Virtual Cooking 2

Start WiSe 2020
Janis Roßkamp, Toni Tan & Gabriel Zachmann
(j.rosskamp, toni, zach) @cs.uni-bremen.de
Institute for Computer Graphics and Virtual Reality (CGVR)

Baseline Scenario

The use of robots in household applications is playing an increasingly important role in an aging society and will be a growing market in the future. The SFB EASE (https://ease-crc.org/) has set itself the goal of developing robots for use in the kitchen. An important challenge is the stable gripping of objects. For this purpose, large data sets are to be generated from various objects using stable handles. The aim of this project is to record data while gripping objects in a virtual environment. The hand and finger positions of the real hand are recorded with a Cyberglove.

Example

The gripping and manipulation of virtual objects should take the form of a cooking game in VR, similar to the cooking mode in the VR game job simulator. So simple recipes should be cooked. During cooking, data is recorded about the position of the contact between the hand and the object, so that heat maps can then be created for gripping a specific object. Furthermore, the trajectories of the objects or the hand should be recorded. This data can help robots grasp stably. Of course, you can let your creativity run free when developing the game and bring in and implement your own ideas.

What We Offer

The project gives you immediate insight into numerous innovative topics and current research areas, such as human-machine interaction, computer vision, and real-time 3D rendering. In our laboratory, the most modern devices are available to you to implement your ideas effectively (e.g. Powerwall, HTC Vives Pro, zSpace display, haptic phantom controller, a Haption 6D desktop device, Cyberglove for hand tracking and much more). Even if the approach in this project is game-like, the techniques and algorithms conveyed are of immediate practical relevance, for example in the automotive or robotics industry.

Workflow

The first step is to develop a realistic concept for the game as a group. In the second phase, the necessary algorithms are to be implemented so that they can be used in the game. Due to the experimental nature of the project, a strictly linear approach is not recommended, but an agile-iterative model. Following the development of the game, data for heat maps and trajectories are to be recorded.

The (Ideal) Team

The (ideal) project team would consist of the largest possible number of programmers, 1-2 user interface developers, and 2-3 designers. The programming language in the project will essentially be C ++, since the project is to be developed in the Unreal Game Engine.

It is an advantage if as many team members as possible have fun with algorithmic thinking, as in this project some new algorithms will certainly have to be implemented, or existing ones will have to be adapted and expanded to the scenario: for example, it is necessary to get the contact points between hands and kitchen objects. The project is suitable for both computer science and digital media courses and is planned as a 1-semester event.

Scientific Use

At the end of the project, we will support the participants in submitting the results to a suitable conference or an international 3D software competition (which is an important building block for your CV). It is also possible to write a master thesis in our working group, in which certain aspects of the project are deepened or expanded. We would be happy to arrange this for you in direct cooperation with companies in the robotics or automotive industry.

Accompanying Courses

To accompany the project, we offer the lecture "Advanced Computer Graphics" (6CP) in the summer semester. Here you can deepen your basic knowledge of computer graphics. You can also get to know about parallelization on the GPU in the lecture "Massively Parallel Algorithms" (6CP).