

Final Report for 6.837 Term Project

A Coke's Life

1. Abstract:

The project animates what a bottle of Coke sees during its life. The Coke originally sits on a shelf in a store besides many of its siblings. It is picked up by a person, taken to the cashier to get paid for, carried to a classroom, drunk by the person, and then thrown into a trash bin. The camera is always fixed about 1 foot from the Coke, and the Coke is always centered in the view. The position and orientation of the Coke remain fixed in the view, whereas the liquid in the bottle and the objects in the background change continuously, through which the viewers can infer what is really happening. The main points in the animation project: make it work, make it nice, and make it fun. The main tool we used in the project was Alias, an animation tool on Athena.

2. Team Members

Yu Sui (yusui@mit.edu)
Ruopeng Wang (rpwang@mit.edu)
Xianfeng Zhao (zxf@mit.edu)

3. Introduction

The main plot of the project, i.e., presenting a Coke's life from its own angle of view, came from a TV advertisement made by Coca-Cola. We adopted the plot in our project for the following reasons:

(1) It is animation.

Through the project we will be able to use and learn standard tools and techniques in modelling and animation, and get a better understanding of the concepts we learned in 6.837 lectures.

(2) It is challenging.

Aside from the logical difficulty of imagining what the scene should look like, many technical difficulties are involved in the plot, e.g., the animation of liquid deformation.

(3) It is fun.

People rarely have the chance to see the world from some other's view, the project provides people with the opportunity and fun to view the world from a totally different angle.

4. Goals

In our proposal, our plot was divided into two scenes, the supermarket scene and the classroom scene. In each of the scenes, the plot was further divided into several sections for animation and engineering reasons.

(1) The supermarket scene.

Section 1: Camera moves from outside into the market, passes several grocery aisles, focuses on the beverage aisles where our Coke resides. Camera moves on until the Coke is in the center of the

viewport. The Coke will always be sitting in the center of our viewport thereafter. Only changes in the background indicate the movement of the Coke and imply what is happening.

Main objects in the scene: market, shelves, merchandise on the shelves, the Coke.

Section 2: A big hand rises into viewport , grabs the Coke bottle.

Main objects: Shelves, Coke, hand.

Section 3: The Coke is taken out of the shelf by the hand, goes down with the hand. At last what we see in the background is the legs and feet of the man. The Coke is facing up, still grabbed by the hand.

Main objects: Shelf, Coke, hand, legs and feet of the person.

Section 4: The man walks to the cashier's desk. All we can see is the movement of the legs and feet of the person.

Main objects: Shelf, Coke, hand, legs, feet of the person.

Section 5: The Coke is put onto the cashier's desk. The big hand releases the bottle, and moves out of the viewport (to take out money, maybe). The hand moves back in after a while with a bill, puts it on the desk and moves out. Another hand (the cashier's) appears, gets the bill, moves out.

Main objects: Cashier's desk, Coke.

Section 6: The Coke is again grabbed by the big hand. Then the background changes. A bag appears. The Coke is taken to the open "mouth" of the bag. The hand releases. The Coke drops into the bag. Lights off.

Main objects: Coke, hand, bag.

Section 7: All Dark.

(2) The classroom scene

Section 8: Lights on. The big hand moves into the scene and grabs the Coke (inside the bag). The Coke is taken out of the bag, put on a student desk. From the background viewer could tell it's a classroom.

Main objects: Coke, hand, desks, chairs, some very simple persons.

Section 9: The Coke is grabbed by the big hand, lift up, brought near the person's open mouth, tilted and the liquid flows out of the bottle and into the mouth.

Main objects: Coke, hand, face.

Section 10: The Coke is put down on the desk. The hand releases and moves out of the viewport.

Main objects: Coke, hand, desks, chairs

Section 9 and Section 10 might be repeated several times until the Coke is drunk up.

Section 11: Class is over. The bottle is grabbed by the big hand again, thrown into a trash bin.

Main objects: Coke, hand, trash bin.

In a summary, in the project we were trying to do three things: (a) model and render objects in the real world with adequate details. (b) animate human body movements, and (c) animate the continuous deformation of liquid.

5. Achievements

(1) Object modelling

The Alias tool we used has very powerful object modelling capabilities. It turned out to be much easier than we expected to construct individual object and to make it look realistic using primitives provided by Alias. The figure below shows a Tropicana box created by Alias. The figure of the Coke bottle shows another example.



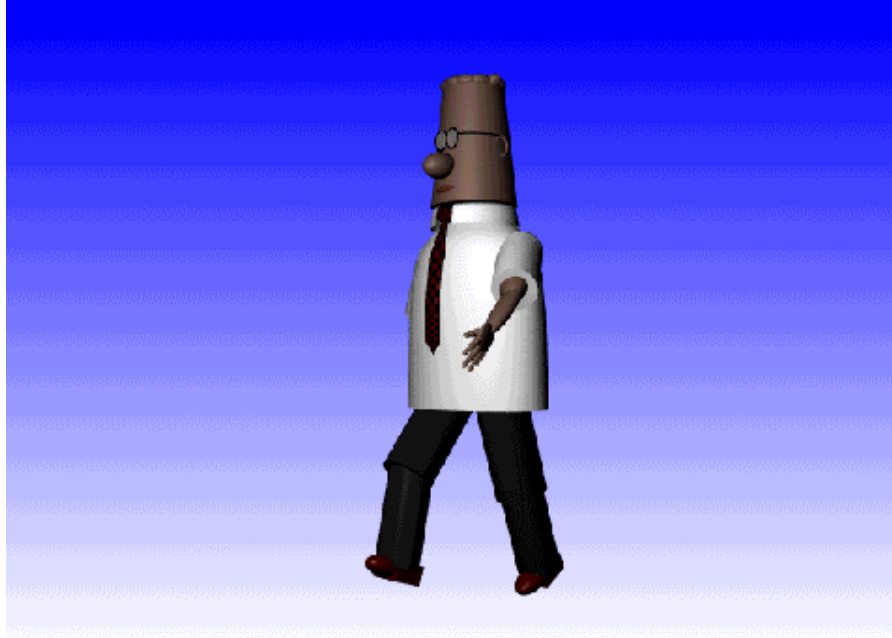
However, It also turned out to be much harder than we expected to construct a scene with many objects that looks realistic. Although it is not hard to make each of the individual objects with fine details to look realistic, with a large number of objects in the scene, the speed of the system is reduced dramatically. It becomes very slow to move things around in the scene, and even slower to render the scene. Consequently, when we were working on big scenes, we had to make the scene have as few objects as possible, and make every object in the scene as simple as possible. The figure below shows a scene at the cashier.



(2) Modelling of human bodies

The first obstacle in making human bodies was making a human-like person in Alias. We were thinking of making a very real person like those dinosaurs in Jurassic Park at first, but later we found that it was unrealistic to achieve this effect in a such short time. So, we decided to use simple objects and curves to build the human instead. However, the question of how to make the human body realistic arised. We went through the human models that were ever built in this class and found that people can build very "good" " funny" person by just using geomtric primitives. One day, one of us happened to watch "Dilbert" cartoon on TV, which inspired us to make a Dilbert-like person in our project.

The next obstacle was to animate the "Dilbert" vividly. Alias has abundant on-line help on this part, which makes it easy to make some simple moves of an object. However, to make a person's movement alive is a different thing. Although we famailiarized ourselves with various animation techniques from making keyframes to making skeletons, IK, from playing around the object's positions and orientations to using action window and Skeleton Edit window. All the necessary teniques for moving a person were understood, but it is still hard to simulate a real person's action, even a simple pace. From observation of real people's walking, we learned that people's walk can be divided into several phases, and there are lot of secondary motions as well. Due to time limitation, we were only able to model the major movement of the person's body. The following figure shows one phase of the person's walking.



But how could Alias deal with camera movement to make sure the Coke always stays in the center of the view? We referred to Alias' on-line help on animating camera, but found that "Autofly" seemed to be the only available method to move camera. But Autofly only allows constant speed movement of camera given the moving paths of eye, view, and up vector. We finally came up with a compromise: we got the curves of the person's hand's moving path, and divided the curves into some segments so that in each segment the movement of the camera would be approximately constant.

(3) Modelling of the coke bottle and liquid

The bottle of Coke is the main character of this animation 'cause it rests in the center of the viewport all over the whole story. Through the change of its background or foreground (the only thing in foreground is actually the guy's fingers), viewers can know what is happening.

Using some curve revolving we could get some pretty good result. The coke bottle is composed of the body of the bottle, the lid, the logo paper and the body of the water in it. The coke bottle is like this:



The difficult point here is the body of the liquid. We choose transparent glass bottle because viewer could see the liquid in the bottle. (Although we feel regretful to choose it). From the change of the surface of the liquid viewer could tell the position of the bottle, say, it is hold straight or tilted. Now the problem is how to achieve the changing of the liquid surface. That is, when the bottle is moved or tilted, how to keep the surface of the water horizontal to the ground and how to make this automatically done by Alias.

We tried 3 ways to do this:

(i) Particle system.

We first decided to use particle system 'cause we "heard" it could realize the water, fog, smoke, etc, with great realistic. But after we spent lots of time on Alias' particle system, we knew our case is not the same one that particle system could handle with. That particle system is to handle the automatic production and movement of the water (or whatever) particles. For example, to realize a waterfall or smoke from a ciga.

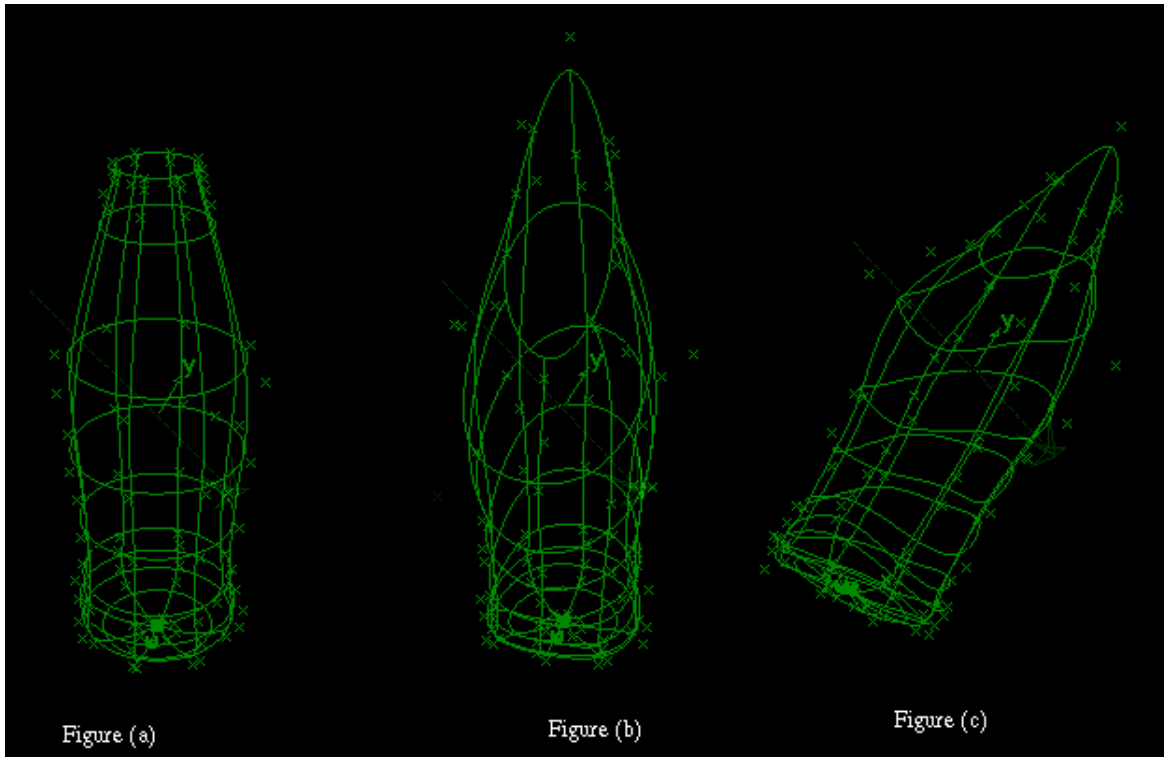
(ii) Surface intersecting and trimming

The surface of the liquid could be realized by trimming the body of the liquid by a horizontal plane. So if we tilted the liquid body while keeping the trimming plane horizontal, this could be done. Unfortunately, Alias could not (or we were not smart enough to find the way) do the trimming in animation. Say, if you trimmed the liquid body in one key frame, when you tilted it in the next key frame, the trimmed surface would tilt with the body and thus not keep horizontal.

(iii) Animating with Deformation Control

At last we used this method to do it. It's not very ideal but finally worked. Alias could do animation with deformation control. You set the original shape of an object as one key frame, use deformation controls

to change the shape and position of the object and set it as another key frame. Alias could do the deformation smoothly for you. In our case here, we first set the bottle vertical to the ground. So the original shape of the liquid body is like figure (a), the locally deformed one is like figure (b), the final deformed one is like figure (c):



The main problem of this method is that when you set up a key frame, you have to move those CVs by hand to change the shape of the object. That took much time adjusting and modifying the position and the shape. It's very hard to get the shape exactly as the one you want (to match the bottle exactly).

(4) Changes in the plot

Although there is no particular technical difficulties in constructing the classroom scene, we were not able to work on the classroom scene as planned due to time constraint.

6. Individual contributions

Yu Sui took charge of the object modelling task, i.e., the modelling of all the objects in the scenes except the Coke bottle and the human bodies. Ruopeng Wang was in charge of the modelling of the

Coke bottle (with very fine details) and the deformation of the liquid in the bottle. Xianfeng Zhao worked on the modelling of the human bodies (including the Dilbert-like person and the cashier) and the animation of the human movements.

7. Lessons Learned

The biggest lesson we learned in this project was how to use Alias, an excellent modelling and animation tool. Using Alias, we can now easily construct objects, assemble them into a scene, and set up a frame for animation. Although almost half of our time spent on the project was actually devoted to learning the functionalities and limitations of the tool, it turned out to be a worthwhile effort. The project also helped us to better understand the concepts we learned in 6.837 lectures, for instance, object transformation, lighting and shading, perspective view... In our mind, the Alias tool and the project served as bridge connecting the concepts in Computer Graphics with the techniques and tools making use of the concepts. In summary, we think this project is an invaluable learning process.

8. Acknowledgements

We wish to thank our TA, Charles Lee, for the time he spent with us supervising our project and the valuable advice he gave us concerning our project scheduling and directions. We also wish to thank Damian Isla, who helped us solve some the technical difficulties we had in our project.

9. Bibliography

The major information source we consulted in our project were the help documents of the Alias tool, which could be found at the URL:
`file:/mit/imagery5/install/aw.8.5/alias8.5/Help/bookshelf.html`.