuCheng Road	200 meters before north street intersection	Left?	Yes, Turn left on He Ping Li north street
He Ping Li north street	start on He Ping Li north street	Where is next turning?	Go straight on, turn left on An Ding Men outside street and then
He Ping Li	300 meters to AnDingMen outside street intersection of	The front left?	Yes, turn left
An Ding Men outside street	50 meters before Ande road intersection	turn right in front of the bank	yes
Ande road	start at Ande road	Where is the corner? The next crossroads?	Go straight to the De Sheng Men Outside street then turn right
Xin Kang road	on the Xin Kang side road	In front of the entrance to go in?	yes

Through the experiment we get 30 sets of data, I will list a set of data due to the space, as shown in figure 6.

Date: on December 24,

Section: Dongzhimen, Beijing normal university

Start time: 10:05   over time: 10:48
Age: 27 years old   Gender: male
                 Been driving, 4 years   whether used GPS navigation: yes

5. Experimental analysis

After the experiment, we carried on the detailed analysis and research for experimental record. According to both the driver's problems and the specific road condition, we had analysis the driver's psychological activities at the time to find out the driver's demand.

Before getting started, drivers need navigate to prompt for the traffic of the whole trip, so that the driver selects the optimal route. In the experiments, 10 drivers will find out the general route through look at a map first and then start. This means that before getting started, the driver needs to have a basic understanding for the whole route and find the optimal route.

In 28 sets of data (account for 93.3% of the total), the driver ask some questions such as "take the highway or ring road?", "The main road or go side road?", "The side road?" etc. So the navigation need to broadcast to the whole trip, including routes, direction, distance, etc.

When the car after the start or turn into a smooth road, the driver need navigate to broadcast the next road of his journey. In 24 groups of data (80% of the total data), Driver will ask some questions such as "where is the next corner? Go straight ahead? After the way?", etc. It is show that when the car goes into a smooth road, the driver will consider subconsciously the next trip, so it need navigate to broadcast the next road of his journey.

When the car is parking waiting for a red light or for other reasons, the driver is more relaxed and more energy. So there will be time and energy to focus on the next road of the trip. In 22 sets of data (account for 73.3% of the total) drivers asks some questions such as" After the red light how do I go?"," Tell me about after route", etc. It is show that driver need broadcast at this time.

When the car is about to reach corner intersection, the driver needs voice instructions. Even if the driver himself has a clear judgment, he still needs further confirmation of navigation. In 26 (86.7% of the total) of the set of data, the driver asks some questions such as "turn left or right in front ?","turn right?", "go straight or turn right?", etc. It is show that drivers need navigation to remind or confirmed respectively in 200 m, 100 m and 50 m when the car is about to reach corner intersection.

When the car is going in highway or ring road, drivers need navigation to prompt that where is the exports and entry. In 24 groups of data (account for 80% of the total) the driver asks some questions such as, It is show that the driver needs prompt respectively in 200 m, 100 m and 50 m.

When the car is driving to special construction or institutions such as schools, railway and so on, the driver needs navigate to at 200m. In 11 sets of data (account for 36.7% of the total) the drivers mentioned related problems such as "is a school at the front?"," railway?"," In my memory it is a residential area door ahead, yes?", etc. so some special places need navigate to prompt.

6. Conclusion

Through the experiment we can come to the conclusion that what is the specific content of the driver's demand.

Before getting started, drivers need navigate to prompt for the traffic of the whole trip and find the optimal route.

When the car after the start or turn into a smooth road, the driver need navigate to broadcast the next road of his journey.

When the car is parking waiting for a red light or for other reasons, the driver need navigate to broadcast the next road of his journey.

When the car is about to reach corner intersection, drivers need navigation to remind or confirmed respectively in 200 m, 100 m and 50 m.

When the car is going in highway or ring road, drivers need navigation to prompt that where is the exports and entry.

When the car is driving to special construction or institutions such as schools, railway, the driver needs navigate to at 200m.

References

[1]IEEE Recommended Practice for the Application of Human Factors Engineering to Systems, Equipment, and Facilities of Nuclear Power Generating Stations and Other Nuclear Facilities. IEEE Std. 1023-2004.

[2]USNRC. Human Factors Engineering Program Review Model. NUREG-0711, 2004.

[3]Jing J. What is us ability in the Context of the Digital Library and how can it be measured [J]. Information Technology and Libraries, 2005, 24(2): 47- 56.

[4]Hi x D, Harts on H R. Developing user interfaces: Ensuring usability Through Product and Process [M]. New York: John Wiley, 1993.

[5]Gray W D, Salz man M C. Damaged Merchandise? A Review of Experiments that Compare Usability Evaluation Methods [J]. Human- Computer Interaction, 1998, 13 (3): 203 - 261.

[6]Nonogaki H, Ueda. HFRIEND21 Project: Two-tiered Architecture for 21st-century Human Interfaces. ACM, CHI'91 Proceedings, 1991: 407-414P.

[7]Engineering Animation Inc. Jack 2.3 Training manual. EAC, 1999.

[8][Boney M.C. Williams R.W. a computer program to layout controls and panels. Ergonomics. 1977, 20(3): 297-316P.

[9]Jef Raskin. The Humane Interface: New Directions for Designing Interactive Systems. 2000

[10]Paul U Lee. Understanding human-human collaboration to guide human computer interaction design in air traffic control.2006.