DDM - Maya Animation

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Introduction

Not entirely unexpected, the fourth and last assignment for the 3D modelling course was to make an animation in Maya. When we first read the requirements, all kinds of wild ideas came up in our minds, most of which were unrealizable in the two weeks we had available. Two weeks we had to use to think of the subject of the animation, to learn how to make animations in Maya, to write this report and of course, to render the final result.

Since both of us never made an animation in Maya before, we decided to work through a few tutorials first, trying the examples described and getting used to the animation interface. When we were able to find and use the most basic items for developing animations, we started to work on our final result.

Our animation starts out with a simulation of the "Matrix Effect", which displays glowing green letters falling down on the screen. Next, the camera zooms out and displays a square filled with domino stones, guide rails and a ball. The ball will fall down onto the guide rails, roll further down and hit the first domino stone, which then starts the falling of the first row of stones. When the last stone of the first row falls down, it will hit the + shaped item, which will turn around, hitting over the large purple stone, which will then hit the large field of stones and set the final action in motion.

In this report, we will discuss how we used the several required features in our animation, some other methods we used and the problems we ran into while animating and rendering.

Keyframe animation

The principle behind keyframe animations is rather simple. It basically comes down to placing an object on a certain location in the scene and setting a key. Next, you transform the object, for example translating, rotating or scaling it, and selecting a frame further in the timeline. Then you set another key, which turns the current frame into a keyframe.

After performing these actions, Maya will now automatically calculate the positions and shapes of the object you "keyed", for all frames that are located between the two keyframes. We used keyframes in several places, but mostly for testing purposes, as it is a very easy way of setting things in motion. In the final animation, we used a keyframe technique to move our camera.

We created two curves, one for the position of the camera and one for its aim, and placed both at their starting positions. Next, we attached a motion path to both the camera and its aim and selected the ends of the curves, to create another keyframe. Maya then calculated the position of the camera in all frames that lie between the two keyframes, resulting in a smooth and gradual movement of the camera.

Reactive animation

Reactive animation proved to be rather dicult to achieve in Maya in the beginning. The learning curve here was quite steep, but once you understand the some of the basic workings, it becomes a bit more comprehensible.

In our animation, several reactions occur. At first, there is the ball that rolls over the guide rails and hits the first stone of the domino row. Then, at the end of the row, the last stone will hit the yellow rocker, which will then start to turn. After turning a little, it will hit the purple stone, setting yet another action in motion.

Since these are all interacting animation elements, this should fullfill the requirements. To be extra sure, we originally wanted to use driven keys in our animation as well. Unfortunately, this did not work out the way we wanted, we will discuss the problems that occured here later.

Dynamics

Where we found reactive animations having a steep learning curve, the curve when using dynamics was almost perpendicular compared to it. The possi-

bilities Maya oers here are virtually endless and this makes it quite hard for beginners like us to create something worth viewing.

We used dynamic elements in several parts of our animation. In order to obtain the desired results, we had to learn how particles and rigid bodies work. Because the tutorial collection of Maya is quite extensive, finding the topics you are looking for can be pretty dicult at times. Exploring through the menus, dialogs, options, attributes and tools, using the Maya helpfiles or Google when needed, we did manage to work things out though.

Animate with particles

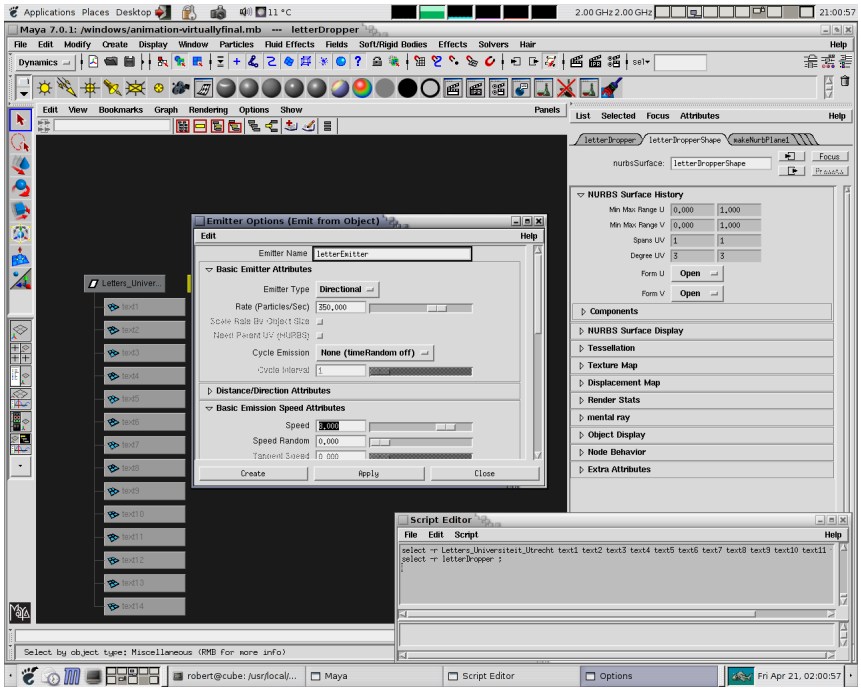
The first thing we wanted to do, was create the Matrix effect. While not perfect, we are quite happy with the result we achieved. First, we created a collection of letters, modelled as polygon shapes.

Next, the polygons and their center pivots are translated to the origin of the world, because the particle emitter that is used to create the letters at random places, will use the original positions of the characters, thus otherwise generating them at unwanted positions.

The following step consists of drawing a plane to which a particle emitter is connected. This particle emitter is linked to the collection of characters, thus emitting polygon letter objects instead of dots. Because the emitter is linked to the plane, it will emit letters all over the surface of this plane. By defining a negative direction in the particle emitter, we could make the letters fall down instead of lift o, imitating the Matrix example.

Unfortunately, when a collection of objects is connected to an emitter, it will only use the first one all the time. This was solved by adding a small MEL script which operates right before the creation of a new particle. This script selects a random object from the collection and will use that instead of the first one over and over again, resulting in a random display of characters on the screen.

When we view this scene in a frontal view, depth can be seen in the falling letters because of the size of the plane, but they will still all just fall straight down. To make the simulation a little better, we also added a bright green blinn texture to the characters, which we gave a bit of glow as well, finalizing the effect.



Rigid bodies

For the other element of our animation, the domino stones, we used rigid body techniques. Every single domino stone is a rigid body with a gravity field added to it, so when it is tipped over, it will fall down as well, emulating a real world situation. In the beginning of the animation, the first rigid body can be found. The ball that falls and rolls down over the guide rails is an active rigid body with a gravity field attached to it. This makes sure that the ball falls downwards and when it hits the first domino stone, it does not go through it or bounce o, but actually tips it over, starting the domino effect.

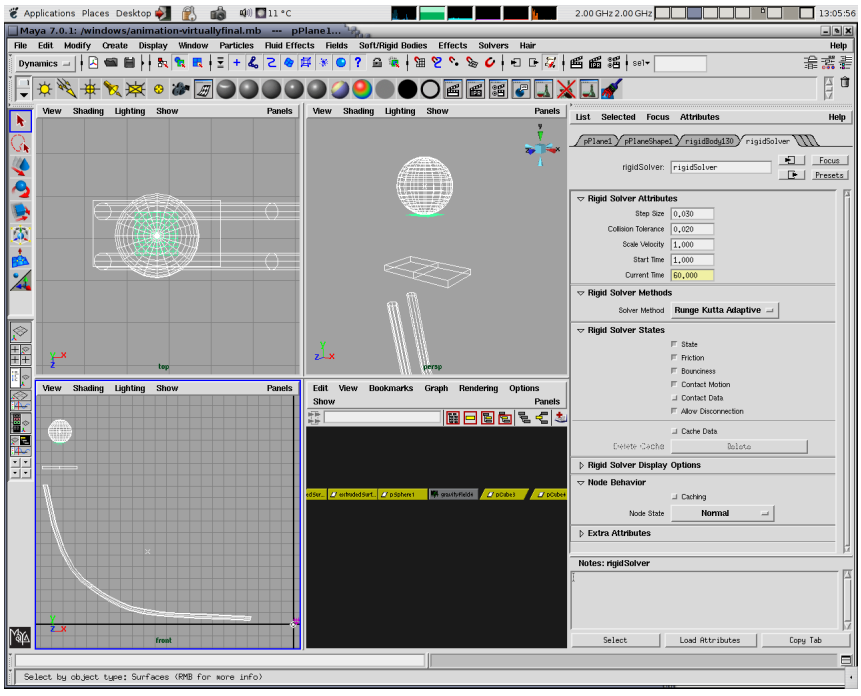
Most of the domino stones were automatically generated using MEL commands. Only the first stone was modelled, textured and set up properly with rigidity attributes. Then, for the first row of stones, a curve was drawn to which a motion path was added.

Using this motion path and a small MEL script, the first stone was easily duplicated, with all copies aligned and set up evenly on the curve. The large field of stones was generated even easier, using two for -loops that duplicated the stones and positioned them in a perfect rectangle. While it was possible

to do automatically as well, we decided that it was easier to add the dierent texture for the letters GMT by hand.

And at last, there is another rigid body: the cross which will tip over the large purple stone that starts the falling in the large field. This cross is a rigid body that has a hinge constraint set to it, therefore rotating around a predefined axis. When the last stone of the first row hits the cross, it will therefore turn around horizontally and hit the purple stone. This effect is virtually impossible to obtain without the use of the hinge constraint.

We tried it in several ways, for example by creating a hole in the cross and letting it rotate around a small solid cilinder or by positioning it on top of a cone, but none of this worked. Using the hinge constraint, we could simply state a rotation axis and add it to the domino rocker, creating the desired result.



Problems

While creating the animation, we ran into quite many problems. Most of these were solvable, some were just too dicult. Unfortunately, even though the number of manuals and tutorials that come with Maya is large, many

things are still not indexed very well, not documented very well or even not documented at all. This lack of information was frustrating sometimes.

Especially since most Maya users use the software profesionally and have obtained a lot of knowledge about it already. When looking up information online, it is sometimes dicult to find help or that is suited for beginners like us. Most authors assume that the user already has more than just a little knowledge of Maya, thus making it dicult to understand the information at times.

Another issue we had with Maya, was instability. When using the version that is installed on the systems in the classrooms, Maya crashed rather often.

Unfortunately, this happened a few times right before we wanted to save our project, but it happened at random moments as well. This happened mostly at the computers in the University classrooms, but also at our home computers, running dierent operating systems. While animating, we ran into several other problems too. One of the first issues we had, was one with the particle system. We created a particle emitter and made it emit a collection of particles. This worked fine. Next, we created the plane that was going to generate the particles and added a particle emitter to it. While it had exactly the same settings as the one we created earlier, there were no particles to be seen anywhere at all.

After some experimenting however, we found out that this was because the emission rate of the particles was linked to the size of the object. The first emitter was only a small point, but as the plane was quite large, the emission rate was very small compared to the size and therefore we could not see any particles. Another problem we had was with the rigid bodies.

When creating the domino stones and adding a gravity field to them, they were connected to a rigid body solver. This is an object that tracks and calculates positions and such for the rigid bodies that it is connected to. Unfortunately, when you copy objects, the rigid body solver they are connected to is copied as well. But when you want an object that is connected to one solver to react with a body that is connected to another, they will not interact with each other. It took us quite a while to figure out what went wrong when we added the guide rails and ball from one scene into our final scene and the ball would roll down the guide rails just fine, but when it was at the end, it just moved straight through the domino stones instead of hitting them and tipping them over. Another funny thing that happened with this, was when we created the blue base plane and later added the domino stones on top.

After positioning the first stone a little diagonal so it would start the falling of the stones, we started the animation. But instead of tipping over

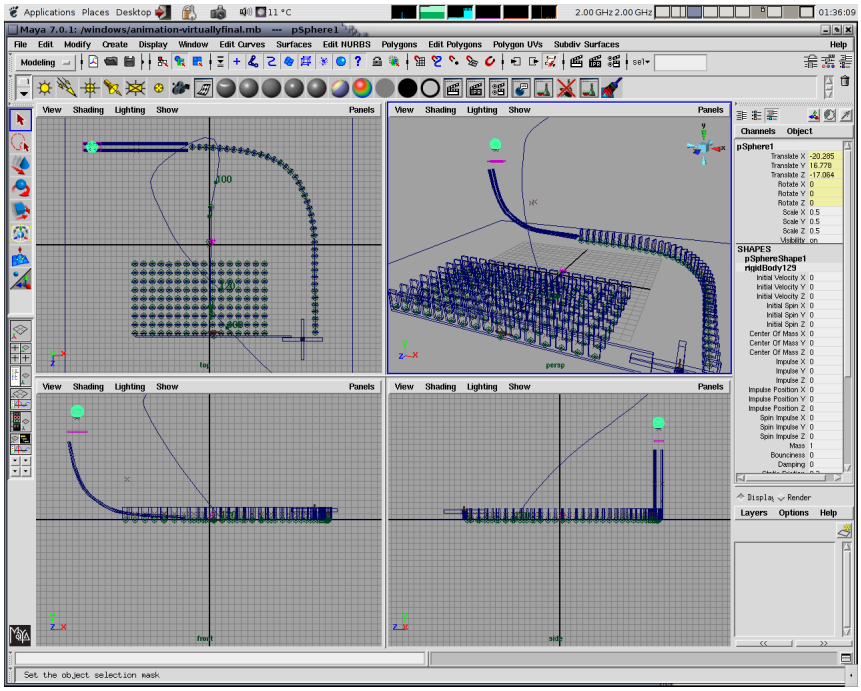
like normal domino stones do, all our stones fell straight down at the same time, right through the base plane, disappearing into nothingness.

Conclusion

After creating this short animation, we learned several things. First, that it is quite dicult and an incredibly amount of work to create a good 3D animation.

Our respect for animators and modellers at companies like Pixar or Dreamworks has become even greater, because we have hands on experience now, in doing it ourselves. When doing the first assignment in 3D modelling, we already found out that Maya has a steep learning curve. It is hard to get results at first, but when you "get the hang of it", it suddenly all falls together.

The same goes for the animation features that Maya offers. The possibilities are endless and that makes it very hard to start with. However, even though the diculties and problems we met, we still found it a lot of fun to play with the features and options in Maya, see what they do and we were content with the final results; both of us are very likely to be found doing more 3D modelling in the future.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