Affordable, fast and user-friendly hardware is available in the market in the form of gaming gadgets. With the increasing demands of gaming experience, gaming hardware production industry is in struggle to produce hardware devices that are more portable and less prone to failure. This gaming hardware can be used in medical such as Microsoft Kinect that can be used in Medical [1], in clothing stores as virtual try-on [2] and in education as student’s attention estimation [3].

Tangible User Interfaces (TUIs) were developed to allow more natural interaction with complex virtual objects by manipulating physical objects in a familiar way. Ap- plying the movements of a physical object to control the movement of a virtual object is often done by embedding devices in the physical object, or by passively tracking the object [4].

Three-dimensional input devices were first considered in the late 1970s by Aish [5] who mainly worked on Computer Aided Architectural Design and Frazer et al. [6].

Rotation of solid bodies can be described traditionally using Euler angles but this is prone to a number of problems such as gimbal lock. Gimbal lock is a phenomenon in which one of the rotation axes realigns with the other axis and eventually causes loss of one degree of freedom [7].

References

1. Naofumi Kitsunezaki, Eijiro Adachi, Takashi Masuda, and Jun Ichi Mizusawa. KINECT applications for the physical rehabilitation. In MeMeA 2013 - IEEE International Symposium on Medical Measurements and Applications, Proceedings , pages 294–299, 2013.

2. Stevie Giovanni, Yc Choi, Jay Huang, Et Khoo, and Kk Yin. Virtual Try-on using Kinect and HD camera. Motion in Games SE - 6 , pages 55–65, 2012.

3. Estimation of students' attention in the classroom from kinect features

4. Derek Bradley and Gerhard Roth. Natural Interaction with Virtual Objects Using Vision-Based Six DOF Sphere Tracking Natural Interaction with Virtual Objects Using Vision-Based Six DOF Sphere Tracking. Proceedings of the 2005 ACM SIGCHI International Conference on Advances in computer entertainment technology , pages 19–26, 2005.

5. R. Aish. 3d input for caad systems. Computer-Aided Design, 11(2):66–70, Mar. 1979.

6. J. Frazer, J. Frazer, and P. Frazer. Intelligent physical three-dimensional modelling system. In Proceedings of Computer Graphics 80, pages 359–370, 1980. Online Publications.

7. Logah Perumal. Quaternion and Its Application in Rotation Using Sets of Regions