A Survey of Hand Gesture Dialogue Modeling For Map Navigation

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ABSTRAKSI

Tren manusia untuk menggunakan tangan pada komunikasi. Pengembangan komputer ubiquitous telah menyebabkan kemungkinan manusia untuk berinteraksi dengan komputer secara alami dan intuitif. Pada interaksi manusia dan komputer, muncul fusi gerakan tangan interaksi dengan modalitas input lainnya sangat meningkatkan efektivitas kinerja interaksi multimodal. Hal ini penting untuk merancang sebuah dialog gerakan tangan berdasarkan situasi yang berbeda dikarenakan manusia memiliki perilaku yang berbeda berdasarkan lingkungan. Pada makalah ini, deskripsi singkat dari gerakan tangan dan materi pendukungnya disajikan. Tujuan dari makalah ini adalah untuk merancang sebuah dialog gerakan tangan intuitif untuk navigasi peta. Beberapa diskusi juga dimasukkan di akhir makalah ini.

Kata Kunci: Gerakan Tangan, Dialog, Modeling, Navigasi Peta, Interaksi manusia dan Komputer, Interaksi Multimodal.

ABSTRACT

Human trends to use hand gesture in communication. The development of ubiquitous computer causes the possibility of human to interact with computer natural and intuitive. In human-computer interaction, emerge of hand gesture interaction fusion with other input modality greatly increase the effectivenessin multimodal interaction performance. It is necessary to design a hand gesture dialogue based on the different situation because human have different behavior depend on the environment. In this paper, a brief description of hand gesture and related study is presented. The aim of this paper is to design an intuitive hand gesture dialogue for map navigation.Some discussion also included at the end of this paper.

Keywords: Hand Gesture, Dialogue, Modeling, Map Navigation, Human-Computer Interaction, Multimodal Interaction.

1. INTRODUCTION

Hand gesture usually performance during communication between human to human. It can deliver the message from a person to the other such as refuse sales person to approach with shaking the hand left and right. Hand gesture not only work with human to human but also

human with pets.A well trained dog will follow instruction from the instructor like palm moving up meaning stand, and palm moving down meaning to sit. Different movements and combinations of hand gesture can express a lot of meaningful messages just like sign language, however the complexity of hand gesture is one the difficult tasks to be modeled[1].

Hand gesture dialogue [6] is the specialized language using hand gesture when interacting with others. Hence, the used of hand gesture dialogue varies depend on different situation. Appropriate design of hand gesture dialogue needed when dealing with different type of interaction such as computer games, map navigation, etc. In this paper, the map navigation interface task being taken because of the large magnitude of scale and the spatial space [4]. However, this challenge increases the difficulty of interface design.

Most of the research concentrates on hand gesture recognition [1, 2] and hand tracking [9]. They ignore the importance of decent hand gesture dialogue can achieve a higher user performance. Hand gesture input would certainly improve the latter role by supplying users with more natural control. Unfortunately, the hand gesture dialogue used to interact with computers in recognition systems have not been designed at all to cooperate [3].

To build interfaces for hand gesture recognition in map navigation, the key issue is how to model hand gesture dialogue to achieve maximum benefit. One of the most significant challenges in this area is the modeling of effective hand gesture dialogue that can support map navigation. In the following parts, we will first review related applications of interfaces in map navigation and then discuss the related issues about dialogue modeling.

2. RELATED RESEARCH

There has been a lot of study on hand gesture researches since the decade [12, 16, 17]. In this paper, hand gesture is divided into contact based and non-contact based which mean the former use haptic sensor and latter use sensor devices like visual capture device that user no need to wear any devices on hand. However, contact based hand gestures become popular among public since the first induction of multi-touch gesture from Apple Mac Book. There are research studies on this technique [7, 8] before the introduction of multi-touch gesture. Wu and Balakrishnan [7] had worked on a gesture set for interaction with Tabletop displays. In their study, user can use multi-finger and whole hand gestural doing simple interaction e.g. tap, flick, drag, and so on. Whether the above technique using contact-based sensor devices but their fundamental is the same with non-contact technology, both used specified hand gesture dialogue to manipulate on the computer.

Non-contact based hand gesture or vision-based hand gesture normally equipped with at least one computer vision sensor devices like camera. Most researchers like to apply this technique tothe augmented reality environment[11, 13, 15] which can make their researches simulateto the real world environment. In study of Malik and Laszlo [14], they used two cameras to track stereo image of hand gesture above a planar surface to design a visual touchpad. With stereo camera, they successfully solve the occlusion problem with the single camera. This state that multi camera hasa greater advantage than the single camera. Kinect sensor device is designed based on this concept with two build in camera and one infrared camera.

Kinoogle is a recent research using the Kinect sensor to achieve natural interaction with hand and body gesture to navigate 3D globe simulator [5]. Whether the combination of hand and body

gesture can be attained more functionality but the hand gesture is not fully in use and modeled with a maximum. Hand gesture dialogue should be modeled to widely in use like human use hand gesture intuitively when communication. Implementation of appropriate hand gesture dialogue with this system will increase the effectiveness of the system such as user performance and intuitiveness.
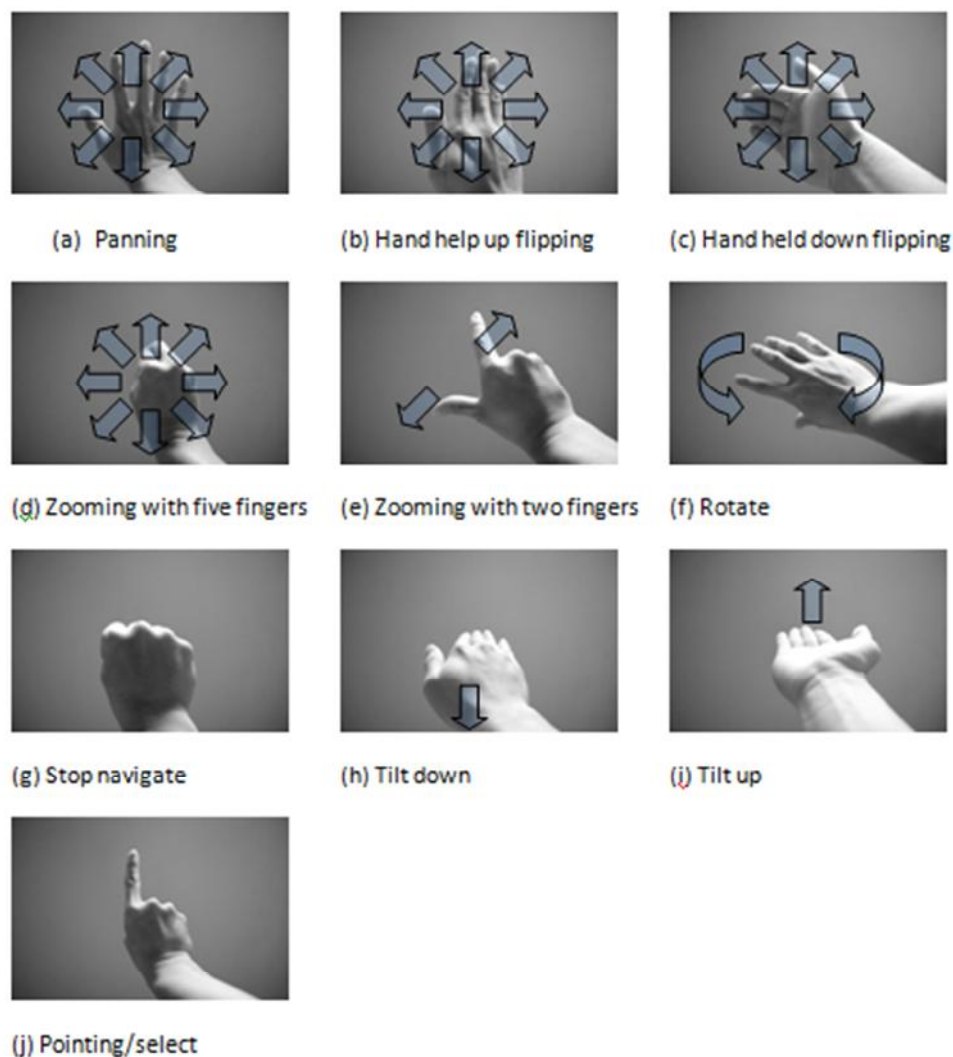

Figure 1: Hand gesture dialogue for map navigation. (a) All fingers are freely open and open palm. (b) Fingers are closer like flipping a book pages. (c) Hand is held down but vertically. (d) All fingers stretching from a point to open palm like (a) and vice versa. (e) Thumb and index finger stretching from closer to away and vice versa. (f) Twist the wrist to clockwise or anti-clockwise. (g) Closer all the fingers become fist. (h) Hand held from up to down with palm down

and fingers closer. (i) Hand held from down to up with palm up and fingers closer. (j) Use only index finger as deictic point.

As the development of computer hardware becomes more and more advanced, this stimulates the demand of hand gesture dialogue. The hand gesture dialogue is undoubtedly [10, 12] important in many areas. The positive growing of hand gesture dialogue greatly encourages the following researchers to model more effective, intuitive and natural hand gesture dialogue in map navigation. This paper's aim is to investigate if hand gesture dialogue modeling in map navigation can ease the user's burden and improve their immersion by distributing the tasks to the most appropriate hand gestures dialogue.

3. HAND GESTURE DIALOGUE MODELLING

Various surveys[1, 4, 7, 8] of hand gesture dialogue have been studiedfor modelingmap navigation.The modeling method in this paper only covers single hand. One of the benefits using one handed is intuitiveness, user can easily memorize the hand gesture dialoguefaster.Initially, with refers to figure 1 during map navigation, the hand is in static position with hand free. Then theusercan either movean open palm (a) orflip (b)to pan around the map, stretching five fingers from one point to fully open is zooming out and vice versa (d), twiststhe hand to rotate (f), closing the hand become a fist to stop navigate (g), held the hand up to tilt up (i) and tilt down (h) with hand held down and use index finger (j) to point or select. Different user has different behavior when navigate the map. It is possible to model not only one hand gesture for some dialogue for example flipping can be hand held down vertically (c) to flip around the map and using thumb and index finger moving away (e) to zoom and vice versa.

The frequent function in map navigation has been listed above using hand gesture dialogue that being modeled. It is designed based on the intuitive of human natural behavior such as flipping a book. This method had been widelyused in the tablet nowadays. The hand gesture dialogue is becoming more important compared with a few decades because the current technology allows the highly process of graphic in real-time.

4. CONCLUSION AND FUTURE WORK

Hand gesture dialogue modeling is not a trivial task in order to make the interacting natural and intuitive. Modeling of hand gesture dialogue just a beginning, in the future, the hand gesture dialogue will be evaluated in a qualitative experiment. The hand gesture dialogue can be combined with other input modality and fusion between the hand gesture and other input modality to become a new style of interactive dialogue.

This paper presented the hand gesture dialogue which applies in map navigation tasks. A similar method can be applied in different fields with refined a suitable hand gesture dialogue. Based on the previous researches, hand gesture dialogue will be working. However the effectiveness and user performance needed to be evaluated to enhance this hypothesis.

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