This Vuze camera project is taken from Peter Simcoe’s forthcoming 360 Video Handbook, available early 2018. To keep up to date with the progress and release of this book, see simcoe.co.uk/book or register your interest by emailing him at design@simcoe.co.uk.

“The 360 Video Handbook is really a milestone for me, not only as a 360 video producer, but also as a graphic designer, traditional video producer, photographer and even musician. The experiments with Vuze camera and other 360 cameras over the last 2 years, combined with 23 years experience of creating traditional video, photography and design, led me to believe I have something to contribute to the 360 community.

This book contains my own personal wish-list of project examples, frequently asked questions and technical knowledge I would have wanted to know when I began my 360 video journey and as a result is a document containing the experience, advice and inspiration I have to offer. It is also the coffee table book I always wanted to write – something easily accessible in different ways, from quick inspirational photo galleries through to detailed discussion and case studies. I aimed to create a visually stimulating book with intrinsic design value combined with solid technical considerations. I hope people enjoy reading it.”

- Peter Simcoe

www.simcoe.co.uk
www.twitter.com/simcoemedia
www.youtube.com/simcoemedia

Note: The images in this document demonstrate the inclusion of the background created with Google Tilt Brush and Google Blocks. Full details of this are included in the 360 Video Handbook.
In Detail: 3D 360 Music Video

I recently completed project involving the use of a Vuze camera, Oculus Rift, Google Tilt Brush and Google Blocks. Blocks is a free VR application for building 3D models using basic construction tools within a VR environment. Tilt Brush is a VR drawing and painting package for use with Oculus and HTC Vive. The level of complexity involved in creating the video is intermediate to expert. The 3D 360 video requires a reasonable level of experience with the Vuze camera to understand how far the performance can be pushed before stitching problems occur. See https://vuze.camera for more details about the camera.
The Project

Having completed a range of tests using the Vuze camera, I was keen to create a new type of 3D 360 experience that had not been tried before. Scanning through the Amazon.co.uk product catalogue looking for some photographic equipment, I discovered Electroluminescent Wire (EL Wire) which comes in 5 metre lengths for around £9 and Ultraviolet (UV) reactive body paint in varying colours, costing approximately the same price, from http://uvglow.co.uk. My next thought was to create a suit for use in complete darkness, using either the wire or the UV paint to highlight the outline of the person when filmed in 3D 360-degrees. Having given some thought to the application of this idea and consideration of the type of video that would benefit from this unique look, I decided to create a video for the song I wrote and performed called “One More Chance” - a progressive rock song with influences from Pink Floyd to Simple Minds. You can hear and download this track at https://bit.ly/audio-omc.

Stage 1: Initial Tests

Initial testing involved purchasing some EL wire and UV paint to assess how clearly the outline of the human body would appear in a darkened environment using these materials. EL wire wrapped around an arm and leg (with some additional sticky tape support) provided enough evidence that the EL wire would be most appropriate for creating a clearly defined outline. The UV light source required to highlight UV paint tends to brighten unpainted areas with a faint blue light, even in black clothing, making it more difficult to isolate the paint in post-production.

Having decided upon the wire method, I completed further tests. The video was stitched and then the black point, white point and shadow adjusted using Humaneyes VR Studio software (bundled with the Vuze camera) to ensure that the environment was significantly darkened and only the EL wire was visible in the shot. Tests proved that with a reasonably dark room it was possible to obtain clear wire definition using this method.

Stage 2: Materials Purchase

As this was a self-funded, experimental piece of work and the complete concept was still relatively unproven at this point, I decided to keep expenditure to a limit of around £140.00 and I purchased the following:

- Electroluminescent Wire glasses £4.30
- Black balaclava to reduce glare and light reflection from my face £2.59
- Men's thermal ski suit covering arms, legs, torso in black £7.99
- 4 x 5 metre EL wire kits which came to a total of £34.36
- Medium Density Fibreboard (MDF) for the electric guitar prop £12.00
- 4 guitar strap pins for the prototype light guitar and backup version £11.80
- Ultra-Violet flashlight at £12.49 (for initial testing - not used in final production)
- Duracell battery charger with 8 batteries for EL wire £29.99 + £7.82
- AAA batteries for EL glasses £4.50
- 7 tubes of 10ml UV glow paint in assorted colours £6.99 (for initial testing)
- 1 x 5m metre EL wire kit which came to a total of £8.59 (for initial testing)

The total for these materials was £143.42. The majority of the budget was spent on EL wire and the rechargeable batteries.

One More Chance

This song is taken from the album “Soundtracks 6”, a collection of tracks written by Pete Simcoe, including the blues song “You Can’t Always Have Your Way” which was featured in Ara Paiaya’s gangster film Instant Death starring Lou Ferrigno (The Incredible Hulk).

Written, recorded and produced by Pete Simcoe. © Simcoemedia. All Rights Reserved.

Download this track and others on Soundtracks 6 from https://audioecho.bandcamp.com/album/soundtracks-6 and the official AudioEcho website at www.audio-echo.co.uk.

Electroluminescent Wire

EL wire has a copper wire core which is coated with phosphor. Very fine electrically isolated wire is spiral-wound around the phosphor-coated copper core and a conductive coating is evaporated onto this. Around the copper core / phosphor / fine copper wire combination is a PVC sleeve around which and additional layer of fluorescent PVC is added. An electrical current is applied which causes the phosphor to glow. For more information see https://bit.ly/el-tech

Ultraviolet Paint (UV)

The ultraviolet part of the light spectrum is invisible to the human eye. However, when a lamp that emits long-wave ultraviolet light is directed at UV paint containing a reactive pigment, some of this invisible part of the spectrum is modified when reflected and becomes visible. This creates the glowing, fluorescent effect.
Stage 3: Production of Props

The video required props in the form of an electric guitar and a microphone with stand. Ideally, it would have also featured a drum kit, but finding a suitable kit, attaching the wire and recording it in the available space would be very time consuming. The solution was to insert a drum machine created with Google Blocks onto the final video.

For the guitar and bass players, the outline of a Fender Stratocaster I used to record the song “One More Chance” was traced onto MDF. My brother, Chris, assisted by cutting out the MDF then routing a groove a few millimetres inside the outer wall of the guitar shape to slot the EL wire into. The final touch was to hold the light wire in place with a series of staples. These were not visible when the guitar was used in a dark environment.

The microphone outline was created by wrapping EL wire around the profile of a microphone on a stand and holding it in place using clear sticky tape.

Stage 4: Production of the Suit

The ski thermal suit formed the main piece of clothing that the EL Wire would attach to as it was a slightly elasticated, tight fit and would therefore be suitable for highlighting the outline of the performer accurately. Cost was also a consideration in this choice of clothing, as was colour and the ability to sew the EL wire onto it – it needed to be black to ensure that only the EL wire would be seen during the recording of the video. The black balaclava and gloves also served the same purpose – to enable only the light wire to be seen but also provide a suitable base to attach the wire.

I gathered the suit, gloves, balaclava, 3 light wire kits and began working on attaching the EL wire. As this is a prototype suit, there are a few issues to be solved:

- Attachment of the EL wire to the head and neck area was difficult and involved significant amounts of transparent tape. Tape was also needed on the hands and feet to keep the wire in place.
- The EL wire battery power supply boxes heated up significantly during recordings of 30 minutes or more and these products tend to emit a high pitch noise which was then multiplied by the number of EL wire kits used (5 in total)
- The ski thermal suit was used for recording 3 times and over time it gradually stretched. The first recording was a test. The second was a development of the performance and the third was the chosen final recording with some final adjustments. Whilst the performance of the song improved with each recording session, the suit gradually began to lose its shape.
- The gloves and balaclava were difficult to take off and there was significant chance of damage. Essentially, another person is required to fit the suit and to remove it due to the fragile nature of the prototype.
Stage 5: Recording the Performers

As I needed significant assistance dressing myself with the light suit, a friend assisted me in fitting to reduce the chance of damage, stretching and tearing of this fragile prototype. The video was recorded in a 4m x 3m lounge area for convenience and to reduce costs in hiring a venue. The zone map image on the right indicates the layout of the lounge and highlights the performance area available between the furniture.

There were some additional issues to consider during the recording and most of these were related to reflections from mirrors and polished surfaces such as tables and even door knobs. Other issues were related to light dispersion from the drum sticks and the remainder of the EL wire hidden at the back of the suit reflecting in mirrors.

The Vuze camera was set up at approximately eye height on a light stand (therefore no tripod handle in the shot). The lenses were arranged so that the two front lenses were placed perpendicular from the performance – this would reduce the chance of stitching issues due to blind spots. I then used the space in front of the camera to perform the song I wrote called “One More Chance”. This was repeated to create multiple recordings of the same performance.

Warnings

Firstly, if you ever find yourself making your own 3D 360 music video in your lounge and decide to start swinging the microphone stand around in the air - all I will say is watch out for light fittings on the ceiling. Secondly, ensure that your performance is both exciting and entertaining through movement between 1 and 5 metres from the camera but also be aware that moving outside of the field of view of individual lenses can cause stitching problems in the final video:

⚠️ Only approach the camera perpendicular to the twin lenses within 1.5 metre range and, as rough guide, 0.5 – 0.75 metres is the minimum distance you should be from the camera as closer can cause eye strain when viewed in 3D.

⚠️ Do not spend more than a few seconds within 1 metre of the camera as this can cause strain on the viewers eyes. It can be more effective to have the performer at around 1-4 metres (moving towards and away from the camera) and occasionally reach out or move a prop such as the microphone towards the camera within the ranges described.

⚠️ Ensure that props, in this case guitars, are not accidentally caught in the blind spots. Your performance may be directly in front of the camera but your props may be offset significantly in the lens field of view.

Multiple Recordings

It is unlikely that your performance will be the best it can be during the first take. It is always recommended that you choose from the best of 3 or 4 takes and if you have time to refine your performance further, then take the time to create more options. Often it is useful to review your first couple of takes to look for areas of improvement.

Zone Map Guide

The central square represents the camera with the grey crossed lines representing ‘blind spots’ where a stitching line between the two lenses may appear. Most manufacturers recommend objects are located at least 0.5m from the camera - this is indicated by the red dashed circle.
Guitars
The guitars featured on the song use a variety of effects such as distortion, delay, reverb and overdrive. I wanted to simulate using the distortion pedal switch and needed to make sure I pressed the same location on the floor with my foot each time so that the pedal model could be added at the next stage. The pedal was not with me during the recording, so the mobile phone case was used as a reference point. This could easily have been masking tape to mark the location.

Drums
Ideally it would have been good to use a full drum kit, but this would involve significant work. The alternative solution was to simulate that the drums were played using sample pads. The light drumsticks added to the effect. The final shot was recorded with me sat on a single seat sofa hitting a foldaway table with a kitchen towel placed across it to prevent damage - you can see the reflection on the kitchen towel in the final video :)

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**PLAN VIEW**
Stage 6: Post Production

Each performer was recorded in the same position in front of the camera wearing the light suit. These recordings resulted in a series of takes of the performance for vocals, guitar, bass and drums. The next step was to select the best take for each of the performances and create a montage in 3D 360 format.

NOTE: If you work with video, ideally your project and video files are on a separate drive with a fast data transfer rate such as a Solid State Drive (SSD) or hard disk drive with a speed of 7200rpm or faster. This is how it was created:

1. REVIEWED each take using HumanEyes VR Software and selected the best clip for the singer, guitar, bass and drums.
2. IMPORTED the best takes into the VR software. I set a single stitch refinement frame for the stitching and the colour as there were no stitching issues.
3. EXPORTED the video at 75Mbps in standard stitching mode (not adaptive). 75Mbps is possibly slight overkill on the bitrate, which would then create a larger file, but it is important to note that this video will be compressed repeated times and therefore preserving as much video frame data as possible ensures the sharpest detail in the final video.
4. OPENED Adobe Premier Pro CC and created a new project
5. IMPORTED the 4 selected videos
6. I did not create a sequence or use one of the new VR preset settings. Instead, I dropped one of the 3D 360 videos onto the timeline to CREATE A SEQUENCE. Adobe Premier Pro automatically detected my video size and frame rate. The frame rate in this case is 29.97 fps and the frame size 3840 x 2160 pixels. You will see the full frame in the preview window which is divided into the left eye and right eye.
7. ADJUSTED the exposure, shadow and highlight settings for the video using LUMETRI COLOUR settings until I could only see the outline of the EL wire. The remaining image was entirely black.
8. REPEATED this process for the other 3 videos. Until I had 4 videos stacked on top of one another on separate video tracks in Premier Pro.
9. BLEND MODE was changed to SCREEN for each of the video layers. The result seen in the preview window was a series of EL wire outlines stacked on top of each other.
10. EFFECTS > OFFSET was used to distribute each of the 4 performers into equally spaced positions. The drummer was placed half way across the edge of the image. I only moved each video layer horizontally as this would preserve the 3D effect. If I move the video layers vertically then the 3D effect will be altered.
11. EFFECTS > CROP was used to reduce or eliminate any rogue reflections and video noise by only showing the portion of the performance featuring the front lenses. The crop effect required some adjustment as the guitar was clipped at one point (required an increased crop area) and the reflection from a mirror was visible at another point (required reduced crop area).
12. VIDEO and AUDIO was synchronised between all 4 layers of video by comparing the backing track high quality WAV file with the track playing in the background during each video performance.
13. RENDERING the video allowed me to see a smooth, high quality version of the Vuze camera footage using a HMD.

1 Each of the selected video files (V2 - V5) are aligned to the audio track played in the background during the recording of the performance. Once audio tracks A1 - A4 were aligned, the master track was added and aligned. A1 - A4 were then removed.
2 The contrast and colour balance adjusted to leave only the glow of the EL wire for each track using the shadows and blacks slider controls
3 Each of the performances were set to screen blend mode in the section under effects controls
4 Each of the performers was recorded in the same position. Offset effect was used to move the performers to equal distances around the point of view.
5 Crop effect was used to isolate each of the performers and reduce unnecessary noise across the rest of the frame. The cropping required adjustment during the performance and therefore keyframes were required.
6 Example of the final video prior to the background being added. Here the lead singer and bass player are offset and cropped to locate them in the correct places and reduce noise.
7 During development of the light suit, some experimentation using EL wire to create a ’mouth’ was tried. This was partially successful but was not at a good enough standard to make the final cut.
8 More experimentation with the EL wire used as a mouthpiece when singing. As previously mentioned, this was unsuccessful.
1. The video preview shows the equirectangular over / under format for 3D 360 video. The frame size is 3840 x 2160 pixels.

2. Using the Toggle VR Video Display button, you can view the preview video as it would be seen in a HMD.

Note: This tutorial demonstrates the inclusion of the background created with Google Tilt Brush and Google Blocks. Full details of this are included in the 360 Video Handbook.
Output

The final video is rendered at 65 Megabits Per Second (Mbps) using Premier Pro with VR VIDEO > VIDEO IS VR checked and STEREOSCOPIC – OVER / UNDER selected. Why 65Mbps? The original video bitrate is 57Mbps, so an additional 8Mbps is added to ensure the minimum amount of data is lost during the compression process.

You can see the final video on YouTube at:


My library of Blocks and Tilt Brush models can be found on Google Poly at:


Downloads

Download for you HMD from the following links:

STEREO VERSIONS

https://bit.ly/audio-omc (Buy the original track)

https://bit.ly/2D-omc (High Quality version),

AMBISONICS VERSION


Thanks to http://visisonics.com for their support with the ambisonics mix. Ambisonic version is best viewed with Oculus Rift or HTC Vive. It can also be viewed using Samsung Gear VR.

Credits

One More Chance written, recorded and mixed by Pete Simcoe, www.simcoe.co.uk
Video designed, recorded and produced by Pete Simcoe.
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Vocals: Alex Edy
Guitar, synth, sequencing: Pete Simcoe

Over / Under Format

A format used to deliver 3D 360 video. UHD 4K video is split into 2 sections where the upper (over) part of the frame is delivered to the left eye and the lower (under) is delivered to the right to create the 3D effect in an Oculus Rift, HTC Vive, Samsung Gear VR or similar.

Ambisonics

In simple terms, this is 3D audio. Audio stems (separate tracks) can be placed within a 360-degree scene. Filters are then applied to give the impression of sound emanating from these selected points when the viewer interacts with the scene through the movement of a Head Mounted Display or moving the direction of view using a mouse (YouTube). Software such as Visisonics RealSpace 3D Audio allows the use of keyframes to create dynamic audio movement within the scene.

Pete Simcoe

This guy always wanted to be a rockstar, but ended up making 360-degree videos of himself pretending to be a rockstar. Just look at the number of times he mentions himself in the credits.
Thanks

Thanks to Tim Aidley at Google Tilt Brush
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Linda Simcoe for assistance in creating the light suit
Chris Simcoe for assistance with electric guitar and microphone props

2D + 3D Versions
There are 2 slightly different environments used in the 2D + 3D versions of the video. This is due to technical issues when matching the 3D depth of the floor in Tilt Brush to the Vuze camera recordings.
Let the stars align.
Let the heavens send a sign.
Let's take this love so high.
Reach out and touch the sky.

Give me one more chance,
To live this beautiful romance,
Living like an old soul,
Making love the only goal

How long has it been this way?
Now's the time to make a change…

(chorus)

Give me one more sign,
We can stand the test of time
Living without looking back,
Hoping that it's not the last

And how long has it been this way?
Now's the time to make a change…

(chorus)

Give me one more night,
The chance to make it right,
Under the heavens and the sea
Love everything that we could be

Love so high
So high, so high
Reach out and touch the sky