Animating Mechanisms: A Pipeline for Authoring Robot Gestures

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ABSTRACT

Designing and authoring gestures for socially expressive robots has been an increasingly important problem in recent years. In this demo we present a new pipeline that enables animators to create gestures for robots in a 3D animation authoring environment, without knowledge in computer programming. The pipeline consists of an exporter for a 3D animation software and an interpreter running on a System-on-Module translating the exported animation into motor control commands.

1. MOTIVATION

Socially interactive robots are being increasingly developed in academia and industry alike. One of the core challenges is to design expressive gestures for these robots[Hoffman and Ju 2014]. Some robots have custom authoring tools for gesture design, and in most cases, developers need to generate code to produce the desired gestures.

That said, professional animators are well positioned to author gestures based on their own professional practice. There is a disconnect, however, between 3D animation software and robot motor control hardware and firmware. Our system addresses this gap.

2. DESCRIPTION

In this demo we will present an open-source gesture design pipeline for robotic devices. The pipeline includes two software components. The first is an exporter for Blender, an open-source 3D animation software that is widely used by animators. The second is an interpreter running on a Raspberry Pi System-on-Module (SoM) translating the exported gesture into motor control commands.

Visitors of the demo will be able to perform the following:

- Use Blender to generate a gesture animation.
- Export the animation into a custom file format, interpretable by our SoM software.
- Watch a robot perform the gesture generated by the visitor.

The robot we will use in our demo is Vyo[Hoffman et al. 2015, Luria et al. 2016], an expressive social robot designed for smart-home control.

Both the exporter and our interpreter is available as open-source, enabling designers of other social robots to implement a similar pipeline on their own system.

Decoupling the gestures authoring stage from software development can improve work flow and alleviate development overhead. We hope that our platform can help novices and animators alike to create professional expressive animations which can be re-created on a physical robot.

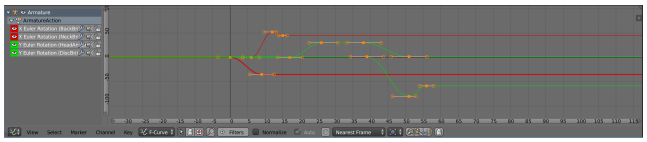

Figure 1: 3D software view of a key-frame animation according to the robot's physical limits.

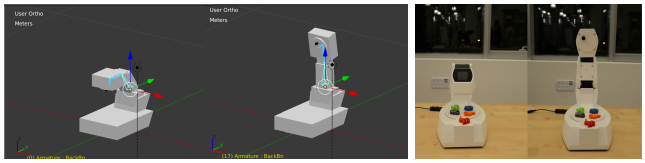

Figure 2: 3D rendering and robot replay of the same key-frame animation.

3. REFERENCES

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