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A Graduate Thesis Animation by

Suruchi Pahwa and Hardeep Kharbanda

Written by Hardeep Kharbanda

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## People Who Referred To This Report

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Fame: A Four-Letter Word?

Obsessive student pens a new tale in Re-Proposal
By Suruchi Pahwa and Hardeep Kharbanda

The way this work came about is interesting, and we feel it necessary that the reader know the story behind it before getting into the how and why of its parts.

In the beginning there were two different films: *Two Many* was Sunny’s thesis idea about a guy torn between his two sides, which was approved by the thesis proposal review committee on the second attempt, and 2, Suchi’s idea of a film about relationships, played out through the exchanges between a man and a ball. Over the summer of 2003, Suchi began to lose interest in the story of 2. Obsessive as she is, she came up with a host of new ideas and re-proposed the best one of them, a work about fame and the harshness of the limelight, tentatively called *Celeb*. It was a much better story, and was approved by the review committee. We each began working on our individual thesis projects, and as we worked side by side, we started bouncing ideas off each other. Each of our works started growing and becoming bigger and better, but we were having so much fun contributing to each other’s works, that it reminded us of our collaborative animated work, *One by Two*. We seriously felt that if we teamed up on our thesis, it would be a knockout movie. We decided to give it a shot and re-propose – again. This happened to be the third time in front of the faculty for both of us. The proposal was passed, if not somewhat reluctantly, but because *One by Two* had done so well. The faculty made a decision to trust that our project would likewise probably be a success. *Two Many* was abandoned, and *Celeb* went full steam ahead, eventually ending up as – *Up!*
Is Zaz A Puppet?

Zaz was rigged using Maya’s built-in tools. Another benefit of his disjointed design was the ease of binding. It eliminates one of the big problems faced by 3D character riggers: shoulder creases! Since our focus was on animation and we wanted to avoid needless technical issues, this approach was ideal. In designing his skeleton, our main goal was a user-friendly setup. The controls on the skeleton are clear, prominent and easy to select.

Zaz denies ‘Spineless’ rumors

The story called for Zaz to go through a whole gamut of actions. This fact dictated the specifics of Zaz’s skeleton: Inverse Kinematics (IK) for the legs with a Reverse Foot setup for easy roll, IK for the arms which is OFF by default but can be turned ON when needed, and Forward Kinematics (FK) for the head and hands.

In order to go beyond basic motion and get the desired level of flexibility and expressiveness, I had to give special attention to the spine. I like the spine setup in SoftImage XSI, which lets the animator rotate and move the hips and shoulders independently of each other and automatically manipulates the spine according to how these two ends are placed and oriented. This is a more natural way of working with characters, and is a step closer to working with a real puppet as in stop-motion. More importantly, working this way leads to more aesthetic, expressive curves for the spine.
My goal was to try and build a similar spine setup from scratch in Maya. It took quite a bit of guesswork, but after a few failed attempts I came up with the following setup:

The level of flexibility we wanted can only be achieved with a technique called spline IK. It draws a curve through a set of joints, which can then be animated by moving points on the curve. The joints try as far as possible to follow the curve. Of course, the more the joints, the more closely they can take the shape of the curve. In practice, for a human-like character, about 3-5 joints are usually enough.

The key to our setup was the simplicity of controls built around this basic spline IK. I made the curve with 4 points, and from each point I made a cluster, for ease of access and also to hook up the spine to the controls, as explained below.

The rig has two control objects for the top and bottom of the spine, and one master control for the pelvis. The upper two clusters are parented to the shoulder control. The lower two are parented to the hips control. These two controls in turn are parented to the master control. That’s it!

The two controls affect different parts of the spine and can be rotated independently of each other. Since the spine is based on a curve, it stays smooth. The individual clusters are still accessible to fine-tune the shape of the spine. This lets us, the animators, give strong and expressive arcs to the spine as you can see here.
The Dual Life of Zaz

One of our goals for this film was to try a new graphic style. We wanted it to be different from the typical 3d animated film, and hence we experimented with a mix of 2D and 3D animation. While Zaz himself is three-dimensional, as are the steps he climbs and the props he interacts with, the crowds that applaud him are mere two-dimensional graphic shapes. Again, the light beam that traps and hounds him is 3D, but the symbols of his success (like the kisses and such) are 2D. We created his environment this way to break away from the regular all-3D look and feel.

To move further out of the box, we tried to play with the frame itself. At key points in the story, the screen splits to reveal two different areas side by side, the action from one pane linked to the other. Zaz even jumps across the divide at one point, transporting himself from one location to another just by jumping from one screen area to the other. When he lands, the background changes yet again, showing his entry into a semi-abstract, iconic space, which replaces both the original spaces. This mixes the 3D space of his world with the 2D space of the frame to give a moody, playful look and feel to the work, somewhat like moving through the levels of a video game.

This playfulness is taken to its extreme in the montage sequence, which is highly stylized in its design.
Moving Up

Inside Story!

For an eight-minute work featuring one character, *UP* has a huge amount of animation. Zaz goes through all kinds of motion: walking, running, sneaking, climbing, leaping, kicking, crying, laughing, sneezing... the works! What’s more, his personality changes from the simple, innocent, common man to a proud, hollow and arrogant celebrity, and finally ending as a crushed, defeated character. We tried hard to convey these changes in personality by making him ‘act’, so that the audience would empathize with him. This is his rough character arc:

Zaz starts out as a naïve, simple character. Hence the beginning of the work sees him move in a slow, hesitant, somewhat ‘loose’ manner. The slow, uncoordinated moves fade as he becomes a reluctant celebrity, and he makes conscious though awkward attempts to put on a confident attitude. But as he starts getting used to his mounting success, his actions begin to get a more brisk, arrogant manner to them. And when he becomes a victim of the spotlight and it begins to torment him, although his actions get more frantic and abrupt, the looseness returns. At the end, when he goes through a range of emotions, his body is almost limp. His animation in this last scene is therefore both slow and staged, a blend of his basic nature and the faked attitude he has incorporated as a celebrity. Diving off the platform is, in a way, his final act. But it is not a perfect act, since his weariness shows through.
All Eyes on Zaz

There are many instances in the film where Zaz interacts with ‘characters’ like a crowd of eyes, hands clapping for him, and so on, that stand for his fans and their adoration for him. To keep away from the regular 3D look, and add some variety in the style of the work, we made these crowds look like flat, 2D shapes. Here are some of the approaches we used:

When Zaz kicks the ball and it goes through the hoop, a crowd of staring eyes appears around him. We used simply eyes because suggesting the presence of a crowd by eyes is powerful in its simplicity. Since Zaz has to look around and see that these eyes surround him, they are arranged all around him. To do this we animated the eyes in 2D, mapped them on NURBS planes in Maya and placed the planes in a circular manner all around Zaz.

In the dart scene, the script called for hands appearing on screen to applaud Zaz’s ‘feat’. Since Zaz is on a platform high above the ground, the crowd is now below him. To suggest the applause from the crowd, the hands pop up from the lower edge of the frame and Zaz looks down at them. The appearance of these hands is timed to Zaz’s repeated action of poking the target with the dart. Simple? Yes. Easy? By no means! Timing the crowd in relation to Zaz was a patient, tedious chore of moving keys and re-positioning hands in an endless cycle. It was only natural that, after a while, I could not see or judge much, and kept turning to Suchi for critique. She would point out a dozen glitches before I could say “Undo”!

In the end, it was worth it.
Searching for the Look

More than anything, we both wanted this work to look special, to stand out visually and to go beyond the harsh image quality of the default Maya renderer. Trying to achieve that 'special' look was the most frustrating challenge we faced in working on UP. We tried several effects and their combinations, went through different rendering software, and a lot of mental anguish, but still the look seemed to elude us.

The first rendering software we tried was Renderman Artist Tools for Maya. Any hopes of getting images as rich as Pixar's renders were soon dashed. Sure, Renderman can do a lot, but it took phenomenal effort and drained a huge amount of time to get one shader going. For practical reasons, we had to abandon it.

We surely did not want to use Maya's default renderer because of the hard, typical 3D look it gives. So we went back to Mental Ray for Maya, which we had used on One by Two. It gave us a lot of trouble on that work, and we had faced several glitches, which we could only patch up but not fix. Nevertheless, we gave it a shot. The rendering approach we used on One by Two was Final Gathering, and we used it again. It gives a very soft look to the rendered images, since it performs a sort of radiosity calculation by considering the illumination and color all around a given point.

The way this helps us light the scene is: we no longer need to create Maya's lights. We simply create large, bright objects like planes or domes that act as fake 'area lights' because of the high incandescence assigned to their shaders. The result is incredibly soft illumination, which
would otherwise take about a hundred precisely placed Maya lights to achieve.

Naturally, this quality comes at a great cost. Many of our scenes took over 10 minutes per frame to render out. And yet there was no guarantee they would look right. Some shots rendered for days on end, and ended up with problems like flickering. There were renders and re-renders and re-re-renders galore. No matter how hard we tried, Mental Ray would find a way to spring a surprise on us. Some of the most bizarre rendering problems we had were:

- Lighting changing from one batch of the render to another. This was bad since we often had to split up the render over different computers to get it done faster.
- Lighting differences between the render view (within Maya) and the batch render (given at the command line outside Maya).
- Zaz’s head detached from his body in the batch render. It looked fine in the render view, but the batch render had a mind of its own!

Since many of these were related to the batch renderer, we had to find a way around it. We could manually render each frame and save it from the Render View, but at that rate we would never finish the work! To speed this up, we called in Isaac Holze, the MEL whiz, to help. He wrote us a nifty little MEL script that essentially automated the manual rendering and saving of individual frames. That was a life saver and helped us finish the movie with a little sanity still remaining!

The spotlight, Zaz’s biggest enemy, threw other challenges our way. The first one was to get
the beam to show up! Here's a quirk: If a spotlight has Maya’s fog on it, then the cone of that light and anything contained therein, including your character, is rendered by Mental Ray as black. There was no way to get Mental Ray to render Maya’s light fog as is. Mental Ray’s own light fog looks great, but takes painfully long to render! Since most of the second half of the work features the spotlight, we would never complete it if we used Mental Ray’s fog.

We were forced to use Maya’s own light fog and then composite it with Mental Ray’s render of everything else. Only problem: Maya’s default fog looks flat, fake and flimsy. It took us a great deal of research, experimentation, tweaking, tweaking and... tweaking, to make it look good. The solution was to texture the light fog using Maya’s 3D textures, thus breaking up the monotony and giving the effect of dust drifting through the air.

Mental Ray render
Maya-rendered light fog
Livin’ in Layers

The hybrid 2D/3D look and feel of *Up* naturally took some compositing. But we ended up spending much more effort in compositing than we had anticipated. Barring the first scene, every single shot has multiple layers brought together in After Effects. There are many factors that cause the layers to just pile up:

- A typical scene has: a background created in Photoshop, and the 3D animation from Maya rendered with an Alpha channel. This considerably reduces the render time in Maya, in exchange for a little more time and effort in compositing.
- Some scenes have 2D elements animated within After Effects as an additional layer, like the hands clapping, the lips, and so on.
- The latter scenes also have the light beam rendered by Maya, since Mental Ray’s light fog takes way too long to render.
- To top it all, we had so many unsolved render problems with Mental Ray that we had to patch them up, by rendering parts of the character or some prop separately, and then slapping it over the bad render in After Effects! Sometimes Zaz’s eyes were separately rendered, sometimes his head and arms were rendered separate from his body and legs, and so on, resulting in a huge complex mess of partial renders put together to make the scene work!
Encore for Amanda

One by Two composer back with a gem

The bold, vibrant visuals in UP called for a music track that matched it in mood, with varying pace, quick transitions and extreme emotions. Having worked with composer Amanda Jacobs on One by Two with great success, we naturally asked her to score this work too. The earlier film is much simpler in its design and story, whereas UP is a richer, more complex work. It was a challenge even for Amanda, but she delivered.

More than delivered - she gave it her all. The music echoes the ups and downs in the film with an adept fluidity. It is dynamic, and creates a fullness using minimal instrumentation. Best of all, the music is catchy. Amanda chose the piano as the dominant instrument, its keys acting as the musical parallel of the endless array of steps Zaz climbs.

Our approach to sound effects was simple: we did not want any. We opted for organic musical sounds instead, keeping in line with the playful, iconic design of the visuals. Here, too, Amanda showed great creativity. She used an array of instruments and objects to create iconic sounds that worked great! Rhythm sticks, Maracas and Clappers became the sounds of an applauding crowd. Two quick, well-chosen piano notes made a sneeze. A can of Coke popped open became a kiss. This way, she built us a rich bank of sounds to play with.

Despite her other commitments, Amanda worked hard on the score, never compromising on the emotional quality of the music. She did it all for free and yet stayed professional, even through changes and revisions. Once more, we have a score we’re proud of.
2’s Company

When it comes to creative thinking, Suchi is now my Guru. I have learnt a great deal from her in the last three years, and I still have a lot to learn. Working with her has changed the way I approach any creative task. I have had a lot of FUN collaborating with her on all the projects we have done together so far! Her energy and sense of humor went a long way in keeping the enthusiasm going on such a long monotonous project. The faculty forewarned us that it is difficult to collaborate on a project of this size. The reason they ‘okayed’ it was the success of our previous film *One by Two*. That seemed to reassure them that we do function really well as a team. When we proposed to do a joint winter film in 2002, there was some doubt and concern amongst the faculty since this had not happened in the graduate program before. But ever since then, we have seen more and more graduate students team up on their films! And that makes us feel proud to have set a precedent of sorts.

Working with Suchi was not only more efficient and motivating, but the best part is that the work turned out great! And that was the real reward. We made two works together that are much better than what either of us could have done by ourselves. Our ideas often went hand in glove, and at times it was hard to tell where one of us stopped and the other began! At other times when we had different opinions, but that only led to a better result, and a stronger work! The mutual critique helped a lot. Suchi has a great eye for catching flaws in animation, design, modeling, pretty much everything! She is my most ruthless and outspoken critic, but she’s a fair critic. And she’s welcome to trash my work on all our future projects! I feel proud to have partnered with Suchi on these works. Here’s hoping I get many more chances to do so!
Curtains

After having screened two works at RIT, I thought I wouldn’t have any nervousness left… but by afternoon on screening day, I started to feel the butterflies. We had tried our best to beat our own previous work *One by Two*, but there was still the anxiety: Would the audience see this work the way we intended it? The response we got gave me great relief. People were laughing at the right places, they were actually enjoying it! And at the end, when the applause sign comes on the screen, they began applauding! That was a pleasant surprise – something we did not see coming. The one story point that received some critique was the sneeze. Some felt it wasn’t clear enough. We were, in fact, somewhat afraid that might happen. But on the positive side, we got many comments from students as well as teachers, and it felt good that our film evoked such a good response.
Appendix A: The Proposal
Celebrity
(Working Title)
**Story**

An ordinary person quickly achieves a hollow and undeserved fame, which then drives him to the brink of insanity.

**Synopsis**

A young ordinary man Zaz, wearing extremely simple clothes, comes across a ball on the ground. He picks it up and casually throws it. It happens to fall into a hoop. An audience consisting of many cartoony eyes appears all around him. Sounds of cheering. A staircase with a few flights appears. It consists of brightly colored planks suspended in the air. He looks around and begins to climb it. Each plank bounces a bit as he steps on it. He reaches the top landing of the staircase. A target pops up at arm’s length. He removes a dart from his pocket and pokes it in the bull’s eye. More applause. His clothes fall off to reveal a fancier costume, with a large, shiny gold medal on its lapels. Another set of stairs appears. He leaps onto the new staircase in style, and continues climbing. At the next landing are a magician’s hat and a piece of cloth. He puts the cloth in the hat and removes it with a flourish. It’s still the same cloth.

Now begins a montage showing his rapid rise:

He paints a dot on a canvas and flash bulbs go off all around him. The background comes alive with silhouettes of top hats, martini glasses, streamers, cigars and other icons of high society. He declares $2 + 2 = 4$ and degrees rain upon him. Prestigious magazine covers featuring Zaz float in the background. He plays one note on the piano and is showered with awards. He puts a light bulb in a socket and light appears. Thunderous applause.

He proudly sets foot on the top level of the immensely high staircase. He is loaded with awards, garlands, lipstick marks and other signs of material success and popularity. There is a bright spotlight shining straight down. He pompously steps into the pool of light and raises his hands to acknowledge the crowd below. The crowd gives out an awe-stricken gasp. After enjoying all the attention, he becomes tired. He takes a bow and begins to back up to exit the “stage”. As he slowly walks backwards the light follows him in accordance with a proper stage exit. Suddenly he reaches the rear edge of the stage and almost falls over but regains his balance just in time. He hears Gasps from behind him. He turns around and sees a million eyes staring at him. Confused he hastens to another edge of the stage, only to see more eyes. The light follows him. Scared, he rushes to the front of the stage. On reaching there he sees the staircase below
him disappear. More eyes. Frantic, he starts running around the stage but there is no escape. The spotlight is dogging his movements.

Zaz withdraws to the center of the stage petrified. He looks around nervously and the constant gaze of the eyes makes him uneasy. He looks up and gestures to turn off the light, but it only gets brighter and begins to blind him. He sneakily steps out of the pool of light and breathes a sigh of relief. But in an instant the light moves on him. He leaps away from the light. It moves on him again. He freaks out and begins to run around the stage. The light chases him. He collapses to the floor exhausted and clutches his head. He looks weary. His face has aged tenfold. He sobs, hits the ground with his fists, laughs hysterically, and then cries again. Crushed, he crawls slowly to the edge of the stage (The light slowly follows him). He peers over the edge. The eyes disappear and the crowd sounds fade. He is all alone in the spotlight. Slowly he stands up, takes a deep breath and DIVES off the edge into the darkness. The crowd APPLAUDS.
Approach

The film will be made in 3D using Maya. The characters will be 3-dimensional but with a scratchy crayon look on the surface. The environment will be simple yet dynamic and the overall color scheme will be bright.

The music will be composed to fit the theme and will also provide the sound effects.

Image showing the crowd and the staircase
Champagne Celebration!

Illustration in the News Paper
Martini Celebrations!

Smoking Illustration

Flash Bulb
Appendix B: A Life in Pictures