Introducing a Modular Concept for Exchanging Character Animation Approaches

F. Gaisbauer, P. Agethen, T. Bär & E. Rukzio

Motivation

- **Character animation** is **essential for many branches** such as gaming industry and automotive manufacturing
- There are **various heterogenous approaches** which are **specialized** on **certain aspects** (e.g. path planning)
- **Motion blending** is widely used and **provided** by most **common gaming engines** and simulation platforms
- **Specialized approaches** such as recent AI-methods or physics based simulations are **tightly embedded** within **tailored platforms**

- **High porting efforts** to **incorporate** novel approaches
- Currently **no possibility** to **couple heterogenous character animation systems** within a **common environment**
- **No comprehensive simulation** using **distinct approaches**

Approach

With the novel concept, the **exchange** of **heterogeneous character animation approaches** will be **simplified** by using a **standardized interface** build upon the **Functional Mock-up Interface (FMI)** approach [1].

- **FMI** allows to **couple heterogenous simulations** in a different context than motion (e.g. production plants)
- **Extension** of the **FMI** standard to **exchange character animation approaches**
- **Encapsulation of heterogeneous** character **animation systems** by so called **Motion Model Units** (**MMUs**)
- **Generation of natural** and **continuous motions** by using a **co-simulator** which **sequences** the respective **MMUs**

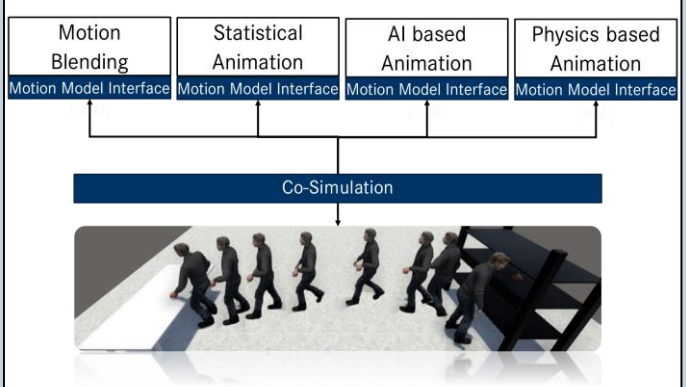

Figure 1: Illustration of the basic concept. Individual animation systems are encapsulated by MMUs and sequenced by a co-simulator.

Motion Model Unit

The core components of the proposed concept are the so called **Motion Model Units (MMUs).** These units **encapsulate** the specific **character animation systems** via **defined interfaces**. The main principles for the execution are listed below:

- Initially, the **context** and **motion description** are set
- Afterwards, the **"do step"**-routine is cyclically executed by the co-simulator until the motion is finished
- The **next character pose** is computed within this routine by the **internal algorithm** of the **MMU**
- Subsequently, the computed **result** is provided as **output** of the respective **MMU**

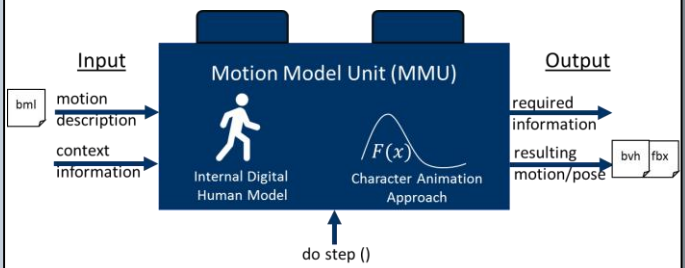

Figure2: Input and output interfaces of the proposed Motion Model Units.

Benefits

By utilizing a **standardized exchange format** for character animation approaches, there are various **benefits** for the **developers**, as well as for the **end-users**:

- **Reduced porting efforts** for incorporating novel approaches
- **Combination** of **approaches** to **simulate complex behaviors** in a **common environment**
- **Reusability** of already existing methods
- **Benchmarking** of diverse systems in a **common framework**
- **New market** for **distributing** the **MMUs**

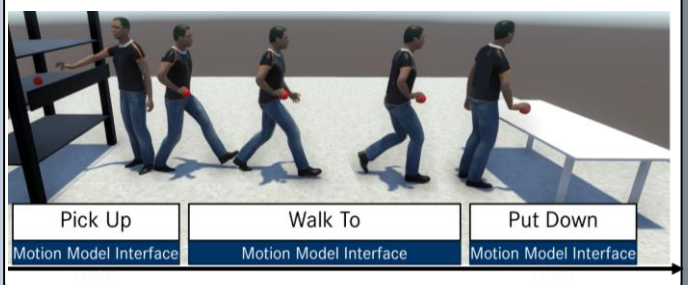

Figure 3: Decomposition of a complex task into several distinct MMUs

Results

- **Combination** of a **statistical motion synthesis** [3], an **animation based** system [2] and a **specialized tool** for **path planning** in a common environment by using the novel **MMU approach**
- Overall, the **system** was able to **produce natural motions**, while **combining** the **benefits** of the distinct approaches

[1] Blochwitz T., et al.: The functional mockup interface for tool independent exchange of simulation

[2] Thiebaux M., et al.: Smartbody: Behavior realization for embodied conversational agents.

[3] MIN J., CHAI J.: Motion graphs++: a compact generative model for semantic motion analysis and synthesis.

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