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Abstract: Reflecta - An open-source framework for motion capture acquisition

We wish to provide insight into the inner workings of Reflecta - our framework for motion capture data acquisition using the Microsoft Kinect for Windows v2 sensor and interoperating with the Unity 5 game engine. Taking into account the rapid development in the field of Natural User Interface (NUI) enabled applications, we felt that we could augment existing, state of the art hardware sensors with a comprehensive solution for processing the sensor input and converting it into actual, meaningful animation data. We have decided to explore this niche in the industry which currently lacks a free, open-source alternative. Our proposed solution handles facial expression and joint orientation data, providing fully configurable filtering algorithms for reducing input noise, and is capable of outputting either raw data, animation clips used natively by the Unity game engine or BVH (BioVision Hierarchy), ready to import in the most widely used 3D modelling software. We have strived to make Reflecta as loosely-coupled as possible and have outlined the difficulties encountered together with our proposed solutions. The range of applications for Reflecta is virtually limitless, from helping indie game developers reach their goal to aiding medical recovery for disabled patients.

We would like to emphasize the author's original contribution to existing literature. At the time this article was written, there was no open-source framework or solution that takes into account both body and facial input data. Furthermore, existing partial solutions provide obscure mappings between different animation systems. This unification of the input pipeline is a defining feature of our solution. As an addition, we have designed DESP (double-exponential smoothing) predictors and applied custom noise-reduction algorithms for the following inputs: facial blend weights, joint positions and joint orientations.

Keywords: Kinect, body joints, facial expressions, animation, avatars, noise reduction.