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R.I.T

SIMORGH

by
Meghdad Asadi Lari

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF MASTER OF FINE ARTS
IMAGING ARTS/COMPUTER ANIMATION

SCHOOL OF FILM AND ANIMATION
COLLEGE OF IMAGING ARTS AND SCIENCES

ROCHESTER INSTITUTE OF TECHNOLOGY
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ABSTRACT

“Simorgh” is a 4 minutes and 30 second 3D animated graduate thesis film which is a personal interpretation of a traditional Persian poem “The Conference of the Birds” by “Farid ud-Din Attar” from 12th century.

This animation is a choreographic piece that incorporates Persian music, calligraphic art and ornament designs to tell the traditional Persian story of life that deals with the fragility of self worth.

The story centers around a few birds of different breeds, each representative of a particular human characteristic; ego, greed, avarice, etc. The birds are seemingly satisfied with their perceptions of self, but on a chance journey they each embark upon, they find they are stronger as a community and are strengthened by allowing others to complete their true ‘selves’.

The film is purposely dialogue-free, and has the intention to entertain its audience not only by providing with appealing visuals, but also by triggering audience feelings by presenting a mix ballet of music, art, film, Sufism, Persian Culture, the traditional story, subtlety and elevated spirit.

This paper describes the processes employed in producing of the film. Aesthetic and technical obstacles and challenges in each stage of production are introduced and the creative solutions and inventions for each challenge are described as well.

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I'm thankful to Saba Alizadeh for giving a beautiful soul to my film with his professional music composition and performance and giving a mesmerizing life to this work.

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RESEARCH, PITCHING THE IDEA, PREPRODUCTION

Our first step in making the thesis film was a Research Seminar class where students of both live action and animation were sitting together developing their stories. It was in this where one of the professors, was helping students to pitch their ideas, and develop their starting point of their stories.

We had Brian Larson as our teacher, who gave us a path to start with. In the second week of the class he mentioned that we should think about ourselves, our lives, our childhood, and find something that we were always interested in. Then he gave us this hint that this thesis might be our last opportunity that we have to work on our own, so we should just think of anything that will give us the joy to work on.

This insight helped me to filter through and discard a lot of ideas, but added the pressure of ensuring that the one I ultimately chose was one I could feel passionate about.

As an international student, and ever since I began studying at RIT, I always wanted to make something that is related to my own culture. But I was always afraid of this challenge that if I make a film that is related to Iranian culture, it will lose most of its international audience. So for choosing and building up the story, I should also be careful about how I would deliver the story in a way that everybody else from any other culture could connect to the piece.

After going through my list of story ideas, I narrowed down my ideas to two stories. They both were well know Iranian stories and were perfect to be realized. One featured a hero character, defending the borders of the country, and the other one was Simorgh.

The second story was more about community and completing each other, so it had a better reason and depth to be made since it was dealing with human dignity.

But my challenge began right in this very early moment! The original story was dealing with at least 30 birds. So even before picking this story, I encountered my first problem. I still can remember the first non-official meeting that I had with my advisor, Brian Larson.

When Brian and I were discussing these two stories, Brian was trying to help me dig into both stories, and find the one that will be more satisfying to me. Although Brian had no idea about any of these two, and he had no connection at all to either of them, I believe he did a really great job on helping me at this very first moment.

When I was describing the two stories and was talking about the challenge that Simorgh story will have in regards to the number of the characters, Brian suggested that I not think about any challenge at all for the moment, and just focus on what I have and what will trigger my interests. I remember his exact words where he said:

“... Meghdad, don’t worry about the number of the birds, we will find a solution for that.”

And he was right, it took a relatively long time, but we could develop a design style that was helpful to make it a bit easier to build and manage the character development process.

So, I picked this story and it was in the Research Seminar class that we were going to develop the story during one quarter. During this course, Brian and I also were having some individual meetings to talk about the film and the ways we can start developing the story.

After choosing the Simorgh story, the first question that Brian asked to define my goal for my thesis, and to decide which aspect would be my emphasis. As a technical animator, my first response could be exploring some new technical aspects, but I also wanted to think about the whole thesis work as a one cohesive piece. Brian also believed that thinking about future employment is good, but most studios are not too worried about how fluent you are in any given software package or how proficient you are in each specific stage of filmmaking, because you can learn them very fast when you find a job. Rather, it’s better to be able to train yourself to become a filmmaker. This way you can show how you can manage a project, regardless of what software you use, or what style you pick.

Brian was right. Techniques can be learned anytime. The vision of filmmaking is something that needs time and practice to build up. And after making several short animations, the thesis was the time that I could apply or improve my filmmaking or directing skills.

But still I needed to make a specific goal for my film. That's where Brian asked me that question, about what aspect of the film would be my emphasis. And I said I want to make it beautiful. That's it. I wanted to make the film so good that when I, or anybody else, watches it, the first thing that gets their attention is the visuals. And I was not just talking about lighting, colors or textures or models. I wanted to make the visuals beautiful, because the story was beautiful and deep. So I really wanted to raise the quality of the work so I could make the connection between story and visuals much stronger, because my main concern, through the last stage of production, was not to ruin the depth of the story.

Simorgh story was chosen. The story of the birds, known as "The Conference of the Birds". The poem is told about birds, but it's really about people. In the poem, all the birds around the world gather to decide who is to be their king, as they have none. The Hoopoe, the wisest of them all, suggests that they should find the legendary Simorgh, a mythical Persian bird roughly equivalent to the western Phoenix. Hoopoe believes that Simorgh is the one bird that deserves to be the king. The complete bird compared to whom all other birds are somehow incomplete. But, reaching Simorgh needs the necessary spiritual trainings.

The hoopoe leads the birds, each of whom represent a special human significance and is proud of it, and also each of whom has a corresponding human fault, which prevents man from attaining enlightenment.

- Eagle is proud of its power.
- Parrot has the ability to talk.
- Swan is always purely clean as it's always in water.
- Nightingale is enjoying love and is able to sing to its love, flower.
- Peacock is proud of its beauty.
- Hodhod (hoopoe) is wise and can be the leader.

The birds are at first enthusiastic to begin their search, but when they realize how difficult the journey will be they start to make excuses. The nightingale, for example, cannot leave its beloved. The eagle is satisfied with its power and so on.

The hoopoe starts to convince each bird to follow him in order to attain perfection. But as he describes the seven valleys and all the hindrances in the journey, most of the birds give up following hoopoe.

After a long series of question and answers, hoopoe convinces some of them and after the long journey to the destination, a group of thirty birds finally reaches the dwelling place of the Simorgh, all they find is a lake in which they see their own reflection, all together, forming Simorgh. Powerful, kind, majestic and complete.

In the poem itself, twelve birds are completely introduced and some others are just mentioned. The total number of the birds that are mentioned in the book are thirty birds.

There is also another layer of playing with words happening in the original poem. “Thirty” in Persian translates to “See” or “Si” and “Bird” translates to “Morph”. The moment where the thirty birds reach the throne and realize that the Simorgh they were looking for is none other than themselves, the poet also plays with the words and builds up a pun:

“
...
thirty (si) birds (morph) are left at the end of the Way,
and the si morph meet the Simorgh, the goal of their quest.
...”

Having all the production challenges in mind, since it was impractical to handle thirty birds in my film, I decided to reduce the number to seven birds, and later I ignored one of them and reduced the numbers to six birds.

The Original Story, My Own Interpretation, Approaches and Twists:

As mentioned earlier, “The Conference of the Birds” is a very deep story that deals with inner layers of soul, spirituality and human dignity. These concepts are hard to describe, show or even talk about. If it happens to be told through film, it needs a lot of consideration. If the duration of the film is short, the challenge rises up. The extreme is when it should be told through a short animated piece, a dialogue-free one!

I spent my whole first summer, when I was interning in a studio in New York City, just to read the whole original poem, do research and understand all the layers of it. I also asked my parents to send me a book from Iran that deeply interprets the story more towards its humanistic layers.

The more deeply I got into the story, the more difficult it became for me to describe all those details, considering the challenge of describing these details within the context of a dialogue free short animation. And when I say it became difficult for me, I'm still not talking in production level. My main concern was delivering the message, and not killing it.

The need for creativity was showing up. After spending weeks on developing the story and storyboard, I realized that I can set my mind free of limitations. Reading the story of these birds was influencing me. I decided to stand out of the borders of narration, and get more abstract. This way I could explore the soul of the story, play with it using visual elements, and just entertain myself. I could still tell the story, yet be free of it.

I had not seen any realization of the story using film medium, and I can imagine it was because of the levels of sophistication that the story was carrying. So I made the decision. I changed the direction towards a choreographic piece, with the story backing it up.

So, now that it was getting poetic, I needed some rhythm. I grabbed a piece of music, and started mixing it with my preproduction elements, like boards, camera tests, some blocking animations and whatever else I had up to that point.

In less than a day, I reached a satisfaction point. That was what I always wanted to do. Animate with music. Create a poetic visual piece. Merge music and illustration.

My energy built up. When I made sure that this direction works for the story, I started looking for a composer. And again, since I didn't want to lower the quality of work, I looked up for some professional work. Fortunately, after approaching to some of my friends, I got connected to a great Iranian composer, Saba Alizadeh, a baccalaureate in Photography and also an MFA in Experimental Music from the Herb Albert School of Music at the California Institute of the Arts. As Saba states, his musical career is divided in two separate paths; performing and composing on the Kamancheh in Persian traditional form. Saba, a virtuoso on Kamancheh, is the son of the internationally acclaimed virtuoso Hossein Alizadeh.

Right away, I sent him some design tests and he agreed on collaboration. So we set up some phone meetings and I described the whole production steps for him. Then I broke down the film into three sections; what are the story elements in each section and how the moods changes during these sections. I also asked him to think of each individual bird, and give them some personality with instruments and notes that he chooses.

Since I wanted to animate on the music, I just sent him some very rough animatic cuts that would suggest some overall timings, and set him free of boundaries of animated characters. Now it was Saba's turn to realize the music, and as expected, by composing and performing the whole piece by himself, he did a great job on it.

After finishing each section, he would send that part of music to me and I could first decide on what actions can be matched to that part of music and then bring the music into my editing software, edit my very rough blocking images with the music, and then when I was happy with the cuts for that section, I could export the music of each shot and bring it back to Maya for the timing reference of that shot and start animating. I would call this method a reverse editing procedure.

DESIGN CHOICES AND CHARACTER DEVELOPMENT

It was time to build the world and it would start with the character development process. One thing that I was sure about designing my characters was that it would be definitely a stylized design. But I had the first challenge at the very first moment; dealing with more than one character! Keeping in mind that I had at least six birds, I was trying to simplify the character design, yet maintain their sophistication to hold its connection to the sophistications of the story.

Design and Modeling:

I started some research for stylized characters, but anything I could find wasn't satisfying me. I really wanted the designs to have connections to Persian culture. So as for early brain storming and having some fresh minds in the research, I talked to my brother and my cousin and described my ideas for them and asked them to sketch some birds as stylized as they can. I got great directions, but still I couldn't find any special cultural characteristic to the designs (Fig 1).

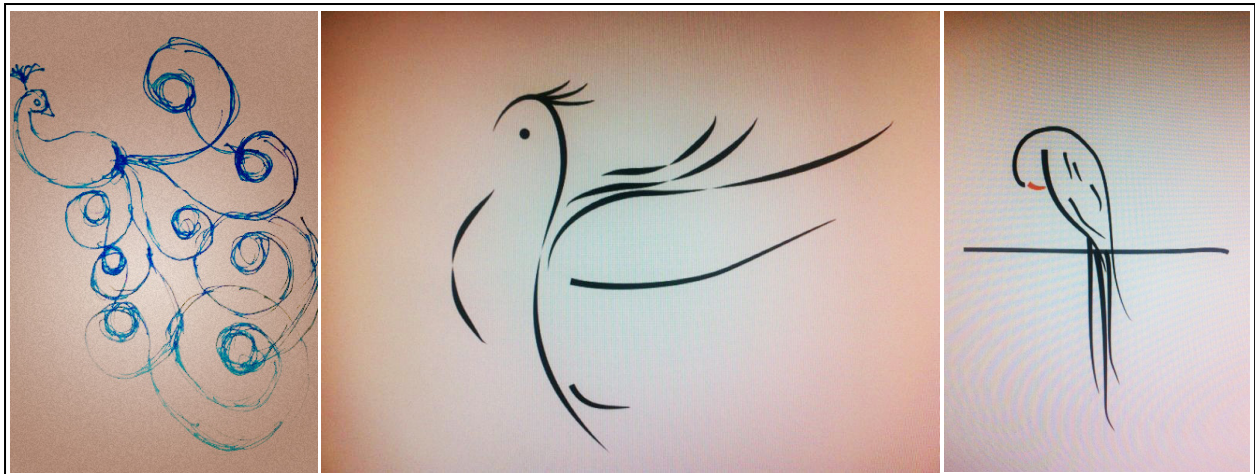


Fig 1: Some early sketches done for Simorgh by Maysam Asadi and Hajar Sadaei.

While I was in the middle of the character design research, I was also having the environment in mind and was trying to imagine how the story can be seen in this imaginary environment. For the environment, I was thinking of telling the story on an old ancient book, in which the poem is

written. I started building this environment in 3D to see how it will look like and how I can use it as a connection to my story. The result was great and I was liking it, but after playing with this idea and discussing it with Brian, he brought up this concern that by introducing this book as the environment, I will be limited in space, and this means I will be limited in storytelling, too. I'm glad he mentioned this. He was right. If I wanted to have that book as my whole space to work with, not only I would be limited in the space and storytelling, but also I would have less freedom to explore different ideas for character design, especially because I was trying to achieve a stylized look for my characters and it was already challenging. So I decided to put this book idea aside and come back to the environment later when I reached to a decent idea for my character designs.

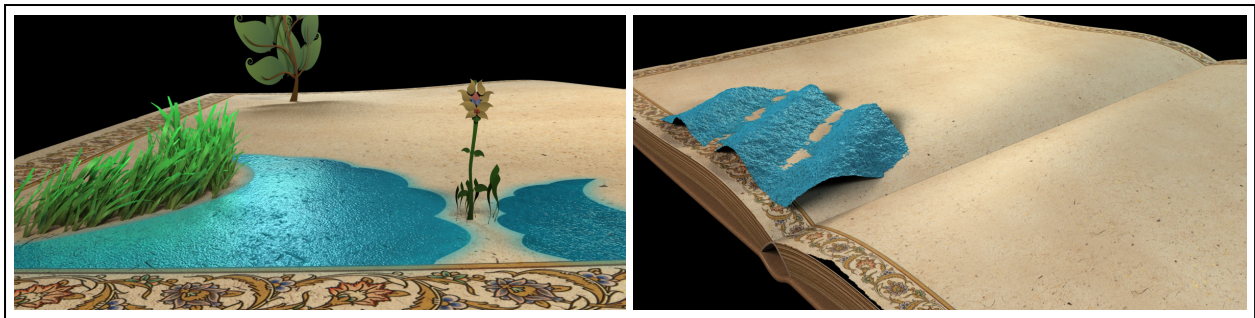


Fig 2: Early environment tests suggesting the story is happening on an old book.

When I was playing with the book idea for the environment, I thought I might also introduce some written calligraphy art on the book pages just to suggest that this is an old book, because almost always, these kind of poetry books are written in calligraphy.

Having this idea of the calligraphic book, lead me to do some research on Persian calligraphy and calligraphic art, and suddenly reminded me of some “Calligraphic Design” that are well known in Persian calligraphy art. This design is a kind of design that uses calligraphy as a tool to draw images. Just right in the moment, I realized that this is a perfect decision for my characters and I could use the same technique to design them. So I started to approach artists who do this kind of art and started communicating with some of them.

I found two artist that were doing the same thing that I was thinking of, drawing using calligraphic writings. So I discussed my film with them, and asked them to design these birds for me.

With the first artist, I decided to choose one of his designs and model it in 3D to test how that can work in 3D space. The result was very good, but the only problem I was facing with was that his style was too much abstract. No face, eyes or anything that can give personality to the characters were found in his designs (Fig 3). Unfortunately this artist couldn't help me to come up with new designs that could give some characteristic to the birds because he was too busy.



Fig 3: Calligraphic artwork research; (a) some examples of Amirhossein Rahimi's artwork. (b) a 3D realization test of one of the designs.

So I approached the second artist and asked if he can help me with designing the birds. At beginning, he was really helpful on brain storming and actually did some sketches for me, but still they were not suitable for the film and needed a lot of work to become more appealing and ready for production (Fig 4). After having few sketches from him and going back on forth and giving him some feedback, I realized I have gained enough confidence to step into the design process myself and experiment with calligraphy writings to see how I could build a character based on it. This way I could also consider modeling and animation concerns through the design to make them more suitable for the film.

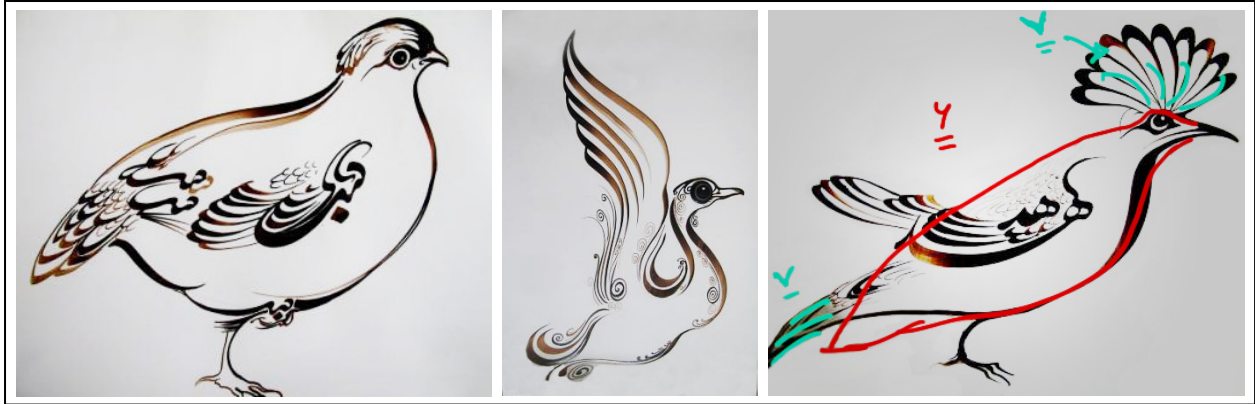


Fig 4: Some early sketches done for Simorgh by Morad Fattahi.

I prepared the calligraphic words and letters and brought them in Maya, modeled each letter and started playing with their placement. Then added more curves here and there to connect the calligraphic letters and eventually form each bird.

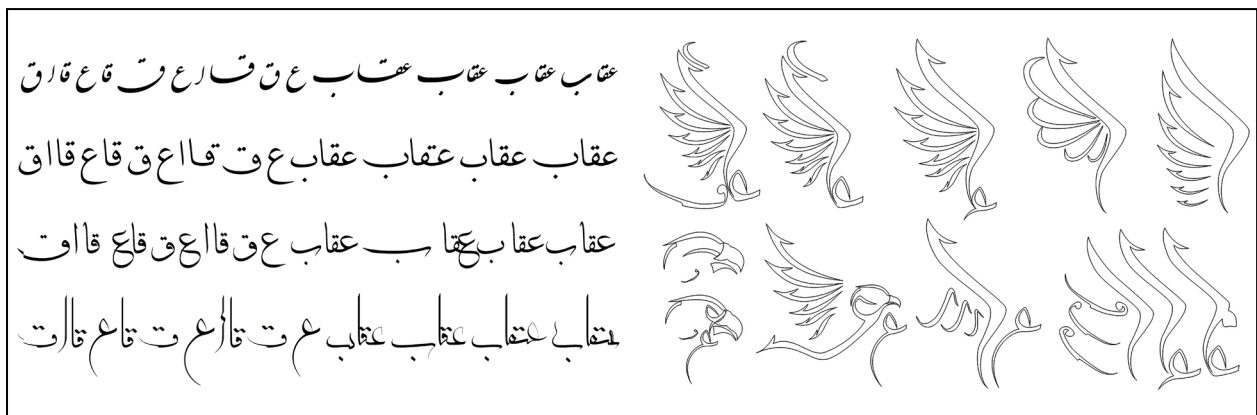


Fig 5: Eagle's name in four types of calligraphy and forming the design based on the letters.

For choosing what words and letters to write in calligraphy and use for the design of each bird, I decided to use the birds' own names as the base of the design. So for each bird, I wrote their name using calligraphic letters, and started forming the models using those letters (Fig 5).

Texturing:

During the process of designing and modeling the characters, I was thinking about the textures and colors of the birds, as well. Actually, it was the main part of making the design decisions. I

should make sure that the textures, colors and overall look of the characters would actually work with the style that I have chosen. I should make sure that all the elements used in the designs, including the color and texture, will all work together and have the same artistic direction toward what I was trying to achieve.

As discussed in the design section, I was trying to make a strong connection between the original story and the look of the film. Since the character designs were all based on Persian calligraphic art, I decided to maintain the same connection for the textures as well. After testing several methods to give a painterly look to the textures and going through some other methods for creating some procedural textures through Maya, I was still not happy with the results and needed more appealing look and a stronger connection to the style of the characters (Fig 6).

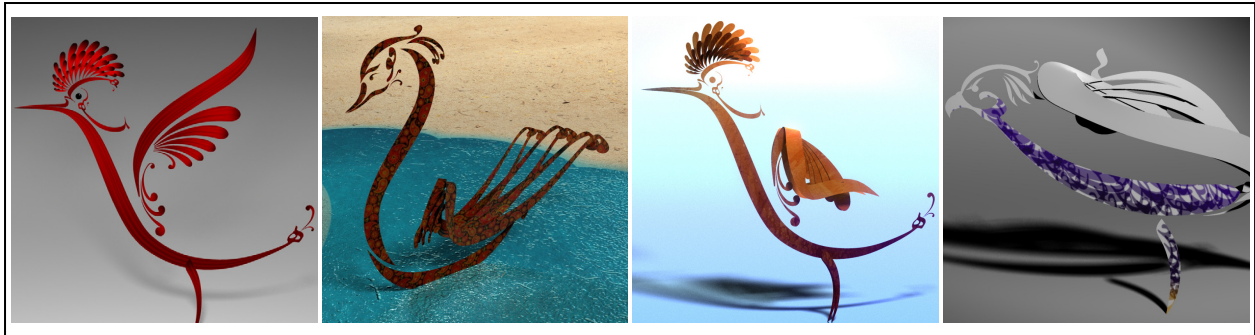


Fig 6: Some CG texturing tests and playing with some procedural methods trying to achieve a painterly look for the characters.

After testing all these CG methods, I realized that the best way to make the textures look realistic is to actually make them in real world. I discussed this with my cousin, Hajar Sadaei who is a great watercolor artist, and asked her to give me some watercolor tests so I could apply them to one of my birds and see how it will look like in the environment. As I was expecting, the result was absolutely what I was trying to achieve.

Next step was to layout the UVs and send them off to the watercolor artist. She would then print the UVs on special watercolor papers and start painting on them. Then she would scan the paintings and send them back to me so I could bring them into Maya and apply them to the geometry (Fig 7).

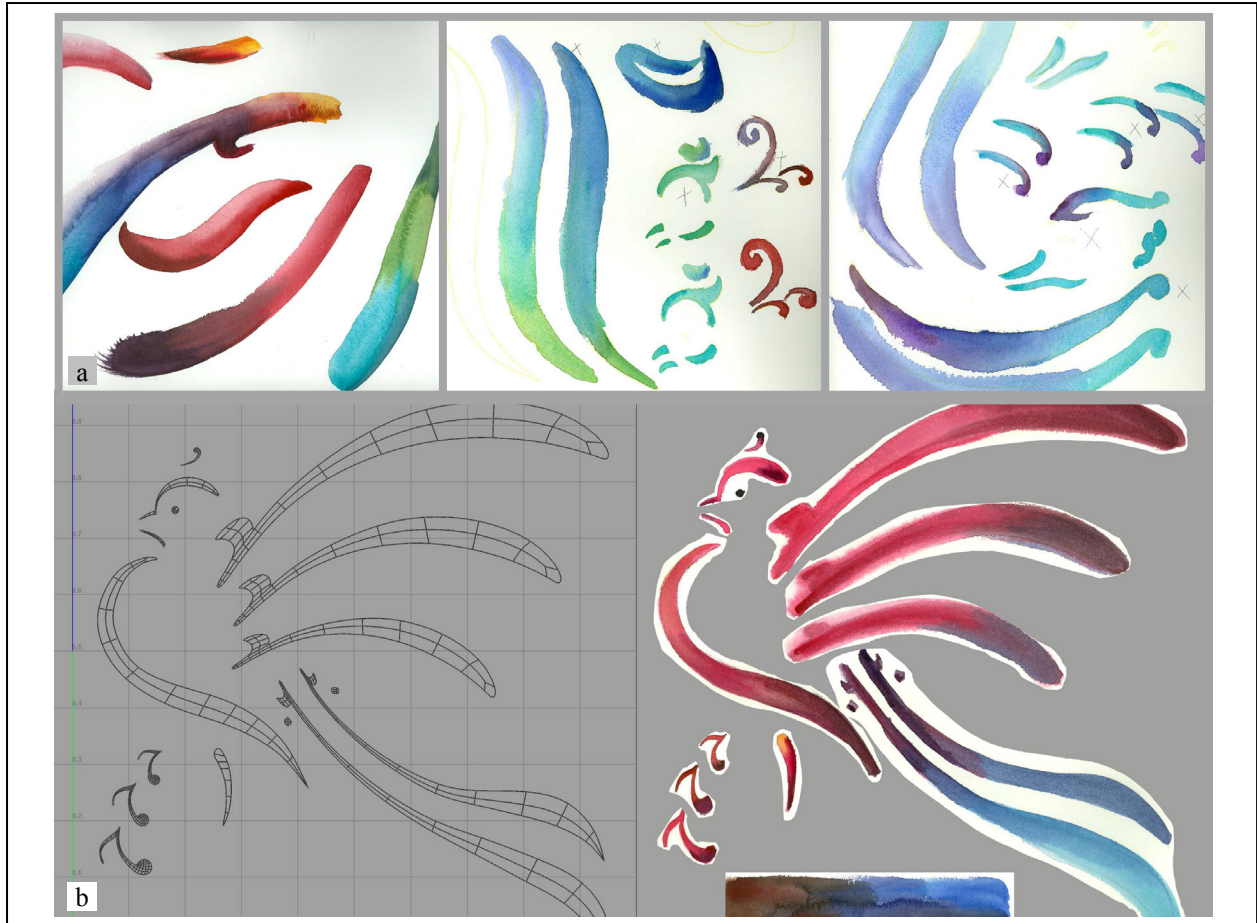


Fig 7: Real watercolor textures have been applied to the characters; (a) some of the watercolor tests. (b) UV layout for nightingale and the painted watercolor on the UVs.

Because my intent was to rig and animate these characters myself, I was able to anticipate some of the challenges that might arise based on the design. So I could modify the designs in a way that not only the look was appealing, but also it was built in a way that I could handle the rigging of every and each single element of the models.

RIGGING

Rigging is the process of binding a CG model to a set of joints and control handles so that the animator can pose the model and give life to it. Riggers work closely with animators to make sure that all technical concerns are considered so that the animator can start posing and animating the model.

In any animated project, especially in 3D production pipelines, one of the most important parts is how to communicate between each stage of the pipeline, so that all the stages are working seamlessly. For example when someone is modeling the characters, the rigger is rigging the model, and animator is responsible for animating the rigged character, each person in this pipeline should be able to communicate to the rest of the team members, so that they can understand what is required for the next stage and adapt their works while having the next stage in mind.

For my film, since I was responsible for all stages, from the design to the animation stage, I knew everything beforehand, so I could be more efficient in making technical and design decisions while I was moving forward.

Luckily, after some technical research and inventing my own rigging methods, I was able to give myself the freedom for rigging the character so that my design decisions were actually not limited to any rigging constraints.

Talking about the designs of my characters, and how stylized they are in my film, it can be imagined that rigging decisions can also be challenging. Since the designs were so unique, there were no prior references for finding the best solution for rigging them. Also, as I said earlier, one of my main challenges throughout the whole pipeline, from modeling to animation, was the number of characters that I was dealing with.

All these challenges can be more visible and harder to handle, when it's time to rigging the characters. I needed to find a decent method so that not only the result would be a very

functional rig, but also it should be adaptable to different type of characters and skeletons, without a hassle.

My scripting skills came in handy. I decided to rig my characters, all through MEL scripting. This would help me in several ways:

- I could try several methods for each part of the rigs, and pick the best and most functional one.
- I could be more creative and invent my own solutions of rigging for each part, without being afraid of losing time.
- I could repeat the process of rigging over and over, meaning that if I was not happy with the rig, I could go back and start the whole rigging process from scratch. This would result in a very clean rig file.
- I could develop the best rigging solution, and with a slight changes here and there, I could apply the same method to all the remaining birds, saving lots of time and energy.

I can talk about my rigging methods for my thesis for several pages. But since it have a great potential of getting boring by explaining it through writings, I will make it brief and pick some parts that are actually more interesting even for me and can be easier to be visualized in this context.

Blendshapes:

Another part that was kind of challenge for me and I would like to discuss it here, was that for two of the birds, I wanted to build a method that I could have the option of turning their head back, just like the way real birds can rotate their head 180 degrees, without making the geometry look like it's been twisted.

I decided to use blendshape concept and deform the neck using blendshapes. This way, I could force the model to gain a perfectly curved shape whenever I wanted to have the bird look back. The result was a successful predictable neck shape when the head was turned back without actually twisting the neck geometry.

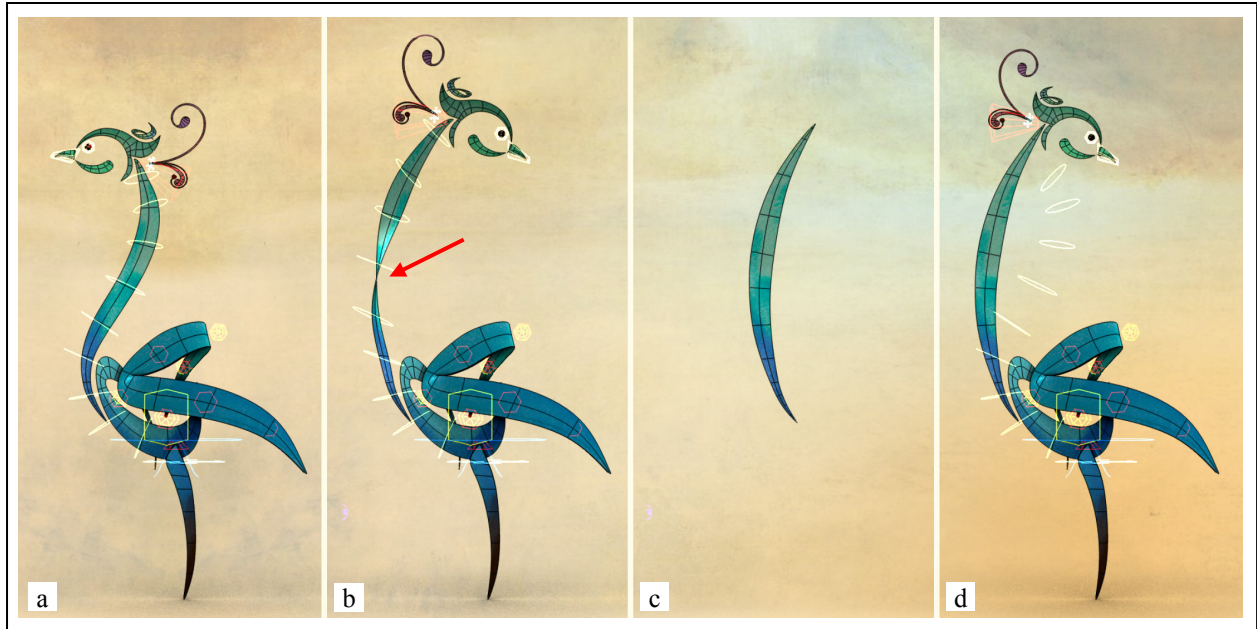


Fig 8: Blendshapes used for neck rotation: (a) default non-deformed neck. (b) neck turns back using controllers resulted in twisted shape. (c) blendshape introduced for neck deformation. (d) neck turns back using blendshape.

Stretchy Legs:

First I want to emphasize that since I was rigging my characters through MEL scripting, whenever I was making a technical decision for each part of the characters, I was not worried about the complexity of that method and I wouldn't be worried about how much time it might take to apply that to all the birds. Because it was just a matter of finding the best method, and then just applying that to all the birds using same script, with some probable small tweaks.

The main consideration for rigging the legs was to give the stretchiness option to them. There are several methods to give this functionality to legs or arms, from using distance nodes to using joint chains. Since I wanted to keep the smoothness of arches in my designs when the legs were bent or stretched out, I decided to use the ribbon method.

Ribbon Method for Stretchy Legs:

To briefly describe this method, the leg geometry is skinned to the “bind” joints that are attached to a surface, the “ribbon” which is controlled by “driver” joints. This method is used because

first of all, the geometry is skinned to a series of equally distanced joints, so it will deform very smoothly. Secondly, since the series of the joints are being controlled by less amount of driver joints, it will be much easier to animate them using just a few number of controllers.

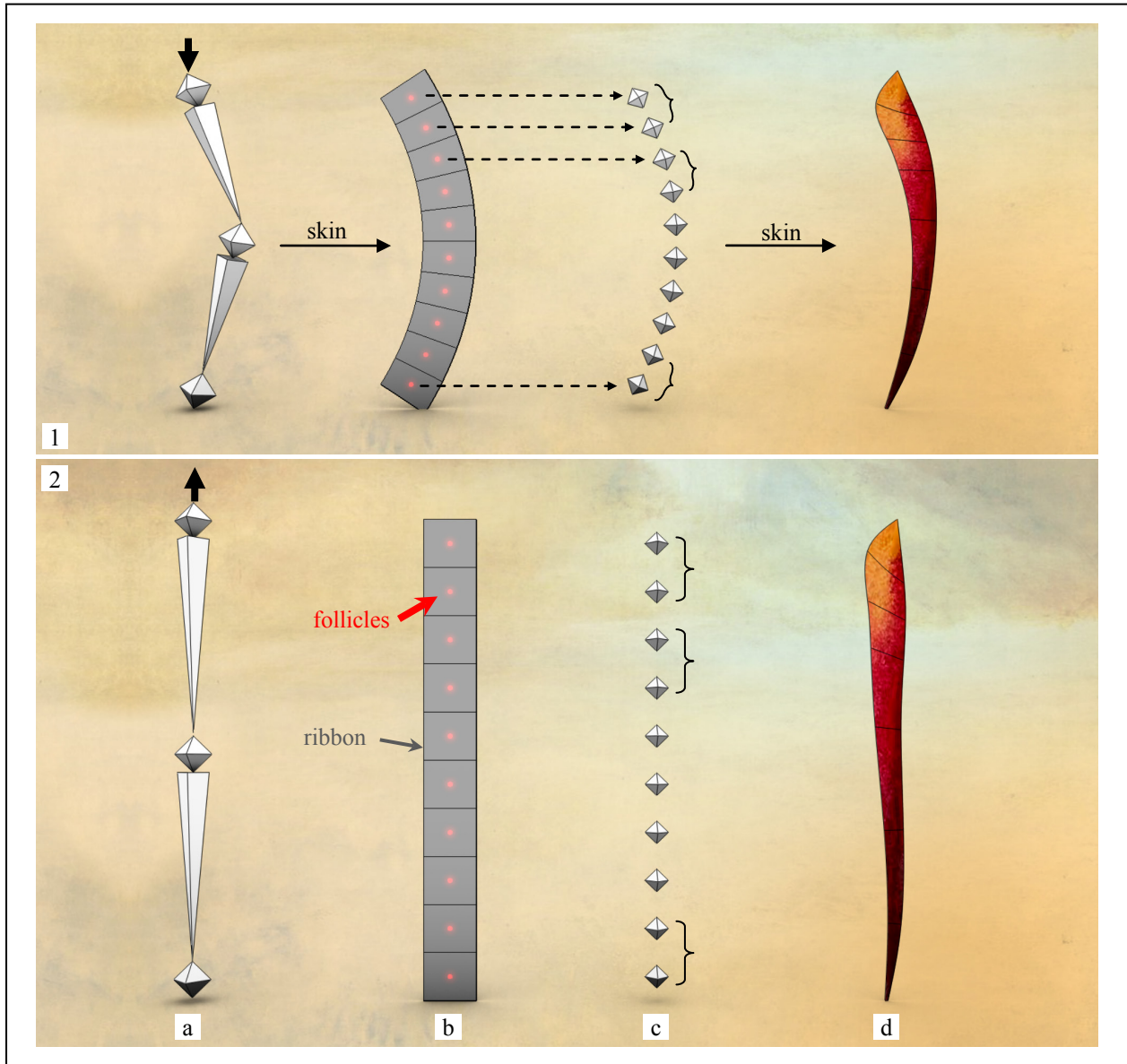


Fig 9:Ribbon method used for rigging the elements in two different poses: (1) bend. (2) stretch; showing (a) driver joints. (b) ribbon skinned to the driver joints and contains follicles. (c) equally spaced bind joints. (d) geometry skinned to the bind joints.

To attach the bind joints to the ribbon surface, we can use hair follicles. The hair system, which is a part of nDynamic system in Maya, gives this ability to attach hair follicles to any surface. Then, it's just a matter of having each hair follicles driving one of the joints from the bind joint

series. This can be easily achieved by parenting the joints to the follicles. The result will be a series of bind joints that are attached to the ribbon, and the ribbon will be controlled by the driver joints, in this case, 3 joints called Hip, Knee and Foot.

Dynamic Joints Chain:

Dynamic joint chains are being used to give a responsive feel to an object or character, to allow them to respond naturally to real-world forces like gravity, wind, turbulence; to have that motion decay with the tendency of any object to retain its original shape; and to balance those dynamic responses against my own input. It's used to add a secondary motion to any part of a rig to give more life to that part, without demanding for a high amount of work for animating that element. To give an example, assume that we have a character who has hair. It's obvious that animating the hair would make the CG character look more realistic and believable, but it's also obvious that animating hairs will be too much time consuming or even not doable. By adding a dynamic system to the hair, it will smoothly respond to forces and animations in the scene, while the behavior of the hair can be controlled with much less attributes. Setting the best values for the dynamic system is another challenge for animators, but at least it's doable and when it's set, the results are much better than directly animating the hair.

I spent one whole month to find the best way to give the rigs a dynamic feel, so that I could animate some few attributes, and the rest was calculated using dynamic systems in Maya, while maintaining the speed of rig response, and also while leaving enough freedom for me as animator to manually animate any part of the rig without being limited to Maya's hard-to-predict dynamic system.

Creating Dynamic Joints Chain:

I'm not going to explain every single step of making the dynamic joint chain since there are lots of free online tutorials that explain a couple of methods, but I will go briefly through it because later on, I will show one of the weaknesses of those techniques and how I was able to overcome

it and make it work for my own purposes. For the purpose of simplicity, I will demonstrate the procedure on one single joint chain, but it will be applicable to any element of the birds.

One of the dynamic systems in Maya is the one that creates a dynamic curve. You just need to create a NURBS curve, and then make it dynamic. This dynamic curve then can be used as the curve for creating a Spline IK for a joint chain.

By selecting a curve and making it dynamic, Maya will duplicate the curve and makes the second curve dynamic. But what would be the reason for duplicating the original curve? Why Maya doesn't just make the original curve dynamic.

By duplicating, we have this opportunity to have the original curve shape as a goal. Maya actually has an attribute for a dynamic curve that forces it to follow the shape of the original curve. This is pretty much handy, and I will show how I used this original shape, along with the dynamic curve to make each part of the characters dynamic, while maintaining the freedom of animating and deforming the shapes manually. Fig (10) shows a simple overview of how the dynamic chain joints can be built.

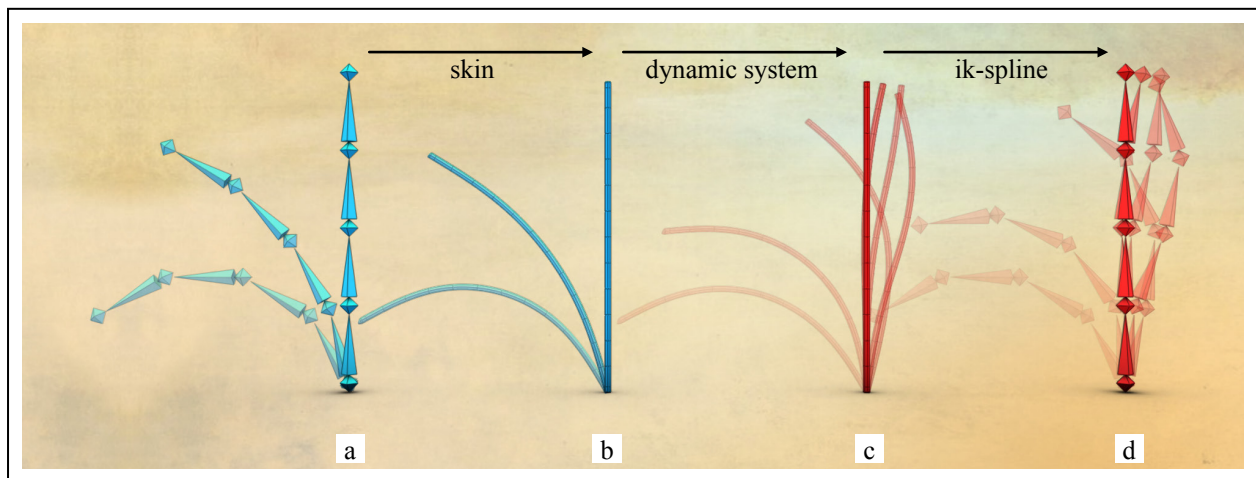


Fig 10: Building the dynamic joint chain. The dynamic chain will have some secondary animation; (a) manual joints to form the (b) goal curve. (c) dynamic curve will follow the goal curve with dynamic reaction. (d) dynamic joint chain uses the dynamic curve as ik-spline curve.

As you can see, I have a joint chain that deforms the original curve, the original curve then will be used as a “Goal” for the dynamic curve so that the dynamic curve will follow this curve

shape. Then this dynamic curve is used as the curve for Spline IK system on the other joint chain, dynamic joints chain.

The animator now can use the manual joint chain to animate and control the original curve so the dynamic chain would follow its shape, dynamically. Meaning that it will try to follow the manual chain, but it's more dynamic and can have all the dynamic properties on itself, like overlap actions or secondary animation.

Now that I build the dynamic joint chain, I could bind skin to the geometry directly to these joints. But as I discuss earlier, I would prefer to introduce another joint chain just for skinning purposes and will parent constrain them to both the dynamic and manual joint chain. Then using that one attribute, I can switch between manual and dynamic joint chain. Or I could use it to dial down the overall dynamics of the bind joint chain!

Controlling the Dynamicity of Elements Using One Single Attribute:

Now that I have built the dynamic joint chain that is following the non-dynamic manual joint chain, I want to have one more level of control on this chain and be able to switch between the fully dynamic joint chain, and the non-dynamic chain. So, I decided to introduce an in between joint chain to be used to actually skin the geometry to it. As a result I would have 3 joint chains, and only one was used for skinning the geometry to.

Next step was to move these bind joints using either manual or dynamic chain, and having an attribute to switch between these two chains. The best and easiest way was to "Parent Constrain" the bind joint chain to both manual and dynamic joint chain, and then using one single attribute, blend between these two joint chains. This was really helpful through my production pipeline when I was animating the birds. Regardless of all dynamic attributes that I had to control the dynamic behavior of dynamic joint chain, I had this extra attribute to control the effect of the dynamic chain on the bind joint chain. Below is a simplified version of the connection between these 3 sets of joints.

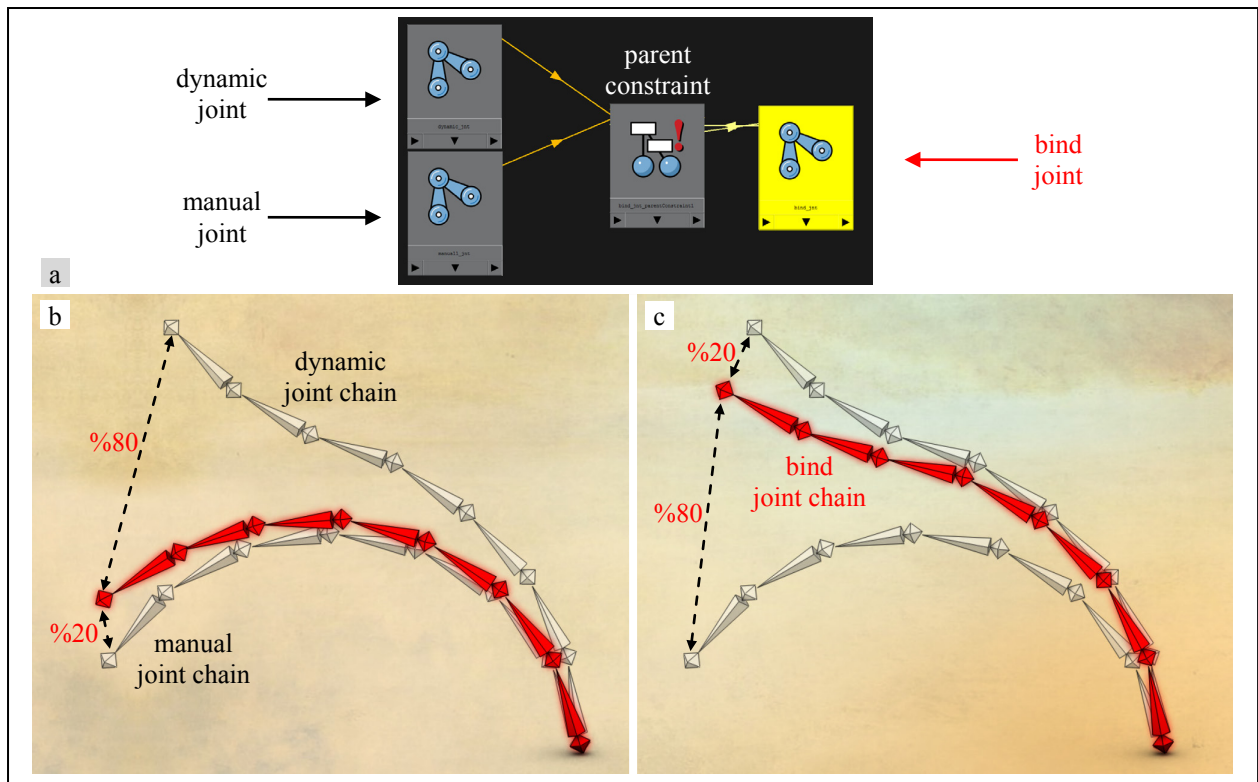


Fig 11: Adding an extra set of joints to be used for skinning; (a) the bind joint chain will be constrained to both manual (non-dynamic) chain and dynamic chain. Using one single attribute, the amount of parenting will be controlled. (b) parenting attribute = 0.8. (c) parenting attribute = 0.2.

Dynamic Joints and the Issue with Twisting the Chain:

This method of having a dynamic chain was working perfect for all the single elements that I had in my character design, until I reached to the point that I wanted to fold or twist the wings of the birds. To describe the issue, first take a look at the folding structure of a bird's wing:

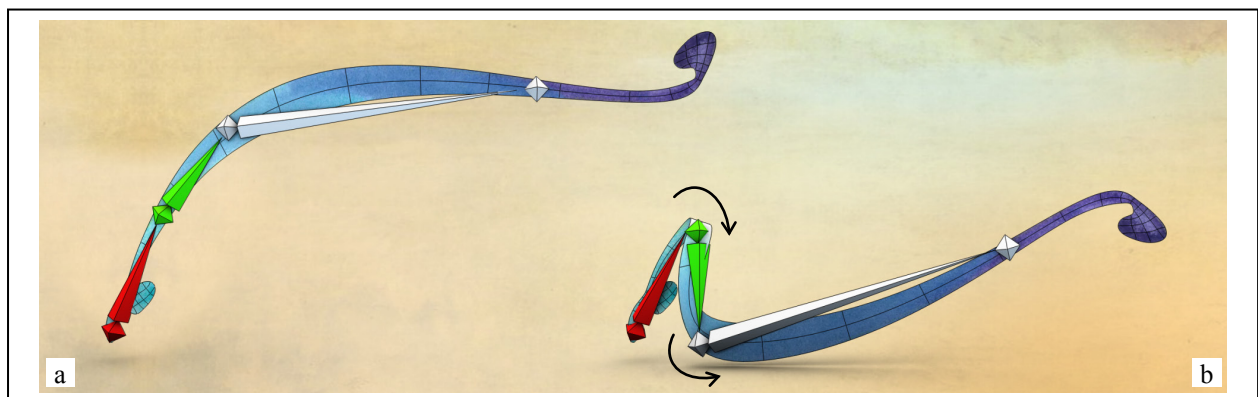


Fig 12: Wing fold structure; (a) normal pose and (b) fold pose.

As can be seen from the structure above, the wings fold around three points: Shoulder, Elbow and Wrist. To add the same folding functionality to my characters, I needed to be able to fold the wings, yet maintain their dynamic behavior.

So again, instead of having one joint chain and binding the wing geometry to that chain, I needed to follow the same dynamic procedure described earlier for the wings as well. Then for folding the wing, I needed to fold the manual joint chains. The manual joint chain would shape the goal curve, the dynamic curve would follow the goal curve and would move the dynamic joints and consequently, the bind joints would move.

Everything should work perfect until the point that in the event of rotating the joints in some axes to fold the original curve, some information that travels from joints to curve will be lost. This loss of information would appear in another situation as well, where animator wants to rotate all the wing joints along one specific axis to create a twisted shape such as below:

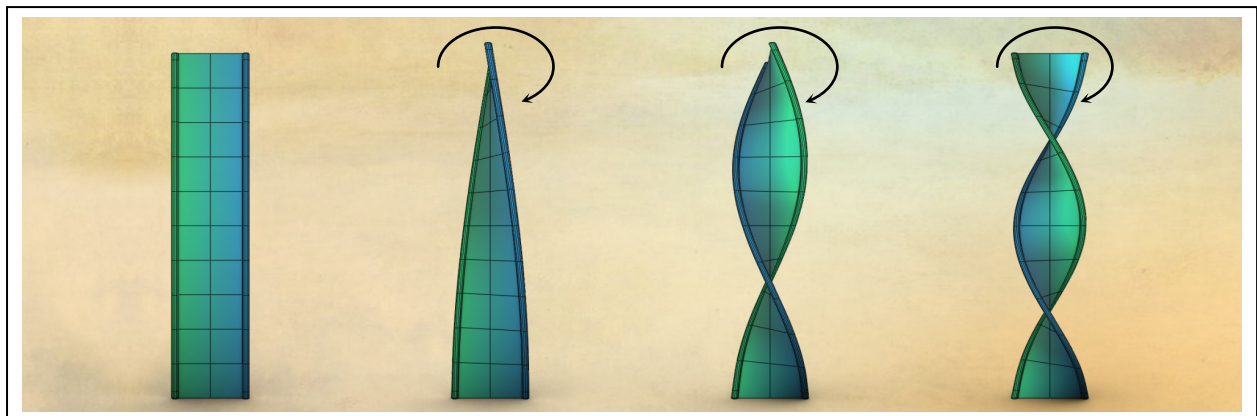


Fig 13: A simple desired twist shape.

All these issues are coming from the fact that curves can't hold twisting information on them. When the manual joints bend in two directions, they can bend the curve, but when it comes to the third direction the manual joints are twisted, this information will not transfer through the curves and this kind of rotation would not pass along (Fig 14).

The problem is that curves have no normal information and are just two-dimensional objects. So they can just bend in two directions, and twisting or rotation in the third dimension is not a defined parameter for curves.

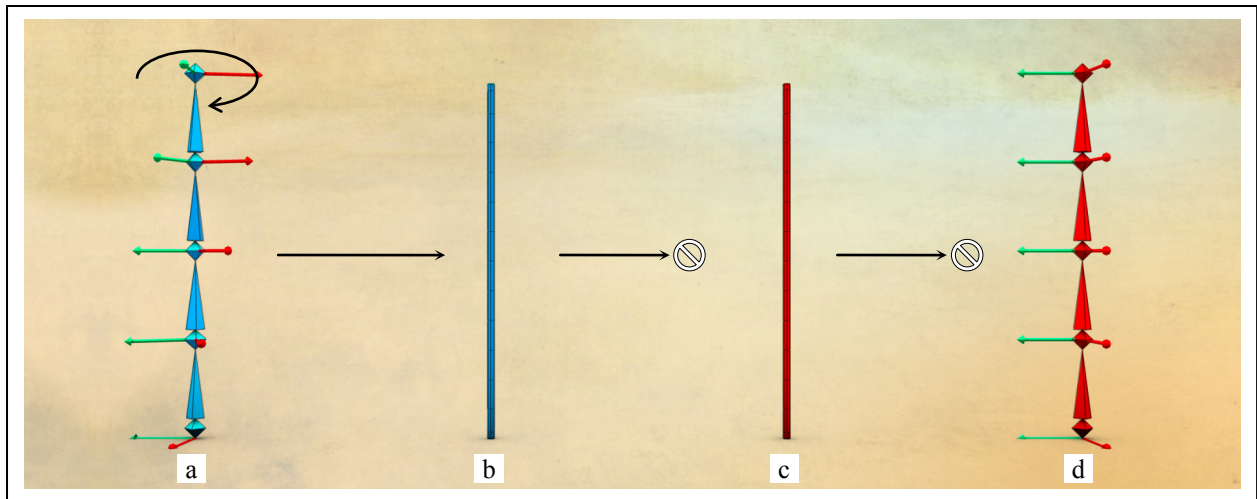


Fig 14: Issue with twisting; (a) manual joint chain is twisted along axis down the chain. (b) the goal curve can't carry twist information. (c) no twist information is passed to the dynamic curve. (d) dynamic joint chain is not twisting.

To avoid this problem, I invented a method for preserving the twist information, by introducing a surface instead of a curve. Any surface in 3D space has an extra information called “Normal” which carries the information regarding the aim that the surface points to. So I could use this extra information to hold the twist information of the manual joints. This way when the manual joints were twisting, they could twist the surface and the surface could hold this information on them. Now that I could transfer all the rotation information, including twisting information, I just needed to add dynamicity to the surface.

To include dynamicity in this method, I just needed to make this surface a dynamic object. Since the dynamic curve system in Maya is a well designed system, I decided to use the same dynamic system and build dynamic curves. Then somehow create a surface out of the dynamic curves and use that surface for the rest of the workflow.

To do so, for each wing or any other part that needed to be able to twist, instead of having one single curve right on top of the joint chain, I would create two curves which were not sitting directly above the joints chain, but rather would place each curve on one side of the joint chain.

Now these two curves will be skinned to the manual joint chain. Each of these two curves will have a dynamic curve which will follow them. Then by creating a “Loft” between the two dynamic curves, I could create a surface that could act as a dynamic surface since it was built out

of two dynamic curves. Then the dynamic joints would sit on the dynamic surface and will carry the dynamic information to be used to move bind joint chain. Fig (15) breaks down the whole wing rig structure:

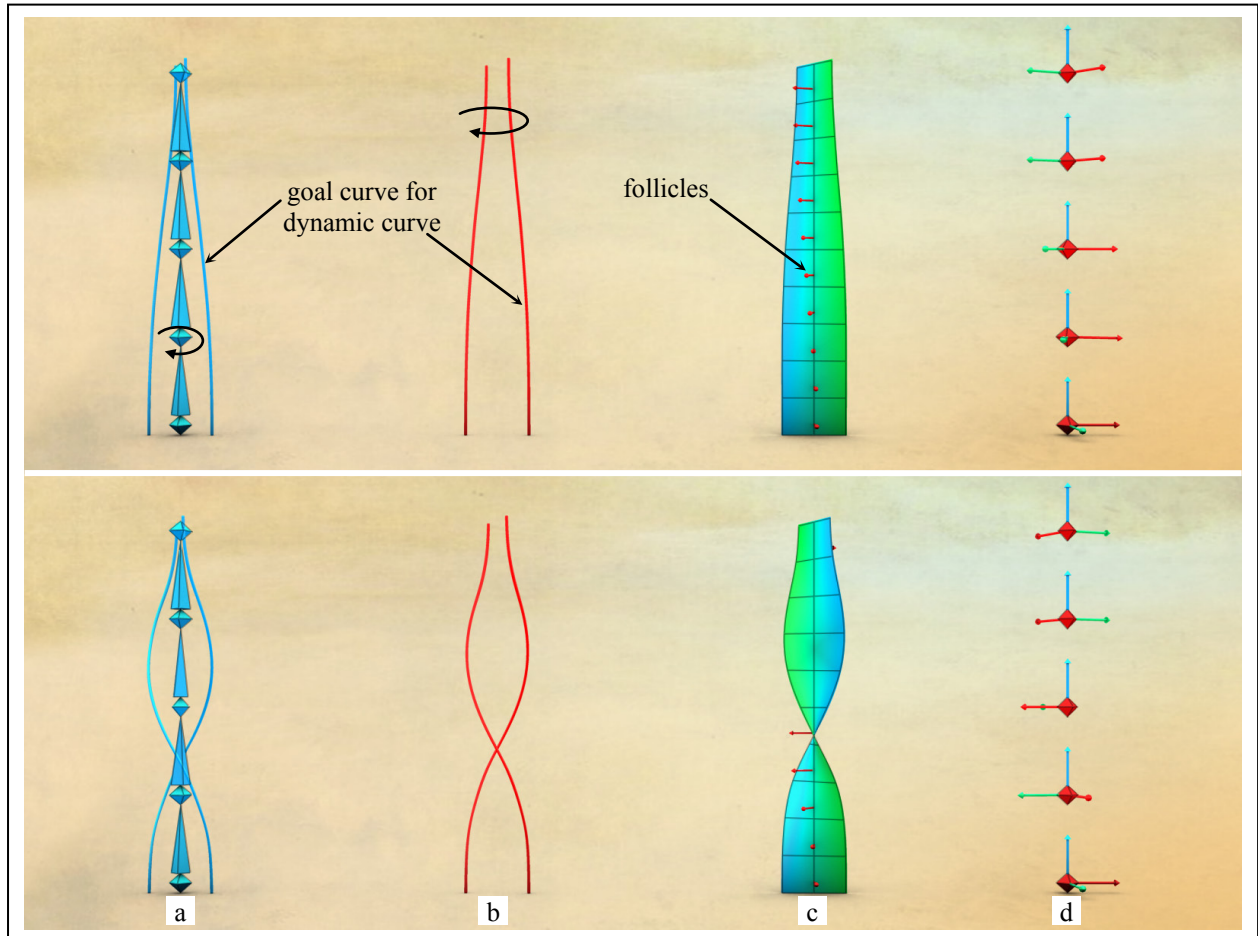


Fig 15: Final structure for creating dynamic chain by introducing two curves instead of one; (a) manual joint chain shapes the manual curves. (b) dynamic curves follow manual curves, dynamically. (c) a ribbon will be created by Lofting the two dynamic curves. (d) dynamic joints will sit on the ribbon and follow the movements, including twist.

I discussed my method to give more dynamics to my rigs. Now that I had figured the procedure, I just needed to apply it to any single element of the characters. When you have too much dynamic on one part of the rig, if any other single element, even small ones, don't follow the same dynamic, that part will be noticeable in our eyes. So made sure that I apply this kind of dynamic chain to every single element of the characters. That's where scripting comes in and saves the rigger, myself, days and days! Just to give an idea on how detailed my scripts became, I ended up having roughly 6000 lines of MEL codes to rig each one of the birds.

FILE MANAGEMENT AND PRODUCTION PIPELINE:

Imagine you are working on a project with just one more partner. How do you split the tasks. How do you keep track of the progress? How do you know which version is the most recent version?

These questions are always applicable, even when you are not in 3D world. The first time I experienced the need of project management was actually several years ago, when I was not animator at all. During my studies in the field of Electrical Engineering, one of the routine tasks that I had was writing codes and papers. Versioning up was one of the essential concepts that I learned back then.

Every time I open a file to continue working on it, I will just version it up at the moment. Means that I save my file as a new file, with a number at the end that increments each time. This applies to any project and in my opinion, it's the base of file management. The very first result is, when I open my working folder, I will have a list of files, arranged by version in front of me, and each version is easily reachable without the hassle of figuring which file is the most recent one or if the final version is the file named character_final or the one called character_complete_final. This naming is nonsense.

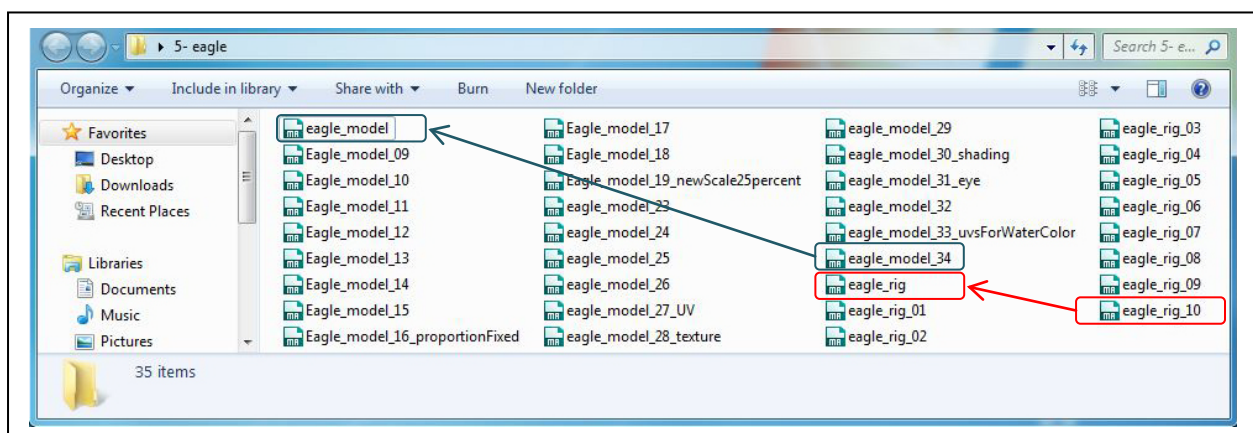


Fig 16: The progress of versioning up during any stage of production and using the final version for referencing in the next stage. In this example, eagle_model is an identical duplicate of eagle_model_34 and eagle_rig is an identical duplicate of eagle_rig_10.

Versioning up is also helpful to prevent losing progress. When the artists is modeling, texturing, rigging, animating, lighting or rendering any project, they should always consider not to overwrite on the file. There is always one mistake that any artist may make, and if he or she overwrite on their original file, they will lose some progress or in some case, if the file gets corrupted, the loss would be all the progress for that specific task.

Now that I talked about versioning up the files, I can go over the 3D production pipeline and briefly describe the importance of referencing.

When a character is modeled, textured and rigged and ready to animate, animator can start animating it. But should the animator animate in the rig file? What if during the production, a need for adding or removing some features from the character shows up? Or what if during the animation stage, animator realizes that there is something wrong with one part of the rig that needs to be fixed before continuing the animation progress. Should the rigger come in, fix the issues on the character, and then animator start over with the new updated rig? It's not efficient at all, horrifying in my opinion.

There is this feature in almost every 3D software, that allows you to "Reference" in any file in a fresh new scene, and work in this newly created file. But what does that mean?

Referencing files into Maya (or again, any other 3D software), actually creates a link between the fresh scene, and the file that is referenced in, without affecting the referenced file.

Let's go back to the example that I just brought up. Assume that we have a character ready to be animated. This time, animator references in the rig and starts animating the rig in a fresh scene. Now if the rigger goes back to the rig file and changes something on the rig, and then versions up the rig file, the animator just needs to replace the old rig, with this new updated rig, without losing all the keyframes and animations that he or she had done with the old rig.

This applies to every stage of the pipeline. As another example, when the animation is done, the file is handed to the lighter to light and render the scene. Again, if the lighter references the animation scene into a new file and light it from there, there is always the option of fixing the animation without losing current job on lighting.

This pipeline method has several crucial benefits:

- Each stage of production becomes independent from the other stage, and can be done in parallel to the other stage. Rigger can start rigging the character, just right after the modeler blocked the low poly geo. Animator can start blocking the animation, or even animating, while the rigger is still finishing the details on the rig. Lighter can start lighting the scene while the animator is still working on the same scene, and so on.
- Any changes applied to any file, will be reflected to all the files that use that file as reference.
- The original referenced file is safe from any unwanted changes that might accidentally happen in the file that it's been referenced in.
- All stages of the pipeline have the option of being adjusted or modified, without the fear of losing other works.

For referencing each file in the next stage, to make the process of referencing and loading the latest version easier, before referencing a file in another file, its final version is always duplicated, renamed to a fixed name like “character_rig” without any version numbers, and then referenced into a new file. Each time the files are updated and versioned up, they will be duplicated and the duplicate will be overwritten on the older master file. This will ease the process of loading the newest version in other files with the reference file in them (Fig 16).

To make it brief, Fig (17) shows the general rule for any 3D pipeline applied to each single shot. Remember that in this diagram, each stage is a separate file which will be “Referenced” into the next stage file.

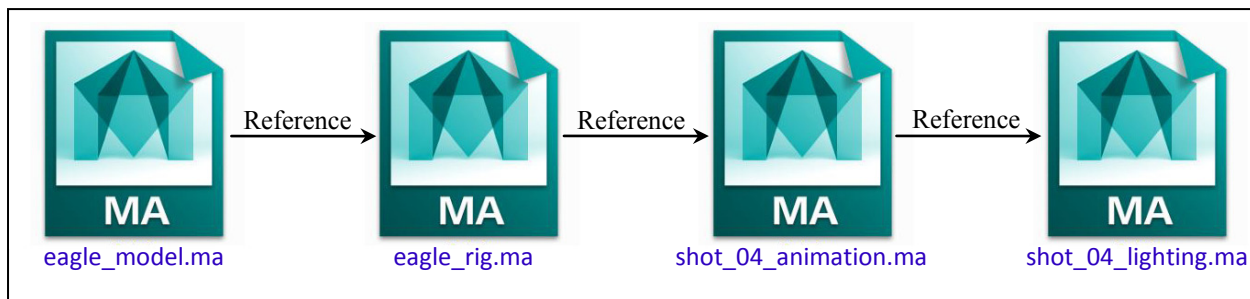


Fig 17: Pipeline diagram. Each master file will be “Referenced” into the next stage. Notice that there is no version number for any file that is going to be referenced.

ANIMATION:

Animating the characters that you have created and rigged is fun because you know what parameter does what. Since I was following the standard pipeline for referencing rigs, I also wasn't too much worried about any issues that I might encounter during the animation stage. I could easily go back and fix that issue and reload the latest version.

One lesson that I learned from making several animations was that when you are rigging a character and you know in one or two shots, this character is doing something crazy which needs lots of technical considerations for the rig, you don't have to incorporate all these functionalities in the rig file, because it's going to be used just once or twice.

Some technical considerations can be done per shot in the animation stage, meaning that for example if you know that just in one shot, the character is going to do some crazy movements or being deformed in a very strange shape, you can introduce those functionalities for that specific shot, without having it incorporated into the rig file and making it a very heavy rig.

As an example, for one specific shot in my film, where the first birds is going to be formed by a ribbon, I wanted to reveal the geometry without having to address the opacity of geometry.

So I decided to go deep into geometry level and animate vertices of the geo. And since I wanted not to lose the rig functionality, I chose to create a blendshape for the geo, in this specific shot. So after duplicating the bird's geo and attaching it back to the main geo as a blendshape in the animation file, now I just had to animate the position of each vertex to reveal the geo.

Since I was dealing with at least 40 vertices per each element of the bird, again I decided to animate this specific shot using MEL. The script was just moving each vertex into a desired position, set a keyframe, and then move it back to its original position in the world space, and setting a keyframe there.

As a side note, since vertices are components and thus cannot be keyframed, I actually created a cluster per vertex, and animated the clusters. Fig (18a) shows the procedure applied to one piece and Fig (18b) shows the result of the procedure applied to the whole character.

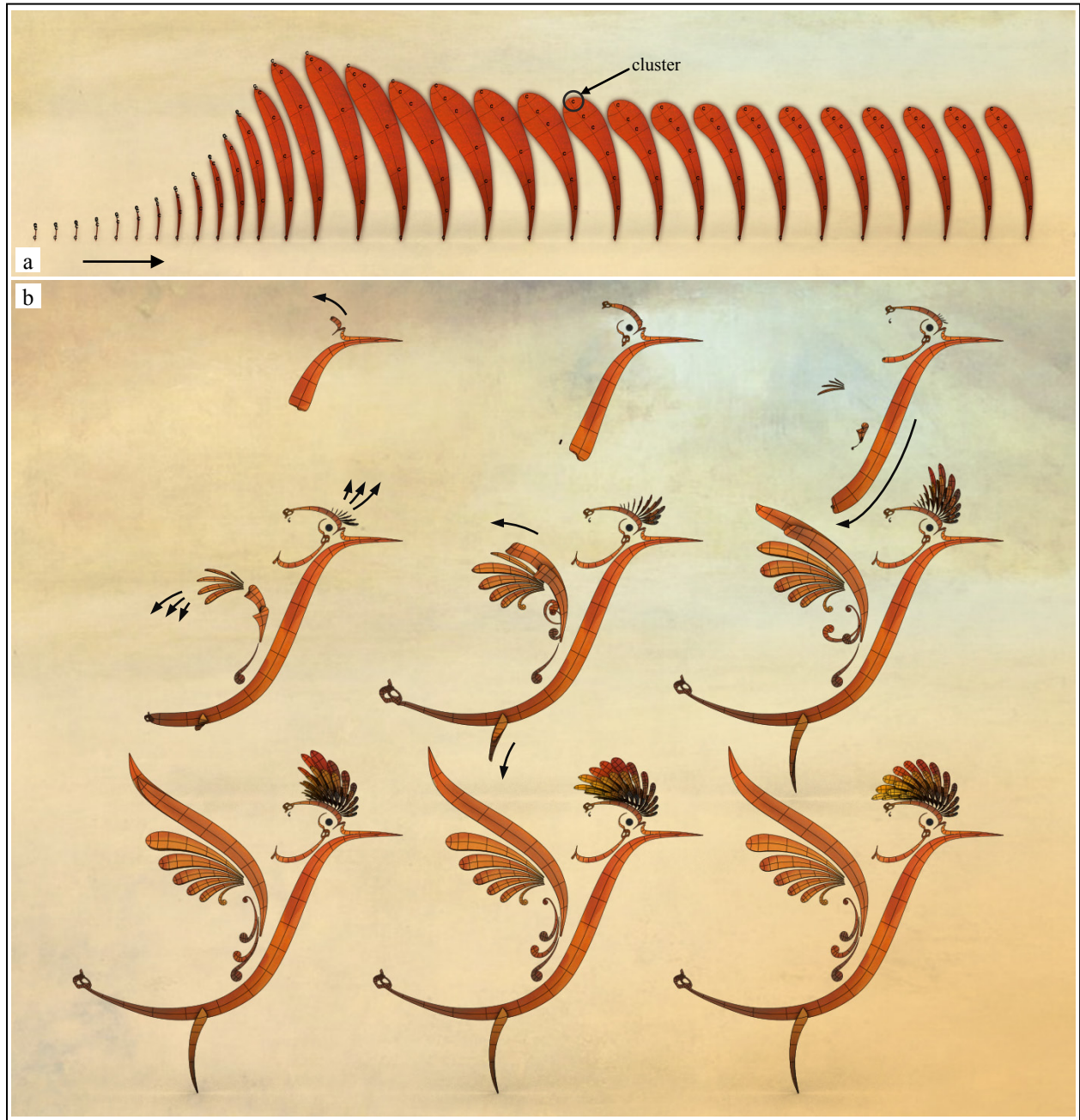


Fig 18: MEL based animation; (a) forming one single element of HodHod's crown. Frame 1 to 31 shows the whole evolution. (b) same concept applied to all single pieces of the character to reveal it during the shot. Just 9 frames of the evolution are shown.

LIGHTING, RENDERING AND COMPOSITING:

The look development of the film took me a long time. From the time I was thinking about character designs, I was concerned about how I will present the beauty of these characters. As I said in the character design development section, my main challenge was the style of these characters. So until the last moment, I was doing tests to see how I can manage my lighting schemes and renderings to bring up the quality of the work, while maintaining an optimal fairly low render time.

The style of the characters eventually led me to the direction that was more graphic. So far, the style of characters and the watercolor look of the textures were pretty much making a cohesive piece in regards to the traditional story. So, it would be the best, if I could keep this connection through the visual development as well. That's why I decided to lead the visuals and renders more towards a graphic style. So I made the decision. And what software was the best solution for me if I wanted to create something more graphic? AfterEffects.

The potential that is hidden in this software is phenomenal. It's a compositing software that is also a professional animation tool. So I could use it both for compositing, and bringing up the graphic quality of the film. While all the characters development and animations were done completely in a 3D environment through Maya, I decided to do most of the look development in AfterEffects.

First things first, I should work on the strategy for creating the render layers and I decided to have at least 3 render layers per each element, Beauty, Ambient Occlusion and Shadow. The benefit of separating these renders into different layers is that first, I was able to manipulate each pass in the compositing tool and modify the look of each pass as an independent layer without affecting other layers. For example if I wanted to lower the intensity of shadows in a scene, I could lower the opacity of the shadow layer in AfterEffects without the need to re-render that scene. Layering the renders would also help me lower the render time and manage everything to be rendered easier with less chance of having broken rendered frames.

AfterEffects and the Opportunity of Bringing Camera Data from Maya:

So far, building render layers is a common procedure that happens in the rendering and composting stage. But back to the idea of having the visuals more towards graphic style, I decided to realize all the environment layout in AfterEffects, and by environment, I mean the ground, the sky, fog effects and all the lightings that had to be done in regards to these environmental elements.

This would help me not only to be able to develop the visuals in AfterEffects, but also by bringing down Maya rendering time by a huge factor. There was no ground to be rendered through Maya as well as the Sky. No geometry at all for these environmental elements, and that meant I could light my scene with some simple directional or spot lights, because I was just focusing on the characters, trees and flowers. Fig (19) shows a screenshot of one of the shots in Maya. As shown, there is no environment in the 3D space in Maya and it's been created and added in AfterEffects.

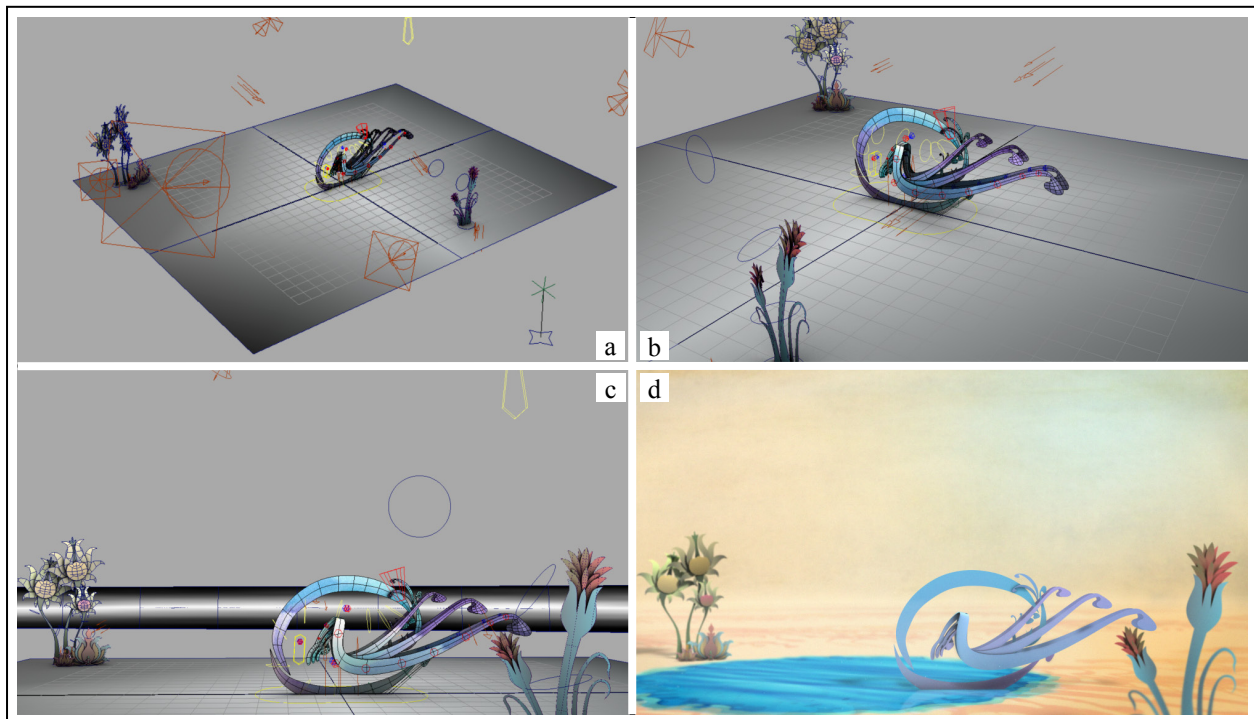


Fig 19: 3D environment layout done outside Maya; (a)(b)(c) Maya scene shown in different angles. There is no environment in the scene. (d) final composite and environment creation done in AfterEffects.

I was happy with this decision. I had a lot of freedom in AfterEffects to play with the look, and wide-open hands to work on the Ground and Sky elements, all in AfterEffects. But here was the problem I would encounter; almost all of my shots had a moving camera. This would be a problem for adding the environmental elements in AfterEffects because I couldn't match the movements of the camera to those additional background elements. Camera or motion tracking in AfterEffects was a good approach, but still the result wouldn't be too clean, while the tracking procedure in Aftereffects would be a relatively hard process. The other problem with tracking in Aftereffects was that this procedure wouldn't give me a real camera in AfterEffects so I couldn't build a 3D space in aftereffects to match the perspectives.

Fortunately, I could overcome to this challenge by finding this solution. There is a method that I could export the information of the animated camera from Maya to AfterEffects. And for world space references when I imported the camera into AfterEffects, I could also have some Locators in Maya scene, that would be converted into Null objects in AfterEffects during the data transfer process. After some practice, I figured this was the best solution. So I wrote another MEL script that could do the whole process of exporting camera data into AfterEffects with just one click.

So this was my procedure for managing the renders in Maya and AfterEffects. I would render the elements consisting of characters, flowers and trees, with render layer considerations. In the meantime, I would export camera animations. Then I would bring both the renders and camera information to AfterEffects and finish the piece all in AfterEffects.

SCREENING OF THE FILM AND RECEIVING CRITIQUES:

“Simorgh” was completed and ready for the School of Film and Animation screening on May 19th, 2014 and Professor Carl (Skip) Battaglia would talk after the screening of my film as my respondent. After that, it’s the time when the audience, students, professors or professionals, will critique the work.

Surprisingly, I didn’t receive any technical, aesthetical, directorial or any other critiques regarding the film during the 30 minutes of critique time on my film. Although I directed the film more towards an abstract narration, the audience was very smart on getting the story out of this abstract form. I was more surprised when non-Iranian comments were all towards the story behind the film.

The comments were also telling me that the way the film was delivered was clear enough to suggest the connection between visuals and the ancient structure of the story, the thoughts behind the character design and the way they were forming out of calligraphic elements. I was happy that not only the story was delivered through the film, the directorial goals were also reached; the comments were saying that my goal of beautiful visuals was achieved.

Soon after the screening session, the film was awarded with the Faculty award from SOFA and I started submitting the film to festivals around the world. In the moment of wrapping up this paper, after almost 6 months of finishing the film, it has been selected to be screened in 16 national and international festivals and has been awarded in 3 of them. The festival submission round is still ongoing in hopes of more festivals and awards to come.

Being screened in several festivals is giving me this opportunity to receive some critiques and comments from audiences around the world, which still are surprising me. I’m receiving lots of great feedbacks from international professional audiences and the only critique that I have received so far, for multiple times, is that they needed to see a longer version of the film to enjoy it more. And that is quite a pleasure for a filmmaker for his or her work.

As for some examples and wrapping up this paper, I will bring some of these comments on the film received throughout the world. Some of the comments are being translated from Persian language or trimmed down to fit in this paper.

Noureddin Zarrinkelk, President of ASIFA (Association International du Film d'Animation) 2004-2006:

"Meghdad; I saw your beautiful work. Congratulations! Persian calligraphic art and the story of 'The Conference of the Birds' gave a freshness and originality to your work. Let this door be open and looking forward to seeing more of your works in the future."

Elizabeth A., Film Critic, Vancouver, Canada:

"I think technically this film must have been a real challenge to make and I salute you for your efforts. By bringing calligraphy to life in such a magical way, and by your skilful integration of the music, the one enhanced the other to create a mysterious ballet with an atmosphere of remarkable spiritual intensity..."

... when I watched Simorgh, I didn't initially realize it was the story of 'The Conference of the Birds' -- I was just totally enchanted by the beauty of what I was seeing, and the deep mystery of it, and the way the birds danced every note of the music into being, and the music sang the shapes on the screen into being. The exquisite colours, the graceful calligraphic curves. I tell you, I forgot to breathe! I found it so utterly beautiful and spiritually uplifting, and so astonishing ...

... there was also a deeply personal element for me, as your film presented me with all the things that I most value in life -- music, art, film, Sufism, Persian culture, subtlety, an elevated spirit. Perhaps it is because I resonate with these things that it spoke to me so deeply, but regardless, I think what you have created is fantastic -- in every sense, art serving its original purpose -- to educate and exalt the spirit, to honor life, to bestow beauty on the world of humans.

My only criticism is that it is not long enough. I hope to see more of your work."

Kristin L., Producer, New York City:

"Really gorgeous job. This is one to watch over and over. It is a true piece of art... from the music, to the colors to the GORGEOUS design and animation!"

Craig D., Couch Fest Films, Seattle:

"Meghdad, I wanted to send you a personal email in regards to your film. We don't write these emails for all the submissions. Your film merited a personal response:

...the screening team [...] mention that they were utterly impressed with the high production values of the short. They thought your animation style was sharp, unique and very professional. They see a lot of animations and thought your style was very original."

APPENDIX A: Original Proposal

SIMOROGH

Meghdad Asadi Lari

Synopsis:

This is a 3D animation that deals with the fragility of self worth. It centers around a few birds of different breeds, each representative of a particular human characteristic; ego, greed, avarice, etc. The birds are seemingly satisfied with their perceptions of self, but on a chance journey they each embark upon, they find they are stronger as a community and are strengthened by allowing others to complete their true 'self'.

Rationale:

This is a famous fable from Iranian ancient literature that deals with concepts related to human beings lives and how their life can be affected by their perception.

The movie would be based on the traditional conceptual story, which may not be an actual narrative story. But it has a great potential of visual works, which I like to work on.

I am planning on working in 3D Animation, while getting help by using some 2D ideas and mixing it with the original work. I want to concentrate on the visual elements by stylizing my character and environment design while keeping it simple, to support the visuals and make it easier to work on. I also want to leverage some morphing transitions in a couple of shots. I will also use particle effects, where needed.

The movie will have about 7 bird characters. I am also planning to have one gathering environment, one journey environment, and one expansive landscape for the end shot.

For modeling, texturing and animating, I will get advantage of my knowledge in MEL scripting to help speeding up these steps.

Treatment:

A group of birds gather in a non-descriptive location, enjoying their life. A nightingale dances around a flower, gently singing to it. A parrot stands on a tree branch, swinging and talking to no one in particular. A peacock spreads his wings and tail, flaunting his beauty and reveling in the spectacle. A duck, satisfied and content floating in a pool of water cleans and primps its feathers, taking pride in being the cleanest creature in the world. A falcon sits majestically above the others, confident and powerful over all he surveys, eyeing its domain.

A hoopoe, well known for his guidance and leadership, is watching and wondering all these activities. He squawks and bellows and catches the attention of the birds. Using rich, descriptive imagery, he tells them of Simorgh, a powerful and all-knowing bird who they should all strive to emulate. He pictures his beauty, kindness and purity and convinces the gathered birds that they are nothing in comparison.

Their interests pique. The hoopoe takes off, hovers above the birds and encourages the birds to follow him. The birds look at their belongings, look at hoopoe and take off in search of this mysterious creature.

The journey begins. The birds fly with a kind of dance around each other. Each bird that gets tired falls behind. But to reach their goal, they should adapt themselves to this hard path. So they do their best to be with the group. They flap their wings harder and faster. In this journey, even stormy weather or hot sunlight cannot make them give up.

As the birds strive to reach their goal with the last of their energy and will, they come together as a group and form the shape of the great Simorgh himself; powerful, kind, majestic and complete. With a short and beautiful bird dance in the air, they fly off over the expansive landscape.

Budget:

Hardware	
External Hard Drive, 2TB	\$250
Software	
Adobe Creativ Suit with Student Discount	\$450
Music and Sound	
Composer	\$500
Muscial Instrument Performer	\$700
SFX	\$50
Publishing	
Blueray Discs, Regular DVDs, Cases	\$100
DVD Cover	\$50
Poster and Promotion Prints	\$50
Festival Submission + Shipping	
Chicago International Film Festival	\$50
Ottawa Animation Festival	\$15
Annecy	\$60
Sundance	\$60
Total	\$2335

APPENDIX B: Production Stills

