The Interactive Learning of Integrating Animation Game with Kinect System for Senior with Mild Alzheimer

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ABSTRACT. *Alzheimer's disease is one of the common problems for the elders. Some mild symptoms of the Alzheimer's might be misinterpreted as normal circumstances because of aging, leading to the procrastination of treatment process. Affected people would have a hard time managing activities of daily living and forget roads back home, which may jeopardize their live safety. Because the patients barely leave their homes, it may place significant burdens for patients themselves and caregivers.*

This interactive game of this projects focuses on Flash, with the help of Kinect motion sensor of Microsoft, making a combination of software and hardware. The skeletal tracking feature of Kinect enables users to control the mouse and other objects through human body, which allows the elders to play some simple games at home. The researcher also used easy questions to observe whether the elders have problems of Alzheimer's, and further to facilitate their brain functions.

The interactive memory learning game for the elders – with the application of Kinect, was developed in this research. The motion sensor camera of Kinect makes human body become a game controller, which provides interactions for the memory match game. With the availability of Kinect, television, and computers, seniors with mild Alzheimer's can facilitate their hand control and limb movements through simple commands. The memory game could enhance brain stimulation for seniors with mild Alzheimer's and decelerate aging process, bringing about effects of sport and entertainment.

Keywords: Alzheimer's disease, Kinect, kinesthetic system, flash, interactive learning

1. Introduction

1.1 Research Background

Alzheimer's disease is one of the most common types of dementia and the typical beginning symptom is dysmnesia. The patient will forget events which happened just now (short-term memory is poor), and early memory (long-term memory) is relatively not affected in the early period of the disease. When a relatively mild dementia occurs, the recent memory often forgets daily things, when it becomes severer, he forgets a friend's name, phone number, direction, etc., and often forgets to return to do the outstanding work due to other distractions.

Microsoft's Kinect can rely on the change of human's body skeleton to judge the extent of human motion and detect gestures according to the finger's posture so as to achieve more subtle judgment, the corresponding response is made in accordance with the judgment of the change of the depth value, the provided virtual images are like personal experience, and what is used is the inseparable relationship between human's body movement and hands, for example, touch, pressing buttons and induction are all technologies of the development of hand movements.

1.2 Research Motives

With the coming of aging society, the problem of life caring for dementia patients constantly appears in communities and families. In the early period of dementia, it is difficult for family members to distinguish whether the forgetfulness of parents is normal aging or disease, and they may fail to know the disease even it becomes moderate degree, as the appearance of the patients are the same as ordinary persons. The elderly with dementia often forget how to go home, leading to family members often looking for them everywhere, many families are afraid of the elderly with dementia going out alone once again, because of which the elderly with dementia often sit for a whole day in the home. As family members are busy with housework, the elderly with dementia have no object to speak to, which causes the memory of dementia patients to decline gradually.

With the popularization of TV video game system, almost every family member can play TV video game system in today's society, the age of the game also rises gradually along with the popularization of TV video game system, and the game types also gradually increase; so animation game is combined with Kinect to produce the game of "Memory Test in Interactive Learning among Dementia Patients", matched with Kinect device of TV video game system, and the game is operated with the body without the need to carry on any manipulation, which can not only use the brain to think about the topics in the game, but make the body move around.

1.3 Research Purposes

This research uses Flash animation to produce interactive learning game of "Memory Game of Dementia Patient", the purpose is to produce the interaction with memory game with Kinect dynamic camera released by Microsoft with the concept of body controller to use simple Kinect operation to make the elderly patients with mild dementia:

1. Use body to control to promote physical movement

2. Use memory games to improve brain agitation

3. Help the elderly with mild dementia to slow down the speed of decline in memory

4. Achieve movement in body and achieve the effect of entertainment.

2. Literature Review

2.1 What is Dementia?

Dementia is not a single disease, but a combination of a group of symptoms (Syndrome), mild symptoms not only include the loss of memory, but affect other cognitive functions, including language ability, space perception, computing power, judgment ability, abstract thinking ability, concentration and other various aspects of functional degradation, and meanwhile interference behavior, personality change, delusion or hallucination and other symptoms may appear, the severe degree of which is enough to affect the interpersonal relationship and the ability to work and so on. Usually, the first symptom found in patients is the frequent forgetting what has happened recently, and then they have difficulty dealing with daily life, work and rest, and the work they are familiar with in the past. The patients themselves may have personality change, behavior change, loss of judgment, finding no proper words to express themselves, thinking obstacle or inability to follow some instructions.

The main symptom of dementia is the loss of memory, we are often forgetful, but the forgetfulness of dementia is different from that of ordinary people; their memory loss is continuous and progressive but not occurs once in a while. These can affect the function of their work or family, sometimes they can not find the way home, and what is more severe is that they will forget how to wear clothes, eat or take a bath and other human's basic life ability.

2.2 Introduction in Relation to Kinect

2.2.1 Hardware

Kinect has three lens, and the lens in the middle is RGB color camera, which is used for recording color images. The lens on the left side and the right side are 3D structure optical depth sensor composed of infrared transmitter and infrared CMOS camera, which is

used to extract in-depth data (the distance between the object in the scene and the camera). The highest resolution of color camera is 1280*960, and the highest resolution of infrared camera is 640*480. Kinect is also matched with focus tracking technology, the motor in the base will rotate as the focused object moves, and the maximum elevation upwards and downwards is positive and negative 27 degrees. Microphone Array is built in Kinect, which collects sound simultaneously through four microphones, the noise is eliminated after comparing, and the sound collection, speech recognition and sound source localization are made through it.
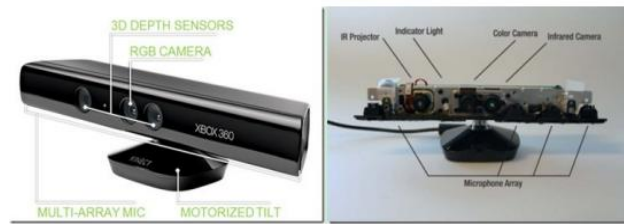

Figure 1. Kinect Sensor

2.2.2 Software

Kinect for SDK v1.7

Kinect integrates the continuous field depth snapshot of Windows sensor from Kinect to establish complete 3D model. SDK 1.7 also includes new Kinect interactive functions, including natural man-machine interface control for the support of pushing and pressing (push to the button) (clip pan) and grasping and transferring, multiple people interaction and reorganization of gesture folding and unfolding: turn on and turn off hand recognition.

2.3 Interactive Learning

The application of Kinect is very extensive, which can be used in the operation and interaction of computer games, through body movement learning and game type learning, the operation of general carriers also have demand for interaction in order to avoid the touch of control system, housewives avoid using their hands with food residue to turn over electronic recipes while cooking, and simulation training, cognitive ability detection inspection, remote diagnosis and treatment, etc. in medical treatment.

In the learning application, such simple interesting physical interaction activities and games can be used and such method can also be used to achieve actual practice for dynamic learning topics such as dance, martial arts, sports and physical coordination, etc., and movement information relating to the learners can be collected as analytical skills and the data analysis on the coordination and fitness ability, thus further providing advanced

personal body interaction learning tutoring.

3. Research Method

3.1 Research Process

Figure 2. Research Process

3.2 Software and Hardware Demand and Development Environment Establishment

The demand for software and hardware in the development of Kinect application program is as follows, the operating system must use Microsoft Windows 7 operating system due to the need of software operating environment, and both 32 bit and 64 bit are available; hardware part needs CPU of dual core 2.66GHz and over 2GB RAM, supports display card of DirectX 9.0c or above and at least one Kinect sensor; software part uses Visual Studio 2010 or Visual C# 2010 Express to write program code, NET Framwork 4.0 environment and install Kinect SDK for Windows. It is suggested to install Microsoft DirectX9 as the skeleton detection part may be used.

3.2.1 Installation of Kinect for Windows SDK v1.7

For the installation of Kinect for Windows SDK, please do not connect Kinect with computer, and meanwhile Visual Studio 2010 is closed up to avoid the failure of installation. Load according to 32 or 64 operating system and install the corresponding Kinect SDK. Restart once again after the completion of installation so as to correctly identify environment variables needed by Kinect SDK.

3.2.2 Installation and Testing of Kinect Sensor Drive Program

Before the installation of Kinect sensor drive program, network connection shall be confirmed to be normal. After connecting Kinect sensor with external power supply, then

connect it with USB plug of the computer, and the system will automatically download and install necessary drive program after the steps mentioned above are completed.
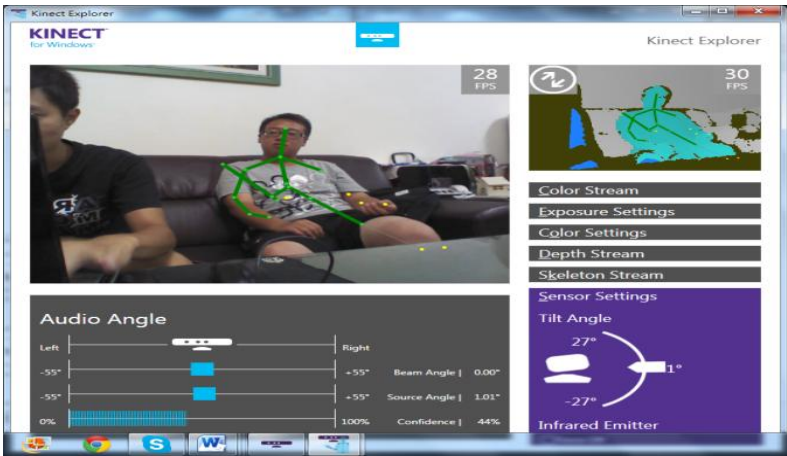

Figure 3. Start Kinect Explorer-WPF Program for Test

3.3 Adjustment of Motor Elevation

Table 1. Use and Instruction Interface of Mouse Control

Use instruction
Right hand: move, change the position of mouse
Left hand: rise high, press down left button

3.4 System Structure

System mainly contains Kinect, Kinect for windows v1.7, Flash and C#; Kinect is responsible for sensing surrounding environment information and sending it to the computer, Kinect for windows v1.7 receives the environment information sensed by Kinect and executes actual mouse operation indication, computer integrates all the data to make decision on Flash game operation, and the whole system structure is shown in Figure.
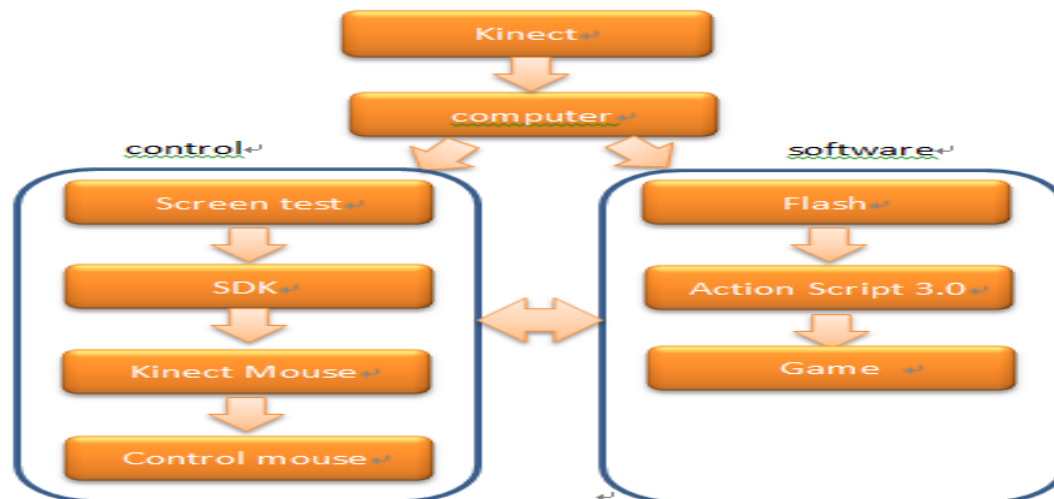
3.5 Design Idea

Figure 4. System Structure

Alzheimer's disease is the problem concerned by the whole world at present and its early symptoms occur mostly in people of more than 65 ages, but people of about 20-30 may have such symptoms due to the current way of life and pressure. The symptoms of Alzheimer's disease include irritability, aggressiveness, emotional ups and downs and loss of long-term memory and our concept is mainly to use the mode of interactive games to help dementia patients train brain to strengthen the memory.

3.6 Improvement of Life

As the cases of dementia of elderly people increase year by year in our society, which causes troubles for a lot of families, besides, dementia leads to the memory of patients decline gradually, interactive learning game of "Dementia Kinect Interaction Game" is designed for patients with mild dementia, as the family members dare not make patients with dementia go out alone, they can only stay at home for a long time, or they must wait for their family members to accompany them to go out when they have spare time; while we produce interaction learning games to make patients with mild dementia think about the topics in the game and move bodies to operate TV video game to realize the activation of brain cells of patients and the movement of patient's body to slow down the decline of memory, this can make family members not afraid that patients have no speech objects at home when they are busy.
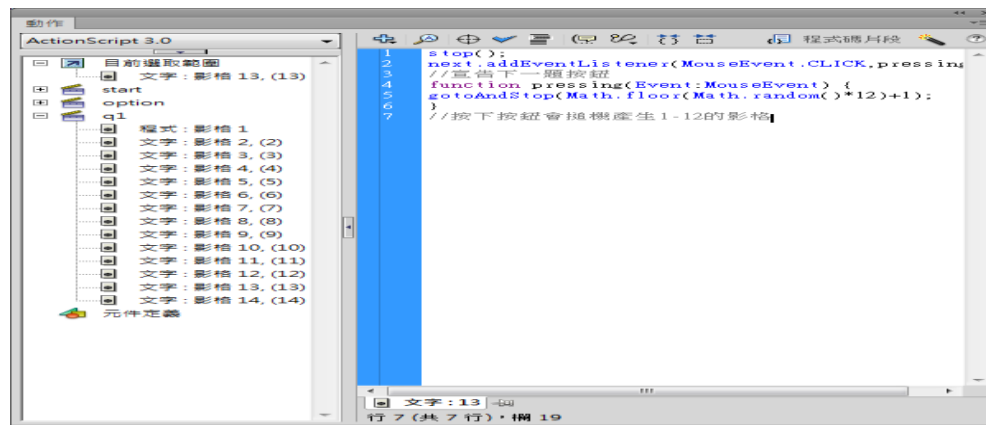
3.7 Internal Program

Figure 5. Adobe flash Program

3.8 Game Operation

Currently we make a measurement on the distance between Kinect device and operators, device angle and height so as to realize the best effect when operators are controlling mouse, but not make the mouse flap, nobody should stand behind the operators, Kinect mouse control is to capture hand movements of persons, so in case of two or more persons, the hand movements of the other person will also be caught, which will cause disorder of mouse.

Kinect layout height: about 64cm

Kinect elevation angle: 7 degrees

Distance between Kinect and operator: about 3.27 meter

Figure 6. Game Menu

4. Conclusion and Future Studies

Kinect device is to combine computer to develop interactive learning system, this research uses flash software as the interactive operation mode of main game Kinect for the game. The main programming language of Kinect is C# program, Kinect is used to control the mouse and operate flash game, Kinect is connected to flash through continuous

attempts, lastly the mouse control program is first started in the computer, the Kinect is used to operate flash game, the interaction learning in this plan which makes dementia patients test animation games in combination with Kinect has achieved initial effect, this research plans to present the game in future with 3D form, 3d max modeling software and Unity game engine platform are used to produce and develop works to make the pictures presented more delicate, this program has successfully completed interaction game learning system, which has preliminary growth space for the health of dementia patients.

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