



**A report on the development of  
the animated short  
The King of Wayside**

by  
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Project submitted as part of the  
requirements for the award of  
BA (Hons) Computer Animation  
Independent Project ACCA6020

[Body text 4316 words]

May 2021

## DECLARATION

I, Gareth James Lewis declare that I am the sole author of this Project; that all references cited have been consulted; that I have conducted all work of which this is a record, and that the finished work lies within the prescribed word limits.

This work has not previously been accepted as part of any other degree submission.

Signed: 

Date: 4<sup>th</sup> May 2021

## FORM OF CONSENT

I, Gareth James Lewis hereby consent that my Project, submitted in candidature for the BA (Hons) Computer Animation degree, if successful, may be made available for inter-library loan or photocopying (subject to the law of copyright), and that the title and abstract may be made available to outside organisations.

Signed: 

Date: 4<sup>th</sup> May 2021

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## Introduction



Jet – Development renders

The King of Wayside is a short, animated film produced in response to the Major Project and Independent Project modules' requirements. In conjunction with this report, it represents the culmination of submissions for BA 3D Computer Animation (3DCA) at University of Wales Trinity Saint David.

This document describes and discusses the processes involved in the later phases of production. Problems and challenges are presented with solutions considered, their effectiveness in application and future development opportunities.

In summarising and formalising a record of the technical and creative processes, for purposes of clarity, the phases of production appear thematically rather than in strict, chronological workflow order.

## Methodology

The film's development had been initiated under Major Project Stage 1 (M6X01898) with the expectation that this would lead to a second stage. Due to organisational restructuring, 3DCA became aligned with the School of Applied Computing in the 2020/21 academic year along with module requirements. Major Project Stage 2 was replaced by Independent Project (ACCA6020)

Following a part-time study schedule, the combined project began in the autumn of 2019, running until the delivery date of 4<sup>th</sup> May 2021.

Excepting musical accompaniment (provided by UWTSD BA Music Technology student, Adam Edmunds), and sourced effects, all work presented is the individual creation of the author. Due to the arrangements necessary for part-time scheduling, there was no practical means of forming a production team over the term of the project.

The “process” of creating this film may be described as a “workflow”. More accurately, it is a reiterative activity, a constant loop of development, review, and response. This approach may be applied project-wide, at the macro level, and also to the micro, the smallest detail of texture or character movement.



King of Wayside – Concept render



King of Wayside – Concept render

## Process



Jet – Early production render

The process is presented in a logical progression. Appreciation must be given to flexibility and adaptation of workflow throughout both development and production.

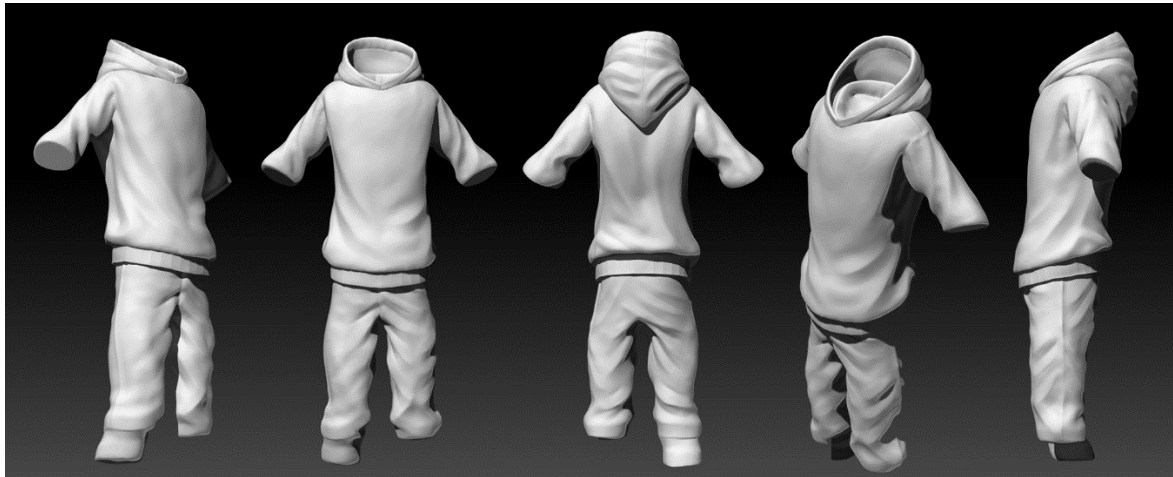
Narrative had informed storyboard and Leica reel work in the Major Project phase, but these remained fluid until late in production. As a principle, it had been recognised that character and environment would support and reflect each other and it was accepted that, as production progressed, the characters would grow in their roles, live in their environment and inform further work.

While this cyclical process, the recycling of information through, and interaction of production elements, may have been expected, it became a necessity as weaknesses had been identified in storytelling.

Despite these problems, it was felt that there was enough depth garnered from the research and design phases, strengths in the growing story-world, to support narrative development.

This would lead, not to a direct workflow that may be apparent here, but to a push-and-pull. There would be a reciprocating relationship whereby environment and incident informed character (Besant and James, 1885, p.69), character informed characterisation (McKee, 2014, p.100-101) and these returned to shape environment and cinematic choices.

Following contributions to Major Project, notes on Independent Project have been posted to various channels via the Discord web and desktop applications (discord.com). These represent the personal work of the author as a record of progress and may be contained within the following text (as precis or full text) without direct quotation. Any responses garnered from individual users will credit the contribution by full name (where known) or username, channel tag and date.

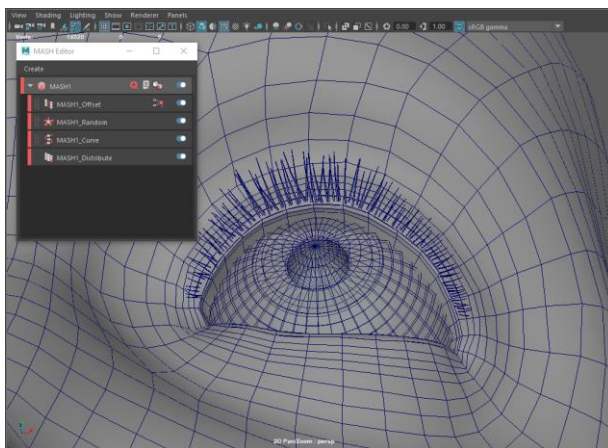


Jet's clothing – Zbrush sculpt

Sculpting had been largely completed during Major Project. The process had lent itself to the creation of organic forms in character modelling. Clothing was based on the simplified retopology of those character sculpts but had lacked the required detail. In these specific circumstances, clothing geometry was taken back to Zbrush in order to add the sags and folds that provide the impression of stiffness and weight in clothing.

## Modelling, Hair and Particle Systems

Alongside the sculpting process, many modelling tasks had been completed prior to the Independent Project module. This section discusses additional content, particle systems and geometry instancing.



Flot's lashes – MASH network in Maya

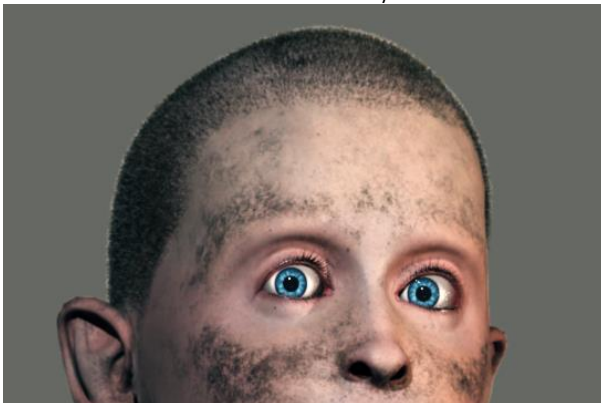
### MASH Lashes

Options considered for eyelashes included hand-placed geometry, hair cards (with alpha maps), xGen hair and, as applied, a simple MASH network.

Supporting geometry was applied as a base for a single lash as instanced geometry. MASH nodes were added to scatter, scale and add controlled random transforms. The lashes also thinned at the inner and outer extremes of the eyelids.



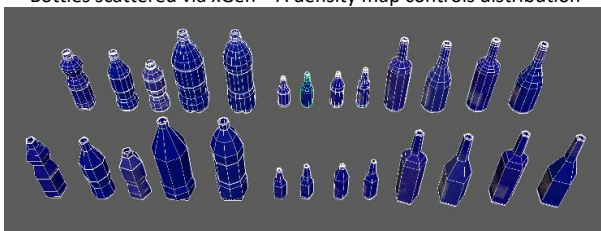
Flot's hair – xGen hair system



Jet's hair – xGen hair system



Bottles scattered via xGen – A density map controls distribution



Bottles at two levels of detail – indexed for xGen

While a very small detail, the lashes have an eyeliner effect, framing the eyes and providing a subtle reflection and shadow on the eyeball itself.

### xGen Hair

All characters (including Bear) have hair systems applied. Initially, these were based on xGen systems. This method would have required the creation of an alembic cache to track the movement of the character rigs for animations in each shot.

Converting to the Interactive Groom toolset promised to negate this with deformation accurately reflected although this would not prove to be the case.

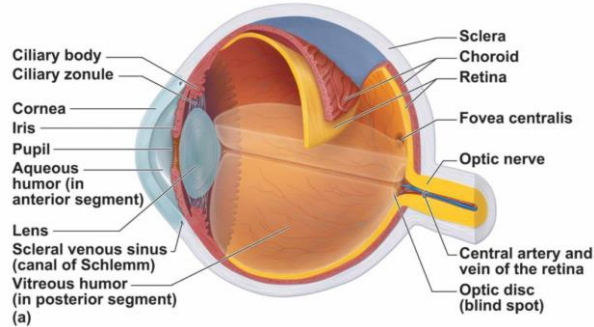
### xGen and MASH Trash

Requiring large amounts of strewn debris, the landscape of Wayside received a scattering of instanced geometry via the xGen and MASH systems. Where MASH provided a simpler, random scattering, xGen could be controlled via density maps giving some consideration to the lie of the debris and interaction with the ground plane, weather, and placement.

Neither method produced ideal results, having some undesirable placement and rotations, but instanced geometry was far lighter on system resources and procedural placement was efficient in time and overall effect.

Shots could be selected to avoid problems and dressing applied to cover up unavoidable areas.

## Anatomy of the Eye



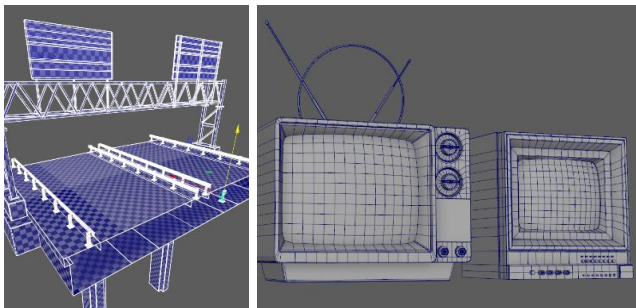
(Nurseslabs, 2021)

### Two-Part Eyeballs

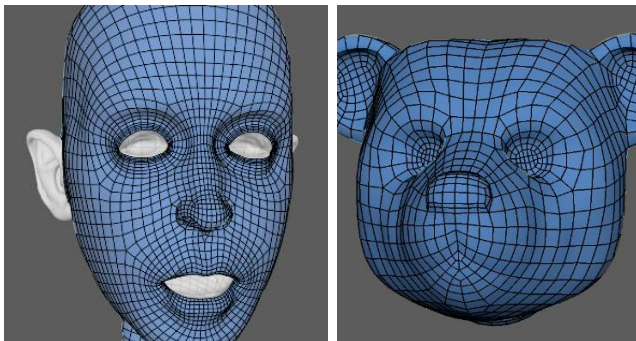
Where simple sphere primitives could have provided an effective representation of the human eye, these would have lacked any of the complexities of light interaction that lend interest.

The characters' eyeballs were modelled to include the outer sclera (with corneal bulge) and an inner vitreous humor with concave iris and pupil. These features would add interest in reflected light, giving more life to the characters' eyes.

## Topology



Hard surface – Box modelling environment and props



Jet and Bear – Manual retopology over sculpt



Large scale geometry – Low poly density

Approaches to topology could be broadly split into three applications.

### Hard Surface

Representative of manufactured or engineered objects and the built environment, these objects could be box modelled and extruded from curves, edges, or modified planes.

### Organic Forms

Retopologised over high poly, sculpted base geometry. For deformable features, this required specific placement of edge loops.

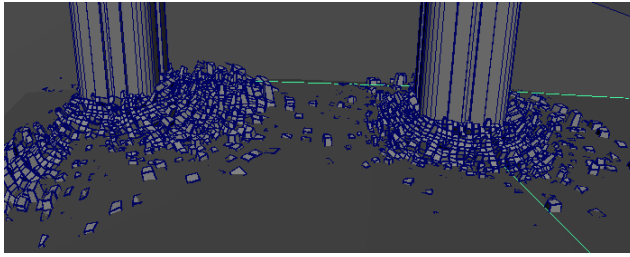
### Natural Environment

Based on modified planes, the subtle use of random transforms provided a base for tiled textures while minimising the appearance of repetition.

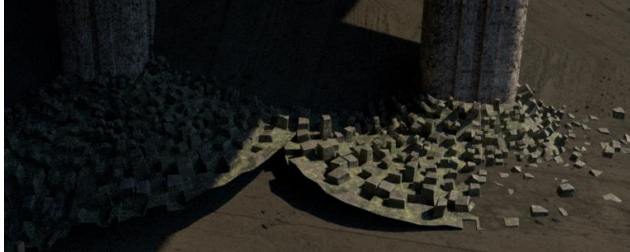
### False Economy

Based on broad forms, the landscape of Wayside was developed with a very low poly density. While this was an economical approach, the sparse geometry led to problems in accurately representing those forms.

Triangulation at render time could cause shifts in surface geometry and problems in the relative placement of large-scale environmental assets, set decoration and animated characters.



Maya viewport – Debris protrudes through ground plane



Test render – Debris sits above ground plane

Initially thought to be an error in the implementation of displacement mapping, experimentation in displacement values appeared to have no effect. It was soon apparent that the renderer was applying an alternative triangulation method to Maya's viewport.

Once identified, the problem was easily resolved by modifying and/or creating denser meshes where relative placement was deemed important. (e.g. in character interaction).

## UV Layout

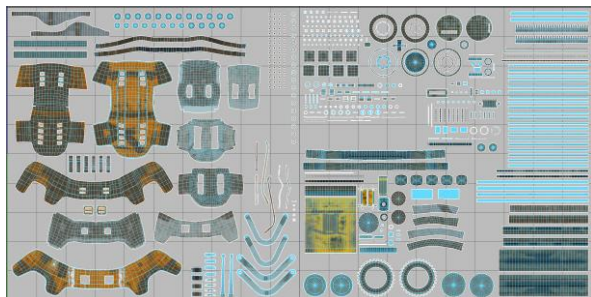


Flot- UV layout in Substance Painter and model (inlay)

UV maps were created in Maya. The layout process aimed to provide an efficient, recognisable base while minimising distortion and disguising UV island borders.

Maya's UV toolset includes helpful features to achieve consistent UVs. Texel density may be sampled from selected islands and applied to all while heat maps, shading and the checkerboard reveal distortion and poor orientation. Where areas of distortion could not be resolved with UV transforms, relief cuts and/or creation of new islands became necessary.

For use in Substance Painter, it was desirable, to orient islands correctly as this would avoid potential problems with smart masking tools and simplify painting where direct application to the UV layout was necessary.



Jet's headgear – UV layout comprising two UV tiles in a UDIM array

### The U-Dimension

For feature props to withstand closer examination they required more detailed textures. Creating higher texel densities, UV layouts were distributed over two or more tiles in U-dimension (UDIM) arrays.

UDIMs may be employed in the treatment of large, continuous geometry where UV islands cannot be made to fit within a single UV tile. In contrast, their application here was a matter of convenience. With Substance Painter rolling out UDIM support during the project, more complex

and non-contiguous geometry arrangements could be grouped into one material and painted together (e.g., Jet's headgear).

This provided a more efficient workflow than was previously available which would have involved creating individual textures with commensurate file handling and balancing.

There are questions over whether these large tile sets would be appropriate for game models but for offline rendering applications, UDIMs provided a suitable solution to complex texturing.



Props textured within Substance Painter – Development renders with example environment lighting

## Texturing



Jet's headgear – UDIM textured in Substance Painter

The use of Arnold as a Physically Based Rendering (PBR) solution required material shaders incorporating several elements.

Early in production, the decision was made to avoid transparent materials in environment-wide set dressing (e.g., the scattered bottle waste) as a means of controlling render times. Feature elements (e.g., characters' eyes) would maintain the use of transparency with limited ray depth in rendering.

Where some early assets had received textures created in Photoshop, the workflow would soon move to incorporate the Substance suite of applications, primarily Substance Painter.



Jet's backpack – textured in Substance Painter

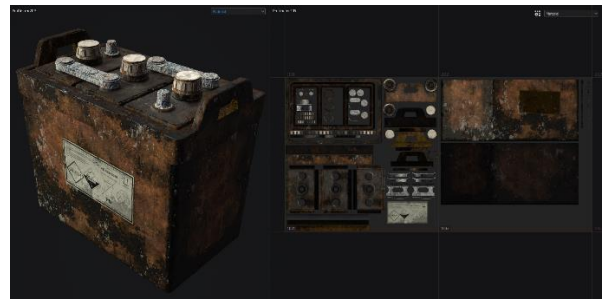
Substance Painter would offer a streamlined and non-destructive workflow incorporating the ability to paint materials (including height and normal information) directly to the geometry.

Moreover, the available toolset lends itself to the production of the convincing signs of age, use, dirt and grime required in the story-world of *The King of Wayside*.

The former workflow had required a manual export of a Maya UV layout as a template to be imported as a Photoshop layer. This would provide a guide for manually painted colour maps.

Further work would involve the creation of monochrome and/or alpha maps (based on or designed to complement the colour map) providing roughness, metallic and bump information.

Normal mapping was not achievable through this process and would require baking from a high poly sculpt to the retopologised low-poly model in either Zbrush or Maya.



Car battery prop – Heavily textured for foreground use

### Sympathetic use of materials

All props and set decoration required a sympathetic treatment. Not only should they reflect a current use and state of repair but also a sense of previous use (and a reason for having been discarded).

Textures were built in layers from base materials to surface treatments, paint chipped from edges, stains and paint splashes, slime and moss, dings, scratches, and scuffs. This was particularly effective where layers of materials could carry varying height information. A scratch into painted metal could not only expose the virgin material beneath but also convey depth and expose the layering of the coats above.

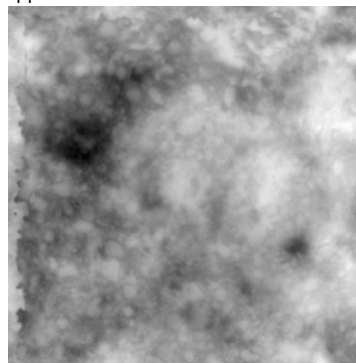
These complex layers were automatically combined on export to produce base-colour, metallic, specular, normal and displacement maps as deemed necessary. Attention was required in selecting the correct format for OpenGL normal maps to ensure compatibility with the Arnold renderer.



Sample texture photography (detail)



Textures prepared in Substance and applied



4K Landscape textures (tileable) – Base colour, height and normal

### Environment Sourced Textures

In seeking solutions for large environmental texturing, the local environment provided resources that could be bent to the task.

Swansea sits on a large bay and under plenty of cloudy, overcast days which give ideal, diffuse light conditions for texture photography. Dozens of photographs were taken at high resolution before manual stitching into 4K (4096x4096 pixel) and 8K (8192x8192 pixel) squares.

Although the textures were not intended to directly represent the features as captured, to provide an appropriate environmental scale, the images were manually processed in Photoshop to enable seamless tiling. Modifications in geometry and UV tiling, combined with lighting, could then provide the illusion of further variance in the textures.

With these large format, base-colour textures in place, the bitmap to material (B2M) features of the Substance suite were employed to produce complementary maps.

Alongside normal, specular and metallic maps, a height map was produced which could be applied as a node in the rendering phase.

## Rigging solutions

The Australian developer Animation Studios provides a comprehensive and flexible rigging system in their Maya plugin, Advanced Skeleton ([www.animationstudios.com.au](http://www.animationstudios.com.au)).

Having been employed in previous projects, this plugin was not without challenges but many of these had been identified and learning points could be applied anew.

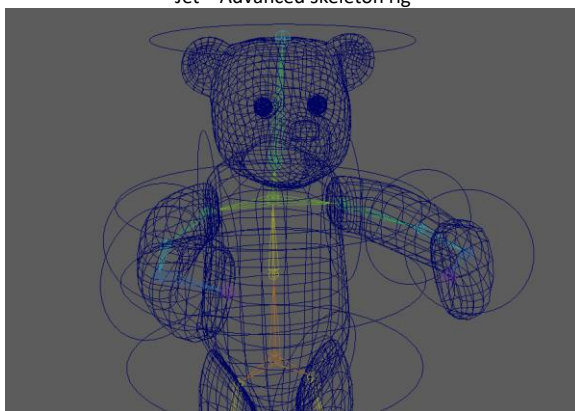
Within the rigging workflow, Advanced Skeleton could provide a complex, whole-body control hierarchy including:

- IK switching
- Hand and foot driver channels
- Complex facial deformation drivers
- A step-by-step, non-destructive workflow which was
- Achievable in the time allotted

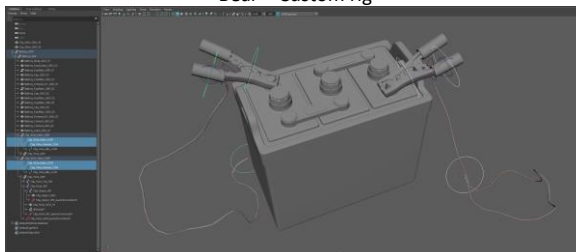
This was a heavily assisted rather than automatic process. Results were dependent on satisfying the specific setup requirements of the system and rigorous adherence to the workflow. Returning to rework previous states required rebuilds rather than individual adjustments. Despite these restrictions, Advanced Skeleton remained a satisfactory rigging solution.



Jet – Advanced skeleton rig



Bear – Custom rig



Crocodile clip – Custom rig with IK wires (controls selected)

## Additional elements

Custom rigs were required to accommodate simpler prop animation and interaction.

- Bear's rig comprised an FK skeleton with controls allowing for simple posing. Where this was sufficient in most cases, the lack of any IK implementation prompted workarounds for specific shots during later phases of production
- Elements of Jet's kit were rigged as additions to the existing Advanced Skeleton. The bottles and smaller bags he carries received distinct joints and controls to allow rotation as the character moved. The large backpack retained the influence from the original rig as the upper spine movement provided scope for animation. Adding a single joint to allow for secondary action may have been preferable but also could have caused conflict with the influence weightings of the straps attached to Jet's body.
- Crocodile clips were designed to be manipulated and developed with an IK rig to manage the attached cables. FK joints also allowed for the operation of the sprung jaws.



Locator used to control IK hand controllers (Shot\_440)

### Common movement and locators

Where characters' hands were required to interact with props or other IK systems, locators could be employed to bind them to common transformations. This remained effective in referenced rigs and acted as a bridge between systems giving reliable movement matching.

The hierarchical structure would also allow the distinct systems to be tweaked when, for example, the shape of a hand grip changed through the sequence.

This approach was found to be most effective when linking IK controllers. The relationship with FK or more simple control systems would prove more problematic.

In the example above (Shot\_440), Jet and Flot's hand controls have been switched to IK with a locator defining common transforms. Bear's rig did not include any IK systems and attempts to apply them to the referenced skeleton resulted in unpredictable deformation. In this case, manual movement matching was required through careful keyframing.

For Shot\_118, Jet can be seen handling Bear by the neck. Again, Bear's rig could not interact through IK.

With Bear's centre of gravity laying around his root control, this was coupled and offset to a common locator placed in Jet's palm.

Lower in the hierarchy, Jet's fingers and Bear's limbs were animated in sympathy with the animation.



Character IK and FK combination (Shot\_118)

## Staging

As previously discussed, Maya's MASH and xGen were turned to the creation of debris required for Wayside's environment. These provided an efficient means of creating the impression of scattered, dumped, and discarded objects. They would not immediately lend themselves to shot building and narrative cohesion.



Shot\_120 – Framing with foreground elements



Shot\_300 – Ground plane replaced



Shot\_420 – Near dressing pushes the appearance of depth

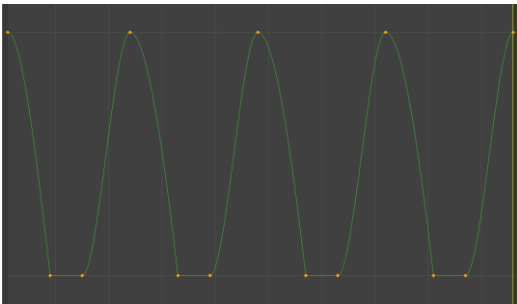


Shot\_200 – Prop placement supporting narrative

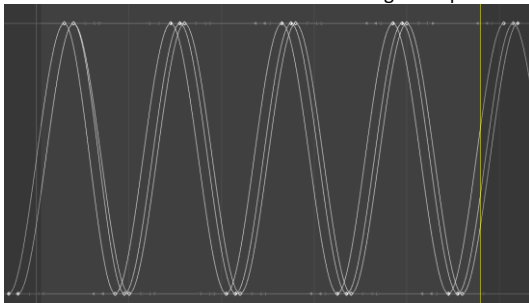
Manual placement of dressing and props was beneficial and necessary in:

- Framing the shot – Foreground elements cut down the frame and aid in drawing the eye to the focal point.
- Covering procedurally misplaced geometry – Where the placement of in-shot instances lacked rationale, dressing was applied to disguise and/or support the placement.
- Providing foreground detail to accentuate depth – Via the effect of parallax, the movement of near foreground elements across the proscenium in response to camera movement is exaggerated. This was exploited in pushing depth.
- Storytelling – Dressing and props supported narrative and conformed to shot choice and composition.
- Production planning – Where shot staging was to be re-used, consideration was given in initial dressing to allow for further shots.

## Animation



Flot – Foot translation with broken tangent impact



Flot Arm – Offset rotations for shoulder, elbow and wrist

In appearance, Jet and Flot's characterisations had been designed to convey their places within the story-world. Jet's clothing was sourced from the refuse while Flot, in his bedclothes, appears apart from the environment.

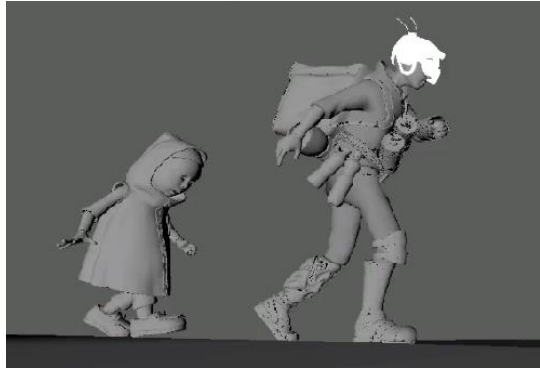
This contrast was intended to be carried through the characters' animations. Jet's confidence in his world would oppose Flot's awkwardness and sense of displacement.

The basic shot workflow involved:

- Placement of characters in shot
- Blocking out key poses
- Tweening and solving translation problems
- Refining timing (via the graph editor)
- Polishing (overlapping and secondary actions)



Shot\_90 – Playblast



Shot\_300 - Playblast

Due to the relatively complex nature of the character models and rigs, playblasts were employed (where available) at all phases to provide true 24fps previews of animations.

True walk “cycles” were not used as both characters had to interact with the uneven geometry of the ground planes. Challenges were also encountered in balancing character and performance. Jet’s walk attempted to incorporate a purposeful stride with the impression of weighty baggage and difficult terrain. This combination led to a strange gait despite reworkings.

In achieving a sense of weight, the techniques of follow through and overlapping action gave momentum to limbs that may have otherwise appeared wooden.

The editing tools and visual representation of movement in Maya’s graph editor allowed for sudden changes in velocity (e.g., footfalls) through broken tangents and the offsetting of keyframes of other limbs in response.

## Lighting and Rendering



Wayside environment - Simple lighting example



Wayside environment – HDR lighting example 1



Wayside environment – HDR lighting example 2

### Consistent render settings

To achieve consistency in output, it was important to establish efficient render settings at the earliest opportunity.

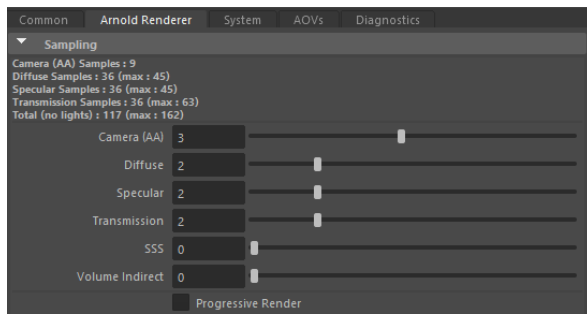
The settings would need to satisfy the following requirements:

- The impression of global illumination with
- The avoidance of unnecessary ray depth bounces
- Sampling settings sufficient to remove noise and firefly artefacts

Settings were also dependent on the chosen lighting solution.

### Lighting solution

The large exterior expanse of Wayside required a lighting solution that would offer a scheme sympathetic to geometry, texture, and narrative.



Arnold – Render settings



Simple HDRI applied to Ai SkyDomeLight for night shots



Shot\_230 – Without complementary key light



Shot\_230 – With complementary key light

Experimental renders were produced exploring combinations including both standard Maya and Arnold specific lights.

The chosen solution was a High Dynamic Range Image (HDRI) applied to an Arnold SkyDomeLight.

As an “Infinite” light source, the Ai SkyDomeLight could not interact with Arnold’s own atmosphere volume node. As a deprecated/legacy feature, Arnold’s fog also proved impractical at the larger scale.

Although these atmospheric filtering options would have provided a sense of distance and scale, the use of parallax was also an option and a Z Depth pass could allow for fog to be composited in post-production.

### Faking key lights

Although providing an effective base for the lighting scheme, the HDRI shots could lack a suitably intense and directional key light element.

Several shots required a complimentary key to support the HDRI lighting. As these were only required to pick out a focal point, a tight angled spot with soft umbra was chosen.

Shot\_260 received a similar treatment. Needing to preserve the shadow on the character, here a point light without shadow casting was used to subtly highlight the can of fish prop.

### Challenging shaders

The Arnold Ai Mix Shader applied to the bridge model appeared to cause a huge increase in render times. This shader network was cut down in an attempt to optimise the process but render times remained high wherever the bridge model appeared in shot.

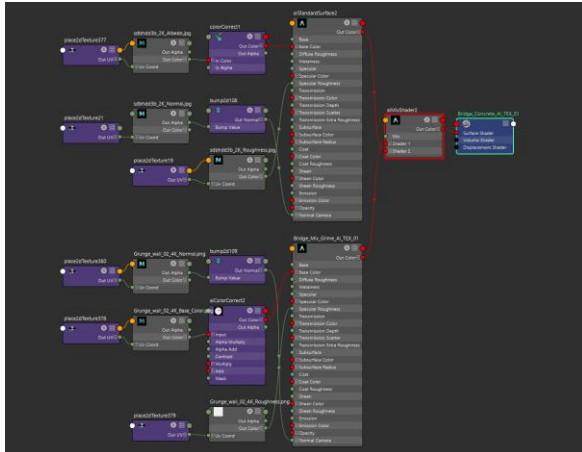


A balance was sought between time spent investigating a solution and the extra time required for renders.

With only a proportion of shots including the model and those shots having limited coverage of the bridge, maximum render times would be higher (exceeding five minutes in the worst cases) but were deemed to be acceptable. The priority would be the forward motion of the project.

In comparison, other shots containing high poly counts and complex UDIM textures could be rendered at between 1m20s and 3m per frame.

## Subdivision and Displacement



Height maps were applied to the landscape geometry to provide variation in form. To achieve this, a displacement node was added to the objects' materials. This would shift the geometry at render time.

To support the height information, the geometry also had to be flagged for Arnold to subdivide when rendering.



A balance had to be sought in revealing all detail and use of system resources. Subdivision would cause an exponential increase in polycount and even simple geometry could become unmanageably large at higher subdivision levels.

Where necessary, only foreground features would receive this treatment.



### Music

During February 2021, an approach was made to UWTSD Music Technology students with a hope of securing a composition for The King of Wayside.

Fortunately, third year student Adam Edmunds offered his services. Through regular communication and iterative development, the musical accompaniment was delivered.

### Sound Effects and Foley

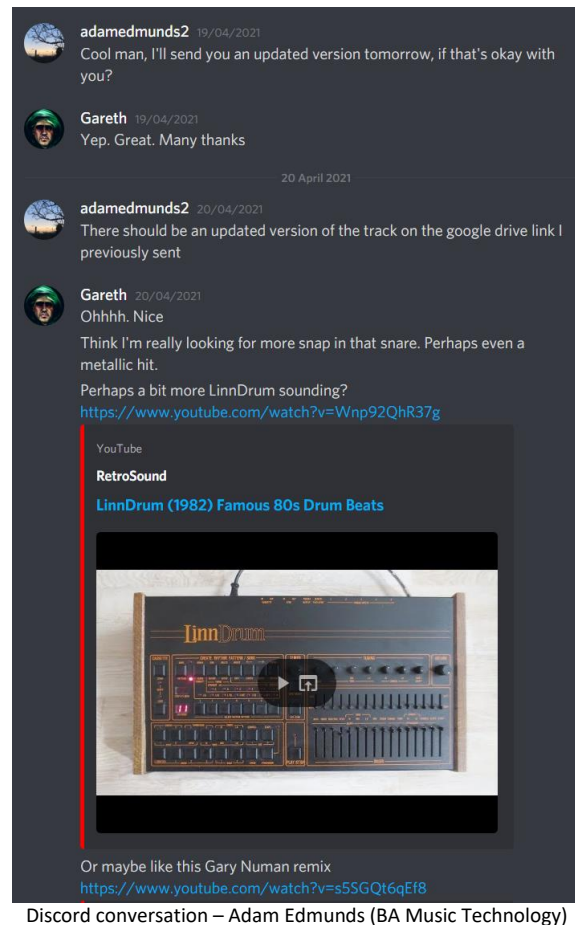
A limited number of sound effects were applied during postproduction. Online resources were checked for usage rights (see Appendix A).

Effects included:

- Antique radio static tuning
- The squawking of gulls
- Electrical sparks
- The thump of hand on wood
- The engine sound of the bin lorries

Once imported into Adobe Premiere, effects were applied to place the sounds within the scene and compliment the audio environment.

- Panning – Subtle panning gave the impression of movement
- Convolution reverb – Long tail reverb with multiple reflections provided the illusion of a large, open space
- Compression – brick wall limiter – threshold lowered until the audio level triggered the compression



## Editing and Post

Editing was achieved in Adobe Premiere Pro. In the first instance, Leica and test renders were employed as place holders and replaced with fully rendered image sequences. This provided a live record of progress against which further shot and editing decisions could be made.

Clips in the Premiere timeline were dynamically linked to After Effects projects where further compositing work was required.

- Renders displaying noise had a denoiser applied. This effect could not be applied too strongly as it tended to remove detail, blur, and lighten the overall image. Within Premiere, these shots required contrast and brightness adjustment to match the original footage.

- 

A close-up photograph of a person's face, focusing on the right eye which is a striking blue. The skin is light-colored and has several vertical white markings or scars running down the cheek and forehead. The person's expression is neutral, and the lighting is soft.

## Results

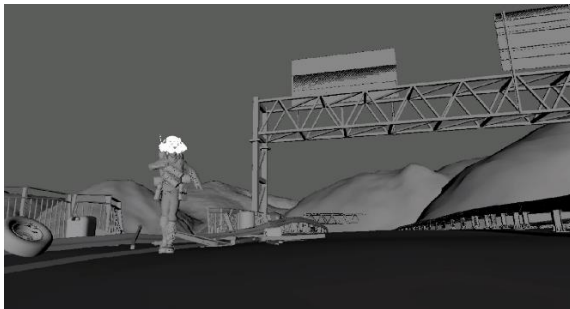
The required artefact, a short, animated film, was completed and provided by the due date though the concepts of “complete” and “finished” may not be synonymous here. A number of challenges were encountered during production and further postproduction elements may have been applied if considered earlier in the workflow.

## Challenges and Solutions

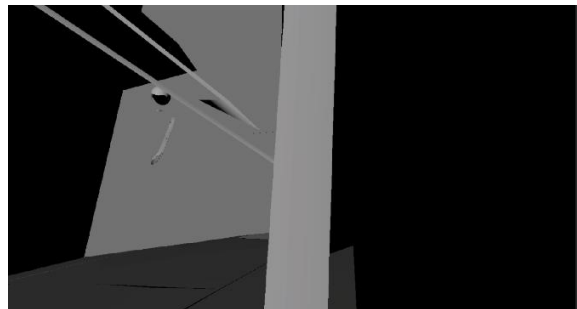
### Playblast Crashes

Several scene files suffered from the inability to produce playblast files in Maya. These quick, viewport-based renders allow animations to be previewed with correct timing and act as an intermediate problem-solving tool before commitment to the time-consuming process of a full render. The problem appeared to present erratically with no obvious cause. The symptoms involved:

- An overly lengthy pre-calculation of the playblast caching
- The rendering process running very slowly
- A corruption of skinned geometry (presenting as extreme vertex transforms and visibility switches)
- Maya would become unresponsive, crash out to desktop or, in some instances, immediately cause a system reset.



Playblast – Shot\_70



Corrupted playblast – Shot\_70

This removed the ability to fully assess the animations prior to rendering and caused a greater reliance on the graph editor to produce anticipation, follow through, arcs and secondary action (Johnston and Thomas, 1995, p.47). These symptoms disappeared during the mid-phase of animation only to reoccur later in production.

The cause was narrowed to specific instances where a scene had been repurposed for a secondary shot and involving the deletion of existing animation data. This may have resulted in junk keying information or nodes remaining. A migration to Maya 2022 appeared to cure this issue but caused conflicts with the characters’ hair systems.

### Hairy Situations

Although, as previously stated, characters' hair had been converted to Interactive Grooms, problems remained. Moreover, issues were inconsistent between characters and through scene setups.

Where Bear's fur might act as expected in one scene (following the model and deformation) it would become detached in another. This was not an issue in the referenced file nor a viewport artefact (as test renders would prove). Jet's hair system would not remain attached to the underlying geometry without the creation of an alembic cache, a step which was not necessary in Flot's.

As shots of Jet's hair were limited, usually hidden under his headgear, where possible, it's visibility was turned off. Bear's problem required the removal of his file reference from the scene and reloading.

### Z Depth Render Pass

This process was not applied to the rendered sequences due to time constraints but will be considered for future development.

The Z Depth render pass creates a grayscale image with luminosity proportional to distance from camera.



Shot\_410 – Z Depth render pass



Shot\_410 – Beauty pass



Shot\_410 – Atmospheric filtering based on Z pass



Shot\_410 – Z pass camera blur (exaggerated)



Shot 410 – Combined effect

Experimentation was performed on a frame from Shot\_410. The Z pass image enabled the application of camera blur and atmospheric filtering based on focal distance. While not suitable for this shot, as proof of concept, it was apparent that depth information could be effective in post and compliment the use of parallax in conveying scale.

## Conclusion

Much was discovered, improved upon, and accomplished throughout this project. Progress was made in the UV layout and texturing workflows combining technical and artistic disciplines. Cinematic sensibilities increased in shot design, camera movement, composition, and transitions. Claims could be made to improvements in rigging while lack of practice and technical problems affected animation.

Although no development work should be described as wasted, many assets remained underutilised or unused. These should be considered learning points even where found to be a developmental dead-end. It is necessary to explore and discount inappropriate methods but also, taking this forward, to recognise where lapses in planning allowed for branches that would never be realised.

Imagination, energy and enthusiasm, the development of knowledge and, perhaps the pursuit of perfection are the driving forces in this project. The paradox is in the recognition that finding perfection would define the end of this process and require no more.

Perfection is something to be desired but never achieved.

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## Appendix A – Foley and Sound

### Freesound.org

#### **Gulls-passing.wav**

Local filename: 162563\_\_sonic-ranger\_\_gulls-passing.wav  
<https://freesound.org/s/162563/>  
by Sonic Ranger  
<https://freesound.org/people/Sonic-ranger/>

#### **SeaGulls.wav**

Local filename: 207130\_\_ahill86\_\_seagulls.wav  
<https://freesound.org/s/207130/>  
by ahill86  
<https://freesound.org/people/ahill86/>

#### **274934\_\_theshaggyfreak\_\_thump1.mp3**

Local filename: 274934\_\_theshaggyfreak\_\_thump1.mp3  
<https://freesound.org/s/274934/>  
by theshaggyfreak  
<https://freesound.org/people/theshaggyfreak/>

#### **88471\_\_davidou\_\_radio.wav**

Local filename: 88471\_\_davidou\_\_radio.wav  
<https://freesound.org/s/88471/>  
by davidou  
<https://freesound.org/people/davidou/>

#### **50750\_\_rutgermuller\_\_radio-noise.wav**

Local filename: 50750\_\_rutgermuller\_\_radio-noise.wav  
<https://freesound.org/s/50750/>  
by RutgerMuller  
<https://freesound.org/people/RutgerMuller/>

Under Creative Commons licensing  
<https://creativecommons.org/licenses/by/3.0/legalcode>

### BBC Sound Effects Library

#### **British Rural Backgrounds - Herring gull breeding colony on roof top.**

Local filename: 07049086.wav

#### **Fly (Diptera) - close-up buzzing from many around a cowpat.**

Local Filename: NHU05046080.wav

Under RemArc (non-commercial) license  
<https://sound-effects.bbcrewind.co.uk/licensing>

## Appendix B - Shot list

Shot 01



Shot label: Shot\_20

**Camera:** High angle with a slow left track

**Framing:** Close up shot relying on the width of frame to reveal the character.

This establishing shot eschews the traditional wide view to introduce the character against hints of the environment. Scale is suggested via the parallax movement.

Shot 02



Shot label: Shot\_30

**Camera:** Extreme high angle, pedestal up

**Framing:** Long shot with subject centre shot

A secondary establishing shot to slowly build tension. Camera movement again combines with parallax to produce an impression of distance and the height of the structure.

Shot 03



Shot label: Shot\_40

**Camera:** Eye-level mid shot tracking right

**Framing:** Track reveals space to frame the aircraft against the sky

The choice of eye-level and over-shoulder places the camera at a viewpoint sympathetic with that of the camera.

Shot 04



Shot label: Shot\_50

**Camera:** Low angle, close-up. Very slow track

**Framing:** Character occupies a third of the frame with space provided for head movement.

A longer lens choice moves the viewer into the character's personal space for a reaction shot while flattening the background.

Shot 05



Shot\_label: Shot\_60

**Camera:** Mid close-up, low angle, track left

**Framing:** The character cuts the frame in half with the open sky revealing circling gulls.

A reverse angle transition returns the viewer to the character's point of view. The tracking now becomes more consistent.

Shot 06



Shot label: Shot\_70

**Camera:** Long shot, low angle, track left

**Framing:** The horizon lies at the lower third with the frame further restricted by the gantry.

The character is framed against the sky as consistent movement is maintained in the 3D space.

**Shot 07**



**Shot 08**



**Shot 09**



**Shot 10**



**Shot 11**



**Shot 12**



**Shot label: Shot\_80**

**Camera:** High angle, extreme long shot, right track. Eye trace is retained from previous shot.

**Framing:** Relying on movement to pick the character from the scene.

Flot is lost amongst the debris of the scene. Moving from left to right, he approaches Jet's position.

**Shot label: Shot\_90**

**Camera:** Low angle mid shot. Dolly out

**Framing:** Horizon frames the face of the character

While looking up at Flot, the angle shares his view with the environment rising above. The dolly movement adds to the feeling of unease.

**Shot label: Shot\_110**

**Camera:** Low angle, extreme long shot, track right

**Framing:** The horizon line defines Jet's trajectory.

The camera track opposes Jet's movement and acts to accentuate it while promoting scale.

**Shot label: Shot\_115**

**Camera:** High angle dolly, long shot.

**Framing:** Frame is cut by one third by lighting.

The dolly moves with Jet as he discovers Flot's bear.

**Shot label: Shot\_118**

**Camera:** Low angle, mid close-up, track right

**Framing:** The hazy blue sky provides a backdrop.

Jet and Bear share the screen-left third before the camera move places Jet looking back towards his camp. The low angle choice maintains Jet's dominance.

**Shot label: Shot\_120**

**Camera:** Low angle, extreme long shot, pan right

**Framing:** Perspective lines of the bridge lead the eye to Flot still lost in the landscape

The pan is designed to maintain eyeline between shots while scene elements frame a tiny Flot in his approach.

**Shot 14**



**Shot label: Shot\_200**

**Camera:** Eye level, mid shot, track right  
**Framing:** Dressing and props frame character in the foreground while a light reveals background.

The light appears to flicker in response to Jet's actions.

**Shot 15**



**Shot label: Shot\_210**

**Camera:** Extreme long shot, track left  
**Framing:** Bear is momentarily framed against the moon

Bear's violent ejection signifies Jet's reaction to Flot's presence in his home.

**Shot 16**



**Shot label: Shot\_220**

**Camera:** High angle long shot, pan right  
**Framing:** Additional lighting picks out the form of Bear in the debris

A narrow spotlight with soft umbra picks out Bear lying on a compositional third. The camera pan is centred on Bear to reinforce the focal point.

**Shot 17**



**Shot label: Shot\_230**

**Camera:** High angle close up, pan right  
**Framing:** A similar spot highlights Flot against the dark background

The transition maintains the screen focal point while panning consistently turns the viewer back to the bridge.

**Shot 18**



**Shot label: Shot\_240**

**Camera:** Long shot, low angle, track right  
**Framing:** Structure frames the vista while lighting picks out Jet's face against the shadow.

The figure of Jet looms above in response to Flot's eyeline in the previous shot. His shadowed form suggests that he is under cover and aloof from Flot's plight.

**Shot 19**



**Shot label: Shot\_250**

**Camera:** Low angle close up, track left  
**Framing:** Scene elements occlude lighting to produce a directional key which frames the character action.

Camera movement is inconsistent reflecting the character's inner conflict while accentuating his look to screen left.

**Shot 20**



**Shot label: Shot\_260**

**Camera:** Eye level, mid shot, track right

**Framing:** Flot is framed by the strong line of his scrap bivouac. The offering of food is presented in the negative space provided by Jet's looming figure.

This shot signifies a conflict in Jet's personality as he concedes to friendship while attempting to maintain his power.

**Shot 21**



**Shot label: Shot\_300**

**Camera:** Eye level long shot, track right

**Framing:** Shifting framing as the characters move apart and foreground elements scroll past.

The camera tracks in sympathy with the characters' movement as Jet's empathy remains stretched.

**Shot 22**



**Shot label: Shot\_400**

**Camera:** Low angle, long shot, track right

**Framing:** Upright scenic elements compliment the characters' strong silhouettes against the brightest area of the sky.

The right track continues to signify progress. Flot gains confidence but remains insecure. The characters are presented at a more equal level.

**Shot 23**



**Shot label: Shot\_410**

**Camera:** Eye level, long shot, track right

**Framing:** As for shot\_300

Characters are static in environment while camera tracks.

**Shot 24**



**Shot label: Shot\_420**

**Camera:** Low angle, long shot, track right

**Framing:** As for Shot\_400

A reprise of Shot\_400, the camera movement continues, progressing the relationship as Jet and Flot finally make contact.

**Shot 25**



**Shot label: Shot\_440**

**Camera:** Low angle, long shot, slow track

**Framing:** Structure frames characters and ships against the sky

Framing and angle suggest shared point of view despite characters in shot.