



Studio in a Box: Low Budget Filmmaking in Maya

Kenny Roy – Arconyx Animation Studios

VI5251

With nearly everything you need to make an animated film, Maya Entertainment Creation Suite software enables animators and directors to do some real guerrilla filmmaking. This class will walk you through some of the techniques we are employing to bring the feature film *Dog Eat Dog* to life on a budget of less than \$1 million. From timesaving rigging techniques to at-your-desk facial motion capture, we are bringing our entire bag of tricks to bear in our quest to release quality animation on a grassroots budget.

Learning Objectives

By the end of this class, you will:

- Learn how to plan your film production properly
- Learn how to use timesaving techniques in character creation
- Learn how to employ efficient animation practices
- Discover some of the most valuable plug-ins and tools to bolster the Maya software toolset

About the Speaker

Kenny Roy started in the animation industry in 1997 as a dustbuster on a children's animated feature film. Since then he has gone on to animate some of the most memorable characters on screen, from Scooby Doo to King Kong. In 2007 he founded Arconyx Animation Studios in Los Angeles, California, where he directs projects ranging from TV commercials to short films to visual effects. An animation teacher for almost 8 years, Kenny is also a well-published author in animation and he is a world-traveling lecturer. He runs an animation-training portal through www.kennyroy.com, and he lives in Los Angeles with his wife and 2 sons.

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About “Dog Eat Dog”

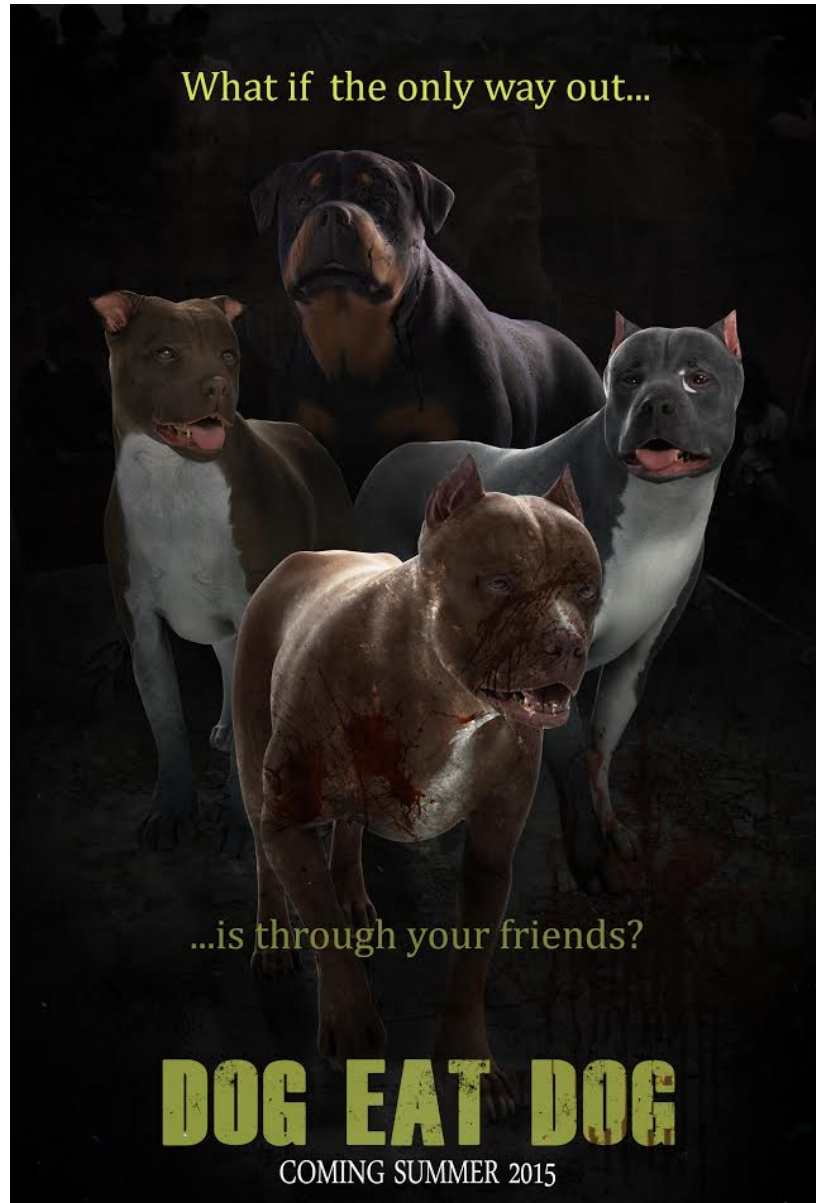


Figure 1: "Dog Eat Dog" - Our low budget animated film.

James Young Entertainment Presents “Dog Eat Dog” – an animated film about a dog surviving a life of fighting, escaping, only to be forced to return to rescue the ones he loves. Our film has a sub \$1M budget, and is being produced on an entirely new pipeline developed at Arconyx Animation Studios in Los Angeles, CA. The film releases July 2015.

Planning the Production

Planning is the foundation of success. In low-budget filmmaking, planning primarily entails identifying the high cost areas of your script and trying to turn them into high value moments of your production.

What does “high value” mean? Value is defined as elements that give a perceived quality to your audience at little cost. High value elements are those that add the most perceived visual quality at the lowest expense.

There are many well-known high cost (therefore low value) elements in filmmaking. Some examples are crowd scenes, epic landscapes, simulations like destruction, etc. Avoiding these elements is essential to staying on budget, but it doesn’t mean sacrificing story points.

Value Curve

The value curve is the amount of value you are getting for your effort (time+budget). As your ambitions to be cutting edge rise, your value rises until you are taking advantage of all of the software, hardware, and workflow methods that are avant-garde; simply put, there is a “sweet spot” of value that the perceived quality and the tools that are being developed currently both peak. However, as the need to surpass expectation continues to rise, the value falls sharply. No gains can be made in value past a certain level of sophistication.

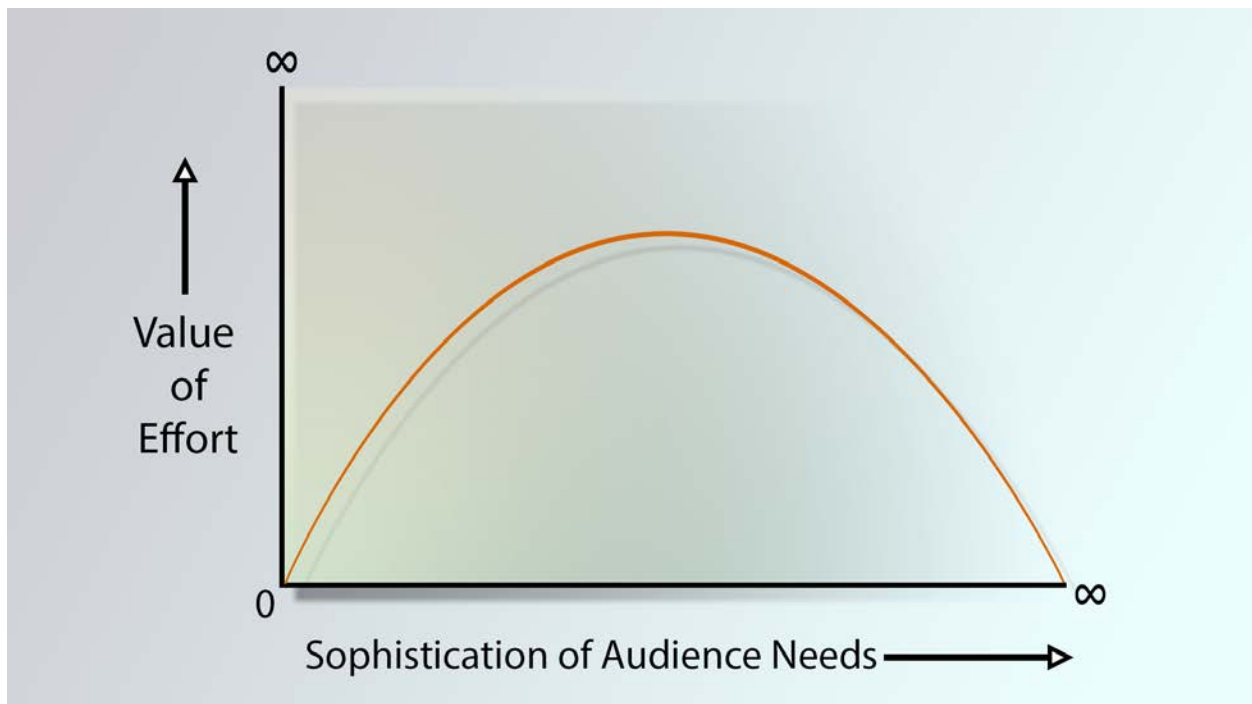


Figure 2: At a certain point, you are throwing money at the problem, where only marginal gains can be made.

Perceived Quality vs. Value

As you are making further decisions as to the production in terms of where you want to spend your money, think about the real perceived quality of certain aspects of your film when weighed against the value of putting them in. Some things, like epic 3D landscapes, are a very low value item but please audiences greatly. Other things, like inexpensive designs, are very high value from a time/effort perspective, but do not improve your film from a perceived quality standpoint at all.

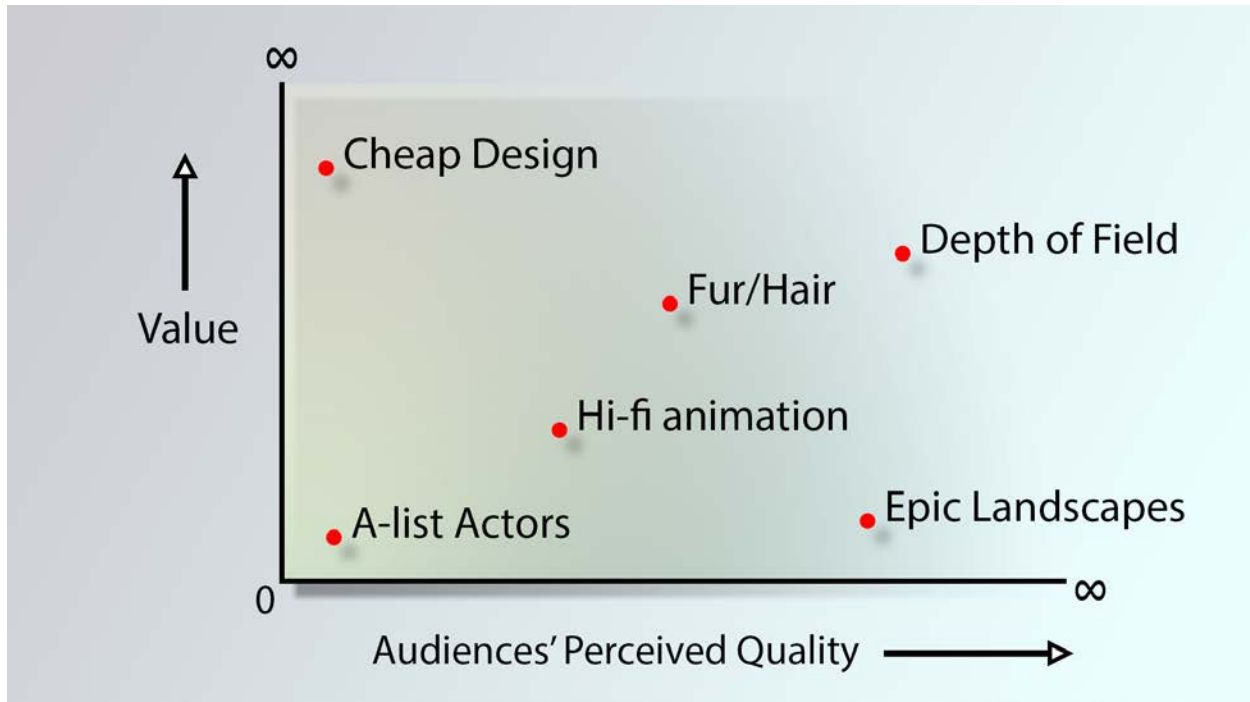


Figure 3: Try to stick to the top right area of this chart, where value and audience perception are both high.

Old Pipeline vs. New Pipelines

Once you have determined the script elements that are going to be adjusted to give the highest value and the highest perceived quality payoff, you have to design a pipeline that makes sense to achieve these results.

We determined on “Dog Eat Dog” that a good amount of the elements we wanted were achievable with a novel arrangement of tools ranging from mocap software to GPU rendering. It is at this point we realized that we had committed to an entirely new workflow as well.

Old Workflows

Do not be tempted to repeat what you know. There is little innovation left in old workflows. For instance, the common wisdom of rendering your shots in multiple passes per character, multiple layers per scene, and then only finalizing the look in compositing works well for high end VFX and big budget movies. With low-budget filmmaking, you must learn how to get nearly exactly

what you want out of Maya. Design workflows to empower you to make finalizing decisions based on what you see in front of you.

New Workflow

In low-budget 3D animation, we need to get as close as possible to “what you see is what you get”. In this way, animation is actually moving closer to live-action filmmaking. We have to create our sets, characters and their performances, lighting, staging, and effects to be “in-camera”.

In this decision, we are committing to our final “look” being whatever the current software and hardware can give us at a value that makes sense.

The hope is that by committing to the “in camera” look, we can partner with Maya tool developers and make strides to improve value and quality.

Rather than try to force old workflows to be low-budget, we need to take a low-budget workflow and try to push quality.

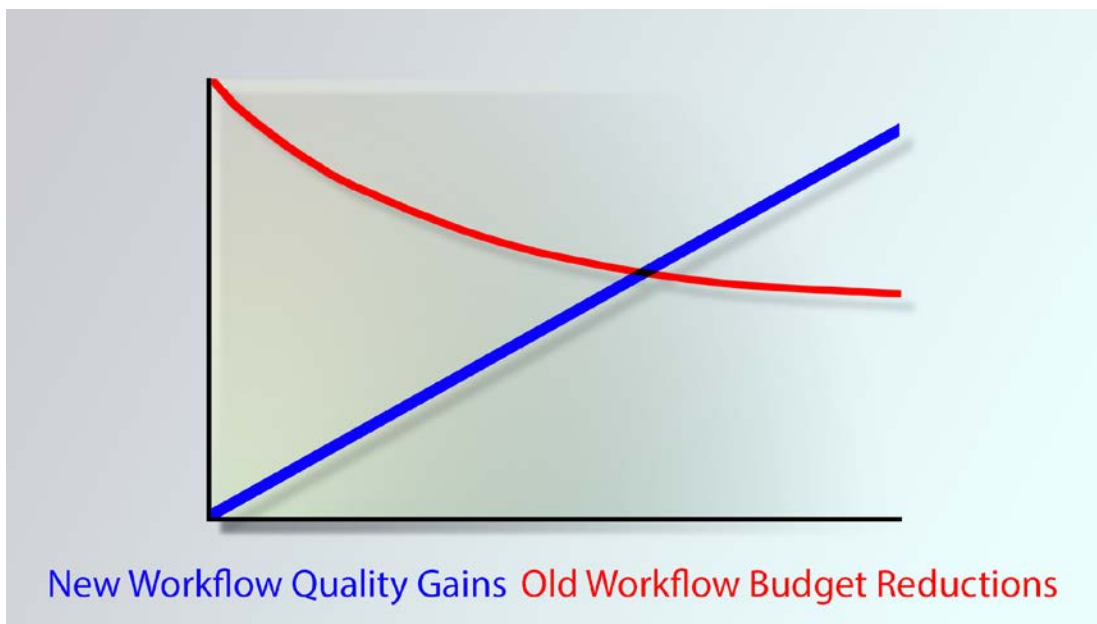


Figure 4: Better to put effort into improving quality in a new workflow than to fight budget constraints with an old one.

Maximizing your Story

Story purists will assert that no sacrifices should ever be made in the name of story.

At Arconyx, we’d rather be making movies for under \$1M than be NOT making \$90M movies with untouched stories.

To maximize your story, make adjustments that fit the highest value/perceived quality. For instance, in our film, we decided to never show any faces of the humans early on. This perhaps bars us from some powerful performance choices, but makes sense from a value perspective. Another example is we made the main characters all the same species of dog: Pit Bull. Even though Pits are the most common fighting dog, it also allowed us to reuse models and UVs – crucial for maximizing our budget.

Readjusting Expectation

Audiences are clamoring for content faster than we can make it, but there needs to be an adjustment of expectation before low-budget CG filmmaking is truly acceptable. If all we strive for is “Pixar Quality” and fall short, then audiences will not respond to our films. If we use brilliant techniques to deliver compelling stories on low budgets, we can make a niche for low-budget CG film.

“Blink”

One of our mottos is to “Never look at a constraint as a negative, but as an opportunity to innovate”. In the Doctor Who episode “Blink”, widely accepted as one of the best episodes of the entire series, this motto rings true. The writer was given extreme budget constraints and could not include the normal expensive “monster of the week” in this episode as there was no money to do so. Ingeniously, the writer created a terrifying monster out of an extremely cheap object to produce: a statue. (If you haven’t seen the episode it is highly recommended).

The constraints on the production ended up spurring the best episode of the series.

Identifying High Cost Areas

Take into consideration what are the highest cost areas that cannot be adjusted for value. These are Asset Creation, Animation, and Rendering.

Asset Creation

We rely heavily on two practices to handle the very large number of assets on a feature film, and still make a <\$1M budget work: purchasing assets online, and creating absolutely everything in a modular way so it can be re-used.

Purchasing

For our environments, Turbosquid.com carries thousands of textured models that populate our scenes very nicely. Telling a story in city and industrial environments is essential to staying on budget. (If we had chosen to set the film on an alien planet, there would be little we could purchase).

Even pricey assets (we found high quality dog models to be in the hundreds of dollars) are worth every penny. Just calculate how long it will take an artist to create the asset, and if it is less to purchase (nearly always) then don’t hesitate.

Reusing Assets

Every single asset we downloaded or created has been configured to be totally reusable. All of the hero dogs are the exact same model, with some modifications sculpted in Mudbox, and retextured to give them a unique look. Further differentiation is possible with the use of displacement maps. All hero dogs share UVs, making transferring data between characters straightforward and easy. Data like skin weight maps, input mesh attract on nCloth, or hair and fur attributes is time-consuming to create uniquely for each character.

Animation

The most time-consuming part of any animated film is keyframing. Hand-crafted performances are costly, and may never have a place in low-budget CG films.

Naturally the first choice to replace hand-keyed animation is motion capture. On a film about dogs, it's hard to get much of the performance from mocap. We are using motion capture on all of the humans though. This saves a huge amount of work.

The next cost reduction method for animating is to create all of your animation in layers. If you have plenty of cycles that are broken up into layers (legs, torso, arms and legs, neck and head), then you can mix and match the movement within Maya to create unique movement. Even with only a few different animations for only a few layers, you can have dozens and dozens of permutations to choose from. And especially with characters that are quadrupedal, having a great base walk cycle (reusable between all rigs) is a must-have.

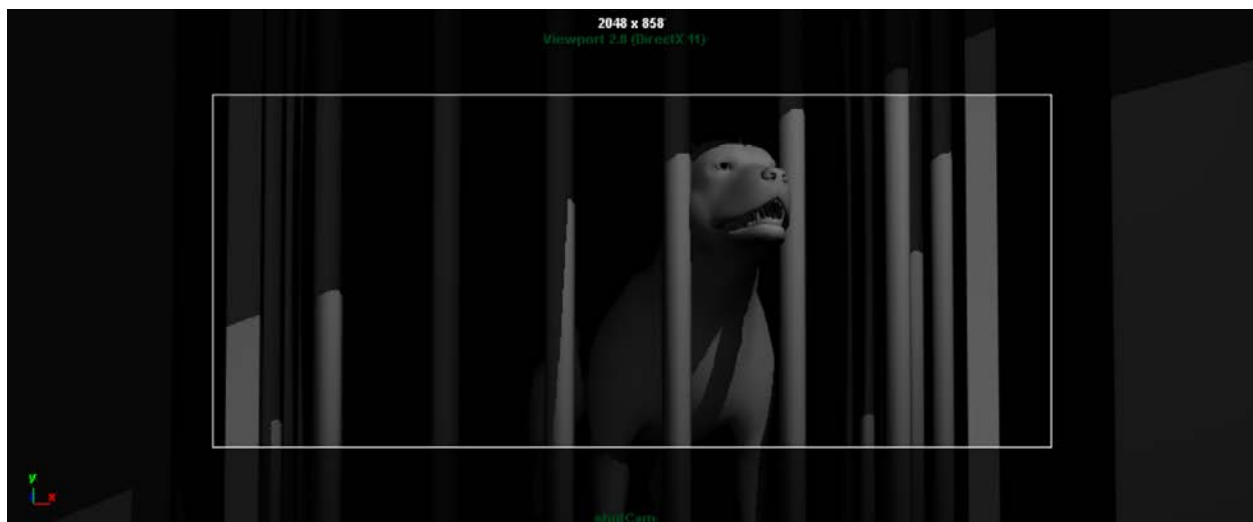


Figure 5: The animation is going to go smoothly with all of the reusing we can do.

Speaking of reusing animation, even with a layered approach, and with only a little bit of the motion being able to be created through motion capture, there are going to be plenty of shots that need hand-keyed, custom animation. In “Dog Eat Dog” we first identified which shots required custom, one-off animation, and color-coded them when creating the animatic. When

creating said animation, we gave each motion some consideration to figure out if it was similar enough to another movement that we could reuse it later. For instance, the puppies playing in the beginning of the film is the same animation as some of the older dogs fighting later in the film. Contextual tricks like use of foreground and background obscure our use of the same animation multiple times in the film.

Rendering

On any film, rendering will take a huge toll on the production. There is always going to be some difference between preview quality and final quality CG, the trick of low budget filmmaking is to try to reduce that gap as much as possible. We know we have to get as close to getting our entire render in one pass as possible.



Figure 6: This render takes only 11 seconds per frame, and holds up visually to the standards we set.

Efficient Character Creation

In low-budget filmmaking, the first place that can really break the bank and the calendar is character creation. If your passion is to make animated films, then to do so on a shoe string budget means being able to create stories with certain constraints. The name of the game is re-using work!

Designing Efficient Characters

At the design stage, common design elements can mean a lot of time saved. In a recent short film I created, re-use of the French “Fleur du Lis” in the designs meant that I was sure there would be an easy-to-reuse element that would save time later in modeling.

Modeling With Efficiency in Mind

We started with a base Pit Bull model that would be easy to uprez and sculpt into our main hero characters. Keeping the geometry loose enough in the beginning mean that we could actually use the same model for a Rottweiler and a mutt as well. (Our Mastiff was custom, but started from a downloaded model).

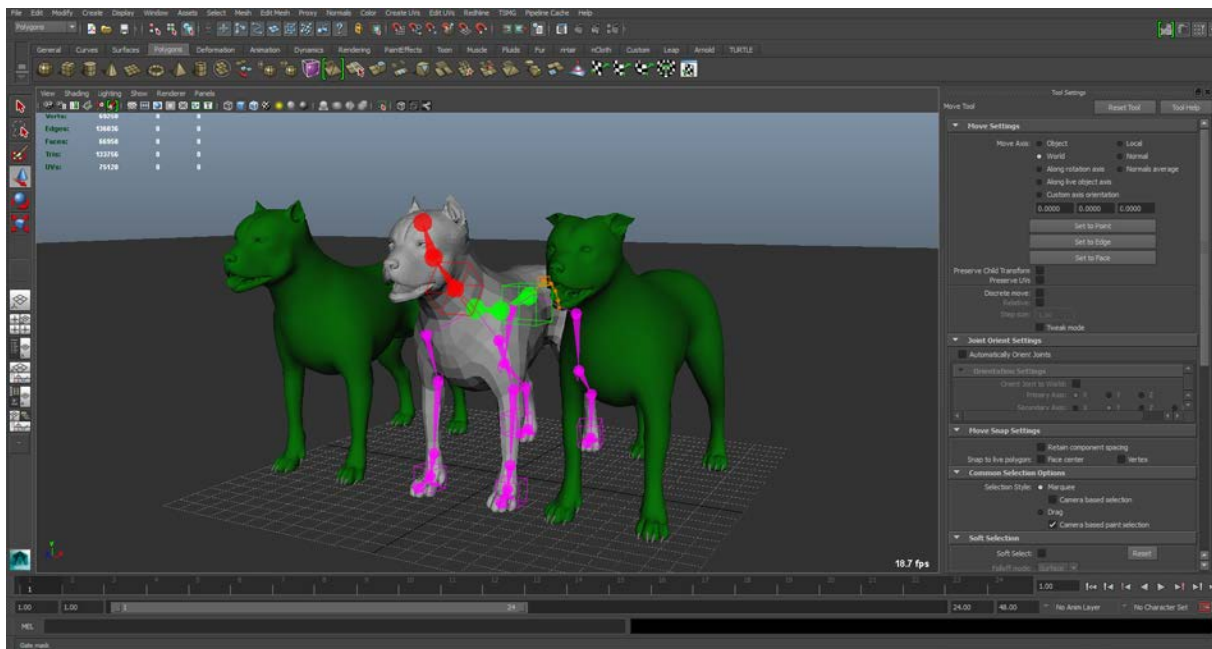


Figure 7: Our three hero characters start from the same model.

Texturing Efficiently

A standardized model helps with moving onto reusable textures. Common UV's will mean that you have a strong starting point to work from after transferring base textures. All of the dogs started with a black and white fur map that was colored in layers in Mudbox. We went from zero to three dogs' color maps in no more than a few days.

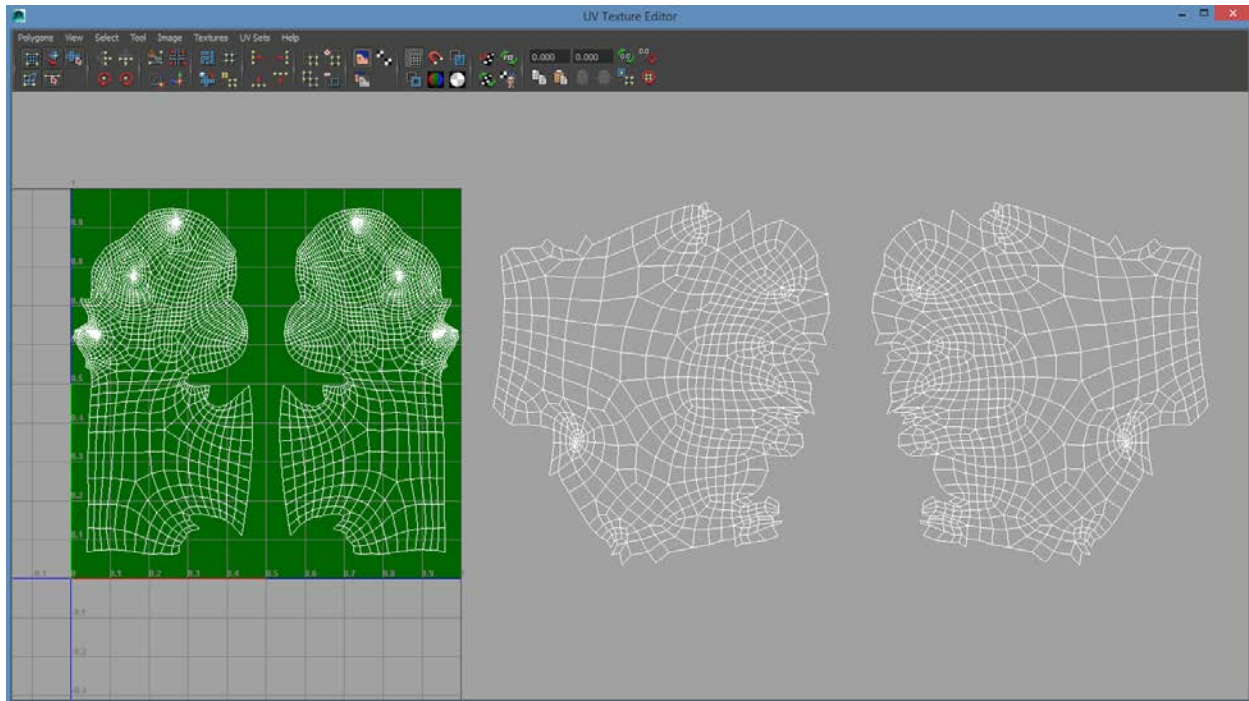


Figure 8: The dogs all share UV layouts as well.

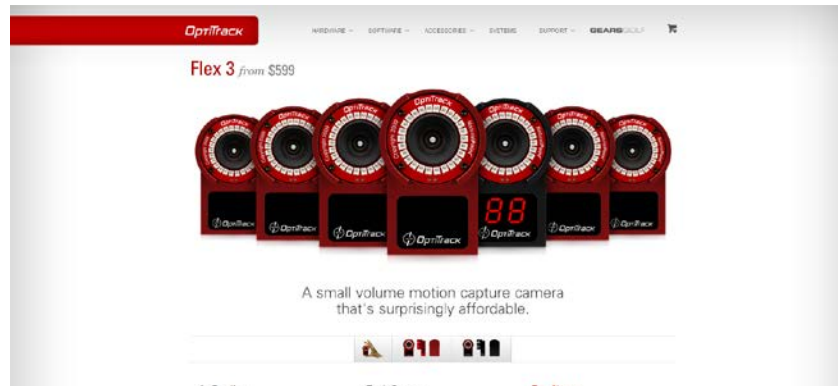
Rigging Quickly

Common rigs are essential to the low-budget process. We started all of the dogs with The Setup Machine Game, and made some modifications to the legs, shoulders, and neck before establishing our standardized “base rig”. From this base, all of the dogs’ rigs will be created. All movements will be able to be transferred between dogs and between shots with only minimal adjustments to the characters’ animation on a per shot basis. And, since we used common UV’s, transferring skin weight maps is also a one-button solution to skinning and weighting the dogs as well.

Animating Movement in Low-Budget Films

Creating the performances in your film is going to be the single most costly, time-consuming tasks, regardless of the method you use.

Motion Capture



The most well-known method to create performance automatically is motion-capture. However, with a film that doesn't star humans, our film is not a good candidate for this method. We do use an older Optitrack system to capture the movement of the human characters in the film, but since we've chosen to not feature the human faces, the motion capture is merely for the torso and legs.

Our film would be even lower budget if it had been a human story, but even as guerilla filmmakers we are not going to restrict ourselves to only making movies with humanoids characters.

Cycles and Animation Clips

By far the most efficient way to generate movement and life on screen is to create, save, and reuse animation cycles and clips. In our film, there are many dogfights, most of which are made up of reusing sections of a master dogfight animation we created for this purpose. When the dogs are not fighting, they may be walking, running, or sitting. For these moments, we created a library of movements that we were then able to reuse as we saw fit. In this way, we were then able to "populate" our scenes with movement and make everything seem like it was alive. Audiences are not as sensitive to cycles and repeated animation as one might think going into an animated film. Perhaps especially in the case of animal movement, you can get away with reusing a lot.

Facial Mocap

Knowing that we had emotive, performing dogs meant that we were always going to have to create some facial animation in some way. Traditional blendshapes with hand-keyed animation or even deformer based controls just do not measure up on a value scale to the kind of timeframes and budgets we have. Sure, it would be nice to have the time and money to keyframe the facial performances, but this stage is an easy trap to fall into.

We decided to use a markerless facial motion capture system called FaceShift to achieve the facial performance. This method captures surprisingly high fidelity facial animation. Now that

we've "seen the light", we're never going back. That is, this method is such an amazing time-saver that even on projects that we have the resources to keyframe the face, we will be creating the base layer of facial animation with Faceshift from now on.

Another advantage of using facial motion capture is the aspect of consistency; the blendshapes in Maya will activate in a similar fashion across all shots. This is ideal for facial animation because as the film progresses, we would not want different animator's styles to create an inconsistent performance in the characters' faces. Even pose libraries do not account for personal taste, and as such the facial motion capture method provides some very nice side effects on top of the time and budget savings.

Animation Layers and Mixing Movement

With libraries of movements stored, we then mix and match movements to generate thousands of permutations of life-like action. With three walk cycles, three different body variations and three different head variations we have almost 30 permutations that we can generate in a shot to bring variety to the scene. This is without even adding the facial performance and dialogue which further push the novelty of the movement for the audience (even the exact same animation will have a different effect on the audience with two different pieces of dialogue spoken). Add a third layer of some final tweaking and emphasis on top of the facial performance and dialogue, and in a very short time you've created a shot out of modular animation elements.

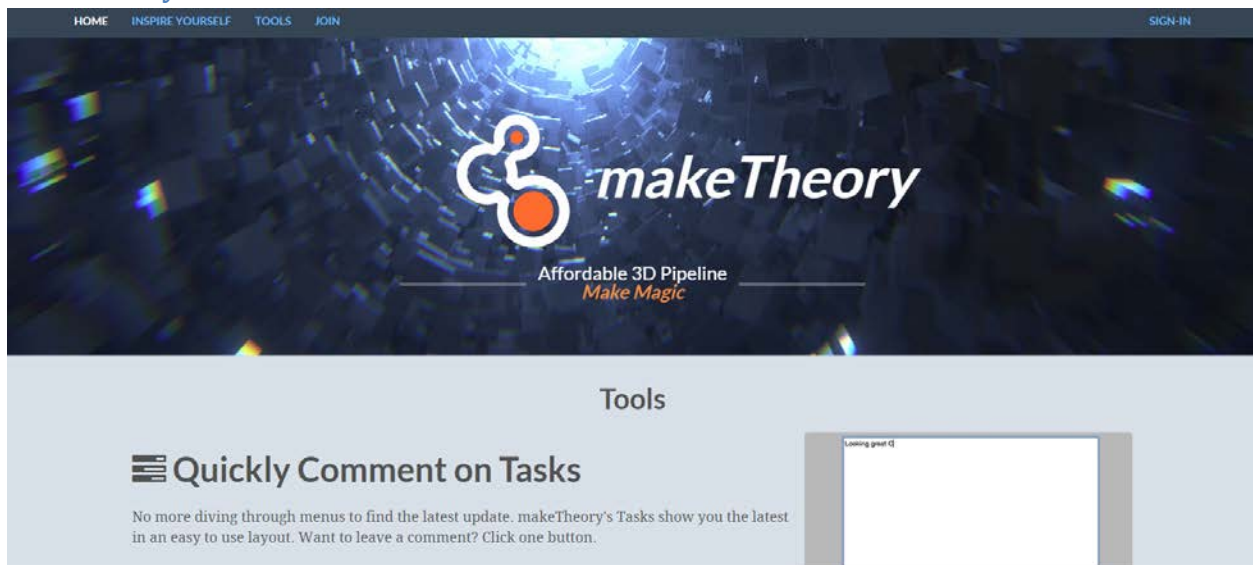
Dynamic Elements

The final touch to creating high fidelity motion is to add dynamic elements to the shot that will "animate themselves". For instance in our film, dog collars, chains, ears, jowls, bellies, and anything that has any secondary motion gives the illusion of higher fidelity motion than we are able to create by hand. Even a simple shot that contains two keyframes of a dog turning its head will be made to feel robust and full of movement when you add the ears flapping and the collar jiggling, all at 24 frames per second. We thankfully can rely on Maya to generate these effects for us.

For the dog skin sliding, jiggling, ears, and the like, Maya's nDynamics came really in handy. It's easy to set up, gives the user a lot of control, and caches easily to make sure there is no scene overhead past the moment when you've approved the dynamics in a shot

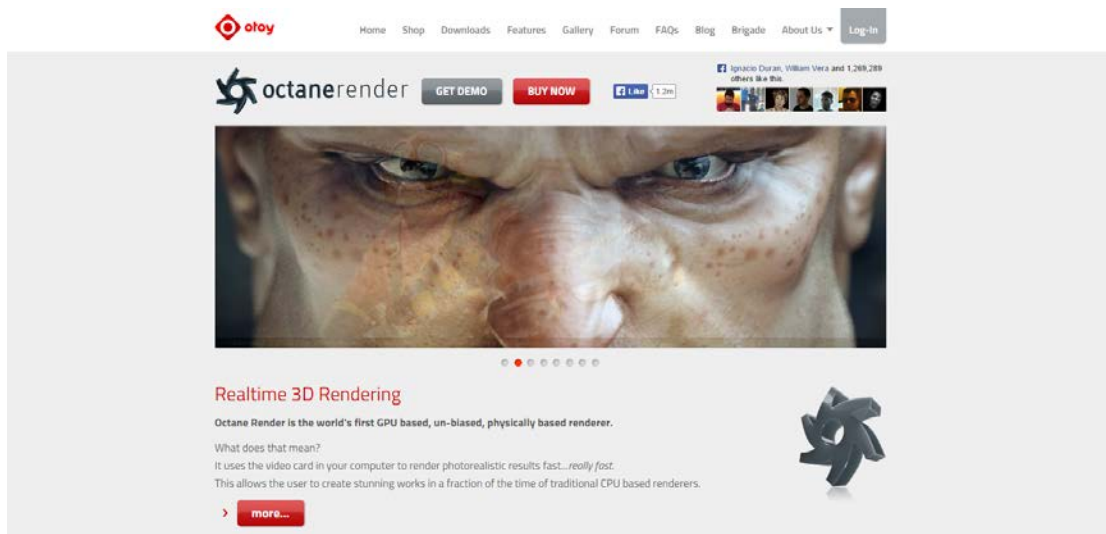
Tools for Cost-Effective Production

MakeTheory.com



This small company produces an easy-to-use online task tracker. Similar to Shotgun or any other Project Management software built for animation and Visual Effects, it sorts scenes and shots intuitively for easy organization of tasks. Regardless of your budget, the amount of money you save by staying organized is well worth the cost of a membership to a website like MakeTheory.

Octane Render



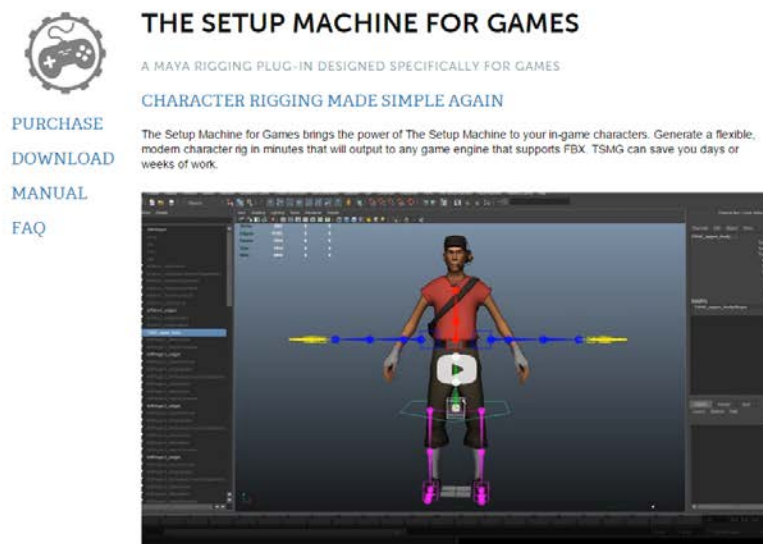
What Octane Render allows Maya users to do is revolutionary; near-real-time photo-real renders within Maya, at a speed/price point that makes sense for even the strictest budgets.

Imagine iterating hundreds of times in minutes, going through days if not weeks of look development in the span of an afternoon.

While Viewport 2.0 brings us closer to being able to use our panels to preview parts of our scene, it is not a true render preview. And though Maya's IPR does offer functionality similar to a real-time render solution, there are still aspects of an IPR render that cannot be included in real-time.

The one drawback of Octane's integration into Maya is the lack of support of Maya's default materials and nodes. We created a MEL script that given a model and a directory of correctly named textures, creates the Octane materials and applies the texture to the models within a Maya scene. Even with dozens of texture maps per object generated out of a program like Mudbox, this script saves us hugely on setup time and translation time from Maya to Octane-compatible scenes.

The Setup Machine For Games



THE SETUP MACHINE FOR GAMES
A MAYA RIGGING PLUG-IN DESIGNED SPECIFICALLY FOR GAMES

CHARACTER RIGGING MADE SIMPLE AGAIN

The Setup Machine for Games brings the power of The Setup Machine to your in-game characters. Generate a flexible, modern character rig in minutes that will output to any game engine that supports FBX. TSMG can save you days or weeks of work.

[PURCHASE](#)
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Using an automatic rigging tool for your characters saves you time in more ways than one. The most obvious savings is the actual rigging creation time; a decent rig that is tested and trouble-free can take days or weeks. With an automatic tool, within minutes you can be working with an articulated character. The second biggest benefit is definitely the ability to copy animation across rigs. Being all generated from the same base rig means your character's controls will behave nicely as you reuse animation from scene to scene. As we discussed earlier, reusing animation is a mainstay of low budget CG filmmaking.

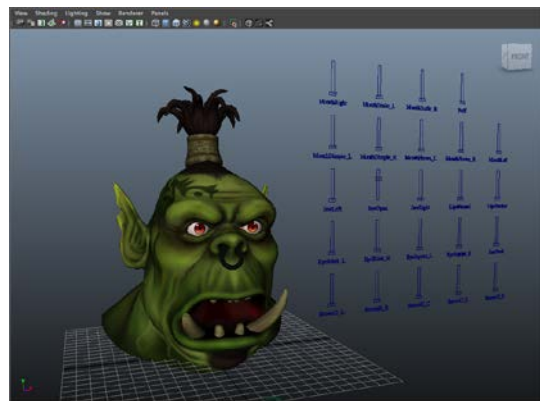
We chose the "Games" version because of the speed of the rig interaction, the simplicity of the rigs (for later customization), and the ease with which we could reverse engineer the rigs if need

be. Other rigging tools we use in this film include Rapid Rig and our own simply bendy spline rig tool developed during years of commercial work.

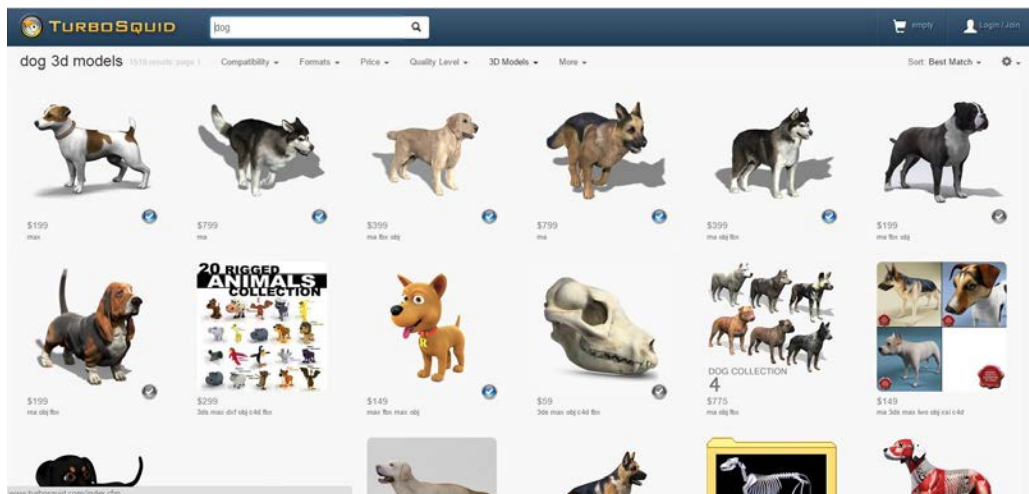
FaceShift



Even with motion capture creating the majority of your performances, or libraries of pre-animated movements at your disposal, there are very few cost-effective solutions for getting your facial performance. Automatic systems that attempt to approximate facial animation based on phonemes and sound file analysis do not have the fidelity audiences expect. And while they are plentiful, marker-based facial capture systems are extremely costly and do not fit nicely into an agile, guerilla pipeline. Enter FaceShift. With its markerless motion capture, and four-figure price tag (with high precision sensor included), it is simply the best solution for creating your characters' facial performances on the market. With direct Maya integration, you can tweak and perfect the data you are getting out of the program. Just as impressive is the intuitiveness that the connections are created between FaceShift and your Maya nodes; meaning, any Maya node can be connected to a FaceShift channel, meaning if you wish, you can use FaceShift data to drive other elements in your scene (like a driven key to make a hat move out of the way when the character's brows raise for example).



TurboSquid



By far the most valuable resource for independent CG filmmakers is www.TurboSquid.com

This site is a marketplace for assets for all stages of CG creation, models, rigs, textures, and more. The value of a repository of hundreds of thousands of assets cannot be understated. From the company's own website "Our customers tell us they save 27 hours per model purchased". Extrapolating the amount of time and money that could be saved on a feature film with thousands of assets, it is clear that (at least for the time being) purchasing the majority of your models is a requirement. Perhaps when 3D scanning solutions become more mainstream or a brand new modeling paradigm decimates the creation process, creating a low budget animation will include creating much of your 3D assets. For now, we have to rely on this massive marketplace to achieve results on small budgets and tight schedules.