

**The 26th International Congress of Computer Assisted Radiology and Surgery (CARS2012)
at Pisa, Italy, June 27-30, 2012.**

**TITLE: Development of three-dimensional graphic viewer software using game controller device
and medical image displaying**

Authors: Yoshihiko Hayakawa, Jian Dong, Yudai Kamada, Kosuke Abe,

Affiliations: Dept. of Computer Science, Kitami Institute of Technology

Contribution: Lecture, CMI session

**Development of three-dimensional graphic viewer software using game controller device and
medical image displaying**

Y. Hayakawa¹, J. Dong¹, Y. Kamada¹, K. Abe¹

¹Kitami Institute of Technology, Dept. of Computer Science, Kitami, Hokkaido, Japan

Keywords: medical graphic viewer; 3D acceleration sensor; 3D virtual space

Purpose

Three-dimensional (3D) virtual space is recognized by some ubiquitous devices in the world of computer games and various entertainments. Nintendo Wii ® Remote Plus (Nintendo, Kyoto, Japan) is the wireless controller of Wii ®, and some sensors (3D acceleration and near infra-red for positioning) and interfaces (Bluetooth) are installed. 3D acceleration sensor enables to work as a 3D positional sensor. Our trial is to develop a 3D medical graphic viewer using a game-input-device, Wii Remote Plus[1].

Methods

The 3D acceleration sensor can recognize 3D virtual space precisely and permit the intuitive operation. Firstly, we examined the preciseness of Wii Remote Plus for the 3D space recognition. Then we tried to develop a 3D medical graphic viewer. The programming language for a medical graphic viewer development was C#. We used the OpenSource Project, Wiimotelib 1.7, for C++/C# [2]. 3D virtual place was created by XNA GameStudio 3.1 (Microsoft, USA). The handling of 3D objects was referred to App Hub (Model Importer Sample)[3]. Our development included the rotation, parallel displacement/shift/translation, scaling (expansion/reduction) of 3D objects, and various light-source settings for 3D viewing. We set dento-maxillo-facial bone structures as a 3D object. The 3D bone structure data were downloaded from the website of the Digital Human Reserch Center, The National Institute of Advanced Industrial Science and Technology (AIST), Japan [4]. We followed the instruction for the statement of the free-download permission.

Results

The default positions of Wii Remote and 3D object on display are shown in Fig. 1, The 3D object in the virtual space was rotated using three axes of the 3D acceleration sensor and enlarged or reduced using Wii

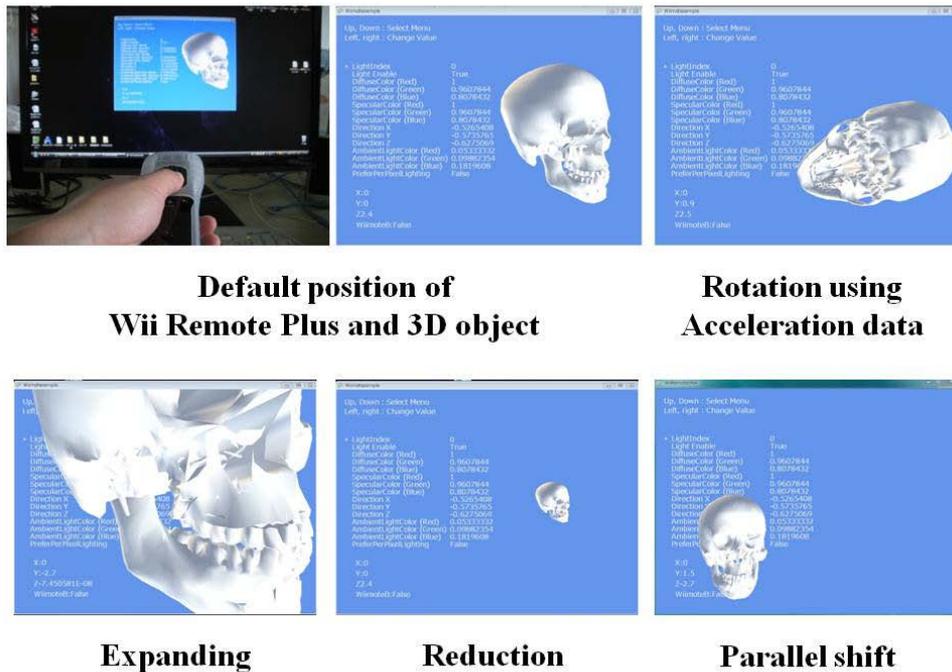
Remote's Up and Down buttons as shown in Fig. 1. Also the 3D object showed the parallel translation using the cross-joint button while a trigger button B pressed (Fig. 1). Also some other functions for virtual 3D objects either are installed or under development.

Conclusion

A medical graphic viewer was developed using a game-input-device, Wii Remote Plus, as an ubiquitous device. Various operations for 3D objects are demonstrated. Such intuitive operation shows potentials as a medical graphic viewer.

References

[1] Okawa T, Sagawa M, Hayakawa Y. Development of three-dimensional graphic viewer software using game-device Wii(R) Remote and medical image displaying. Medical Imaging and Information Sciences, .28(2):46-50, 2011 (in Japanese).
 [2] Website of WiimotLib_1.7 (Managed Library for Nintendo's Wiimote), <http://wiimotlib.codeplex.com/>, <http://www.codeplex.com/WiimoteLib>
 [3] App Hub (Model Importer Sample) http://create.msdn.com/en-US/education/catalog/sample/custom_model_importer
 [4] Digital Human Reserch Center, The National Institute of Advanced Industrial Science and Technology (AIST) <http://riodb.ibase.aist.go.jp/dhbodydb/bone/>



**Default position of
Wii Remote Plus and 3D object**

**Rotation using
Acceleration data**

Expanding

Reduction

Parallel shift

Fig. 1 The default positions of Wii Remote and 3D object on display (left and center on the upper row). 3D object (skull and mandible) shows the rotation (right on the upper row), scaling (expansion/reduction) and parallel shift (displacement/translation) on the lower row.