

GeoVR Content Collection Manual

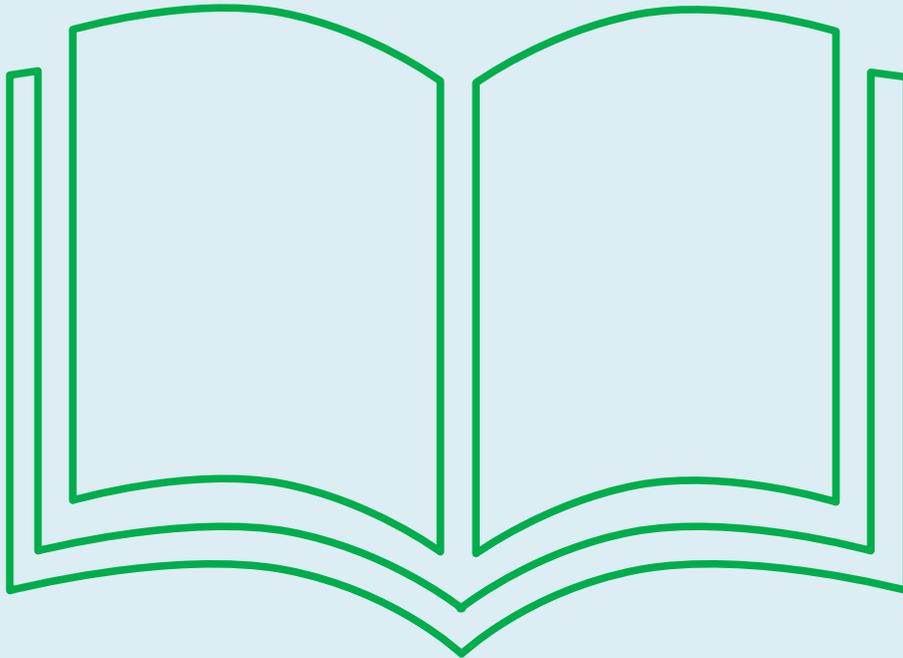
A technical guide to VR, 360° video and storytelling



1.0 Welcome to the GVCCM



The geoVR project has officially started, and the scope, ambitions and possibilities are increasing almost on a monthly basis. To ensure maximum content quality, avoid time-consuming errors and enable all partners to fully understand both technical aspects and overall objectives, we have compiled this official geoVR content collection manual. Enjoy.



Ambitions are high

Welcome to the Drifting Apart GeoVR Content Collection Manual (GVCCM). This manual is compiled to explain the concept of Virtual Reality (VR), summarize the main objects of the Drifting Apart workpackage 4: GeoVR, and most importantly: Provide step-by-step instructions on how to operate the content capture and collection equipment provided to ensure adequate output for a high-quality end user experience through the final GeoVR installations.

The GeoVR partners, represented by main lead Magma Geopark and technical developer Doublethink, has offered to provide the project partners with the basic equipment needed to collect data, photos and videos to be processed into suitable VR data.

Two equipment kits will be available for the project partners, both administered by Doublethink.

Each kit is comprised of six GoPro Hero4+ Session cameras to be installed in a custom made heavy duty camera rig. The kit does require some assembly, and the data captured will require post production work to be adaptable to the GeoVR solution.

The amount of post production needed will vary, as it will depend on the quality of the raw material received from partners wishing to collect material themselves.

This GVCCM publication is meant to help ensure that such material will be of sufficient quality and proper formats. In it we will describe and illustrate how to assemble, operate and handle the camera rigs. Also, how to plan your shoot, extract the data and how to handle the collected data when shooting is finalized, as well as describe some key elements and philosophies behind VR as a concept and technology.

Please refer to sections 6.0 in the this GVCCM for any questions, comments or reports.



Thank you for partaking in one of the world's most ambitious and rewarding VR projects. Your work and input will offer knowledge and joy to the world.

This manual was developed with the support of the Drifting Apart project, funded through the Northern Peripheries and Arctic Area Programme under the European Regional Development Fund



The GVCCM will be continuously updated in the course of the project.

New versions will be made digitally available for all project members.

The current version is: **v2.1**



Northern Periphery and Arctic Programme
2014-2020



EUROPEAN UNION
Investing in your future
European Regional Development Fund



NORA
Nordisk Atlantsamarbejde

GeoMuseum



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World exploration is for everyone





2.0 The Basics

The GeoVR story: Sharing the scenery

The GeoVR project has several key objectives. It aims to enable people from any country, creed, location, with any physical ability/disability or background to experience and partake in the rich geological history of the world without actually travelling or going there. It also aims to stimulate knowledge and environmental awareness among children and young students, expand the knowledge of adults and inspire people, young and old, to go out and explore the world more. Thirdly, it will act as a showcase for a number of UNESCO WHSs, raising awareness on issues like environmental protection and cultural heritage.

Across these goals can be found a linear story, shaped and told by entities backing the project, like the pan-European Drifting Apart initiative, NORA and several other programs.

The various partners in the projects are all connected and signed on to one or more of these programs. Magma Geopark can provide additional information on the various partnerships and/or programs.

They will however all become connected through the GeoVR project. As such, the quality of the content must be consistent, the storytelling must be in line with general guidelines and the information provided must be accurate, and perhaps most importantly: The story told must be in such a shape, form and way that all project partners can take pride in the final product.

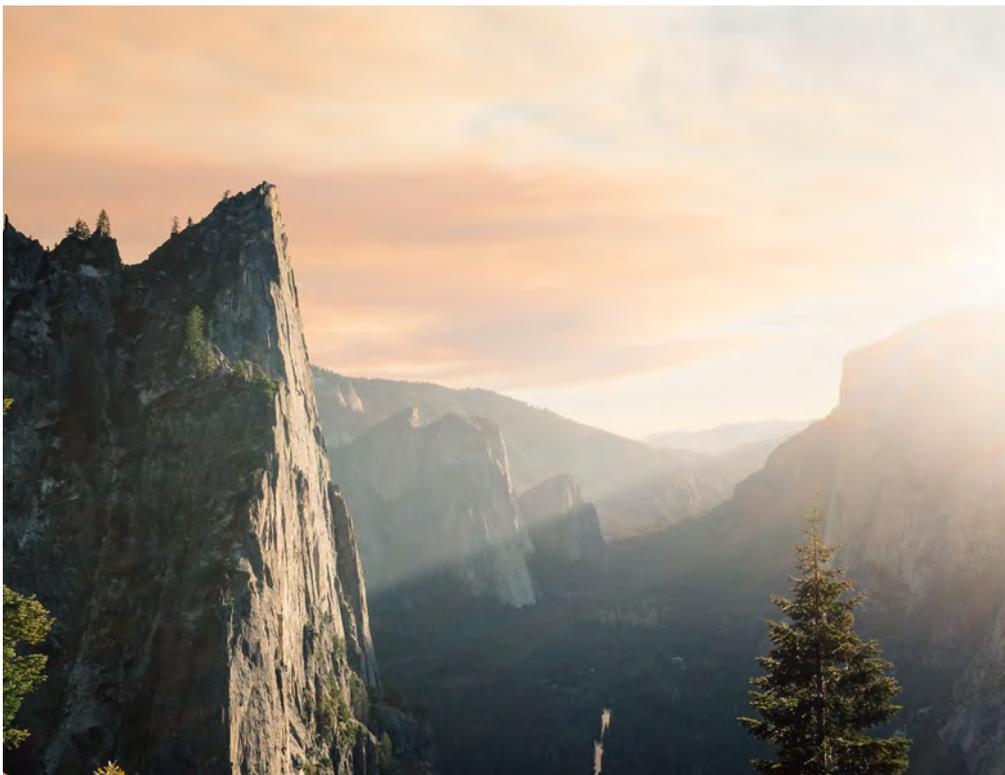
The GVCCM is meant to be a helpful guide to make sure all these criteria are met.



Each hotspot will stand on its own. It is your contributions that will make them all interesting for the users.



geoVR will be based on a new, very open content management system, allowing more and more content to be added as time passes. That will allow even more partners to join the project at a later date.



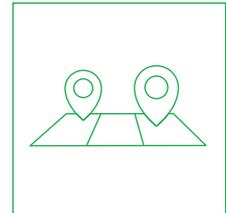
2.1 GeoVR: How it will be put together

GeoVR will be made from data and collaborations spanning several countries, partners, locations and input providers.

The data and collection processes will all follow the same pattern:

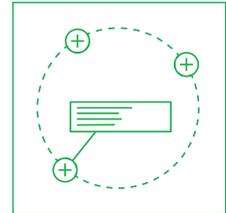
Locations

Each project partner has listed a number of locations to be included in the GeoVR experience



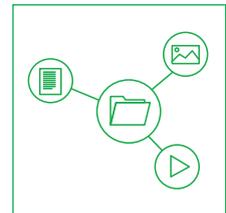
Hotspots

Each location has a potential to include 3-4 "hotspots" to explore



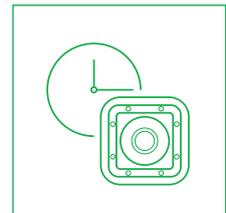
Collecting data and media

Each partner is responsible for collecting data/video/stills/text/sufficient information for each listed location and related hotspot.



Equipment rental

Magma Geopark/Doublethink offers equipment rental for data collection by the partners



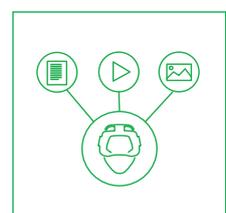
Assistance

If any partner is unable to film/gather data themselves, Doublethink can offer assistance at the expense of each individual partner; cost levels will vary from location to location (pricing will be discussed)



Processing and incorporation

Collected data will be sent to Doublethink for processing and incorporation in the GeoVR programming and algorithms, along with rented equipment.





2.1.1 How to tell your story

Before you start planning your shoot or data collection trip there are a few key elements you need to take into consideration before starting your data collection:

- Do you understand the main objective of the GeoVR experience in the making?
- Do I/we have the technical knowledge to collect/produce the necessary data for your location's presentation?
- There is little room for backtracking once data has been collected and submitted for inclusion in the program: Are all the theoretical data/background checks in order before you start shooting video?
- Do you know if any of your hotspots (in your location(s)) require 3D modeling to tell the story properly? If so, discussions and arrangements must be made with Doublethink, and a storyboard draft must be produced.

With all the boxes checked, you will be ready to start collecting the data needed to tell your story. The story to be told will vary from location to location, country to country and objective to objective.



Here are some key elements you need to keep in mind when collecting your data:

- You want to emulate the feeling of “being there” whenever possible. That means keeping the camera at just above average head height (more on that in chapter 2.2)
- Do you best to capture the natural sounds and acoustics of the area without human or technological interference; the lesser the feeling of “I’m just watching this through a camera lens”, the better the VR experience.
- Think of this as a combined tourism ad and educational content piece.
- Take your time if you have it; a rushed production will lead to a lackluster end result, affecting the users. Also, backtracking for reshoots can be costly and/or time consuming.

2.1.2 Our suggestions for content and storytelling

The project partners have all been supplied with the guidelines for the Drifting Apart project and other (to them) relevant projects. As such the foundation of the storyline should be available to all.

The details of the story are however to a certain degree open to interpretation. Magma Geopark and Doublethink urge you to consider the following when collecting your data:

Storylines

Examine the Drifting Apart and other program storylines thoroughly, as they should provide information on what part of the main storyline your location(s) should focus on.

“Pull” the user

It is your objective to “pull” the user towards new hotspots and locations. As such, the information/scenery/data presented at each hotspot should urge people to keep going and discover more at the next “stop”.

Storyboard

Draw an internal storyboard for the user’s journey through your location; map out the key elements for every hotspot so you know where to film/take photos/center focus. This storyboard can later be submitted to Doublethink as companion documentation for when we are assembling the content in the GeoVR.

Pacing

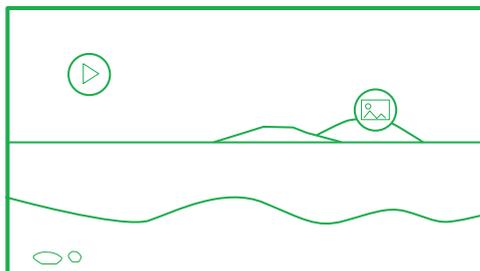
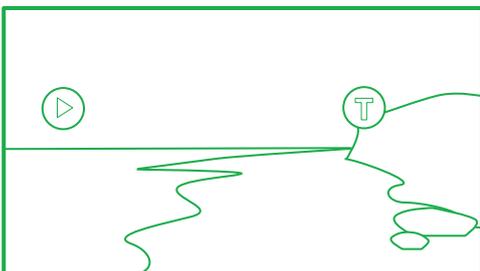
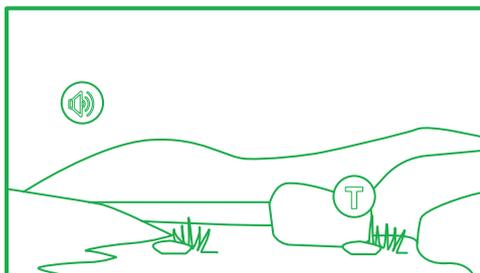
The most “exciting” part of your location should not be the first point of focus when the user arrives; it should either be in the middle or last stop on the journey through the location, to tempt and urge the user to keep on exploring.

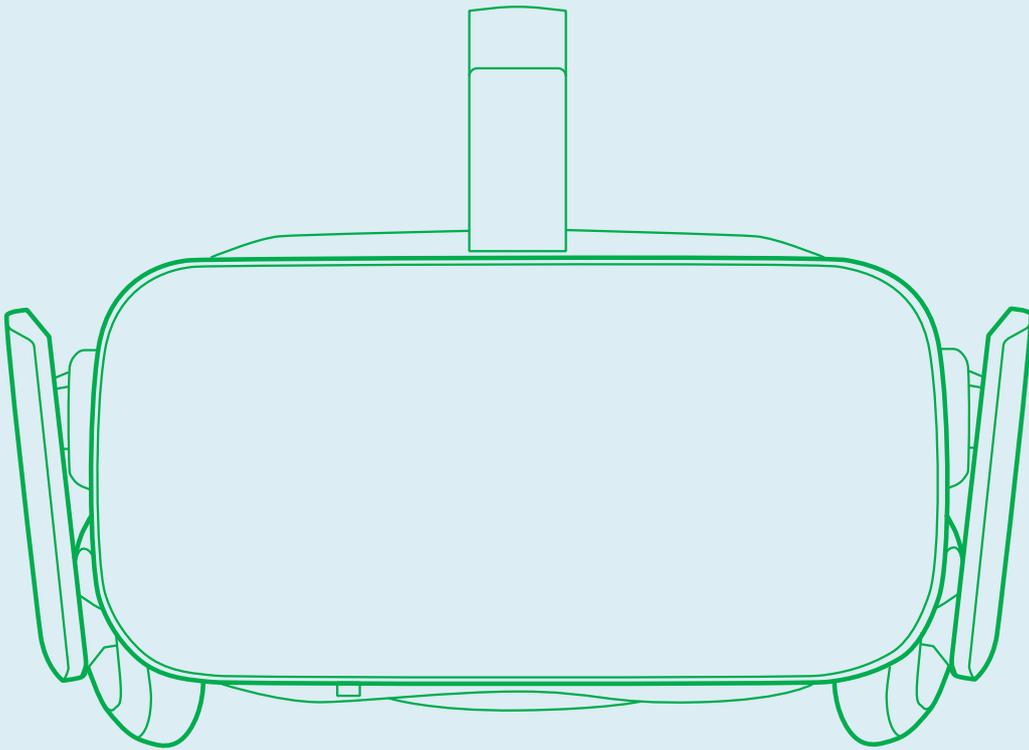
Text quantity

Text messages should be clear and technical jargon should be kept to a minimum; the GeoVR will largely be targeted towards a young audience.

Focus on important highlights

Keep in mind that the user will most likely move/travel from hotspot to hotspot and location to location with only short stops on each location – focus on important highlights as soon as possible for each stop. If the users need to look around too much to find points of interest, they might miss them.



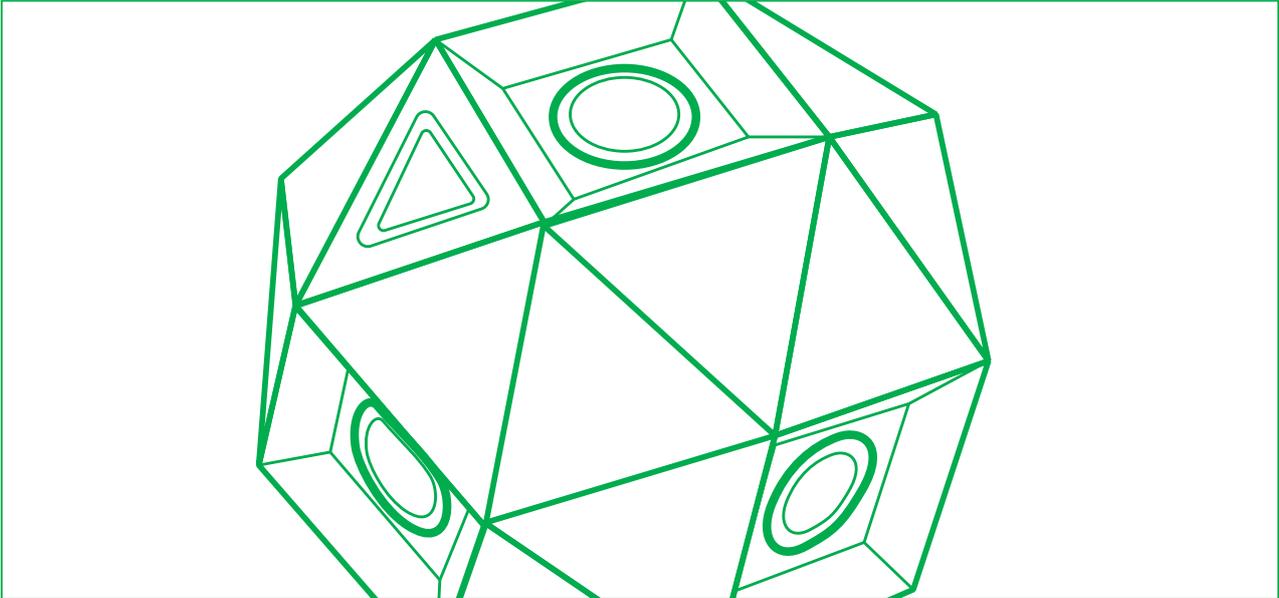


2.2 The live footage part – 360° film

The GeoVR experience will be created using a mix of nature film shots, some elements of still photos and pure 3D-created content. In addition, text overlays, voiceovers, ambient sounds and HUD elements will supply the material to ensure an immersive experience.

The live film parts are the most difficult to get right. Most of the other elements can be added later, redone digitally or made in creative studios from scratch. As a result, shooting high quality live film is paramount to the final product. As there is a number of partners involved, all set to capture their own locations using 360-degree film cameras, every partner must pay very close attention to every technical detail in the process. This is one of the main reasons we have compiled the GVCCM.

Every aspect of the operation must be studied and understood before shooting. We cannot stress this enough. That being said, we eagerly await the results.



Options for filming in 360 degrees have increased and improved significantly in recent years

2.2.1 What is 360° film, and what is the point?

360-degree video, alongside 3D-modelled content, is one of the backbones of any virtual reality experience. In short, it means that a spherical video is captured, either by means of special camera lenses or a series of wide-angle cameras and lenses (6 or more) daisy-chained to cover an entire sphere.

The 6+ video streams from the daisy-chained cameras will be stitched manually using specialized software in post-production. Using high-end equipment and software will also allow sounds to “fill” the sphere, creating true surround sound within the spherical video.

The point of 360° video is to create immersion. When loaded onto a VR headset, the headset’s built-in gyros and accelerometers will detect when the wearer turns and shift the viewing angle inside the spherical video according to the wearer’s position. This easily “fools” the brain, overriding your senses and creating an illusion of being in

another world. By adding sounds and/or other tactile equipment, “full” immersion can be achieved, creating a truly fascinating experience for the user. In short: A higher number of human senses stimulated or “fooled” will create greater immersion.

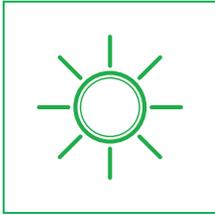
Alas, the human mind is clever. Although 3D environments do have a staggering effect in VR, few things can compare with high-quality “real” footage.

This is why we want to employ as much of it as we can in GeoVR; to create a fuller experience.



2.2.3 Planning your shoot: Lights, camera, weather.

When planning your video shoot, there are several variables to take into consideration. Some are location independent, while some require adjustments according to local aspects:



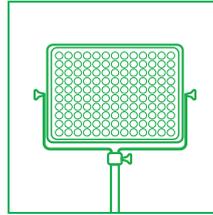
Day time

As no external lighting sources are planned in the kits available, footage must be captured during day time. Neither the Sphericam nor the GoPro kit cameras are designed for low light conditions.



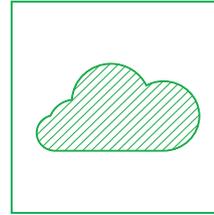
Dark areas

If footage of caves and/or permanently dark areas need to be included, external lighting must be used. These light sources must be provided at the partners' own discretion.



External lighting

Should external lighting be used, designated photo/video lamps must be used due to kelvin levels, elimination of "flickering light" effects in the videos and reduction of time-consuming post-production adjustments.



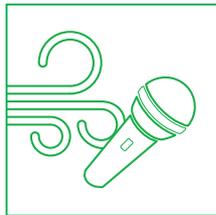
Light grey skies are preferred

For best results, filming should be done in clear weather. Preferably not too sunny; light grey skies, given enough natural light, can be adequate.



Time window

It is recommended to shoot the video in the time window between 10am and 3pm to maximize the amount of natural light.



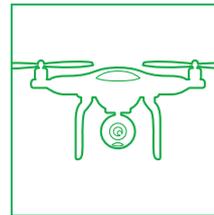
Wind noise

Filming should not be done in windy surroundings if possible. Excessive wind noise not only ruins the audio recordings, but can also contribute to film quality interferences and unstable shots.



Heavy rain

Although both the Sphericam and the GoPro kits are IP67 certified/splash proof, shooting in medium to heavy rain is not recommended. Light drizzle might work, and in some cases even add to the realism, but too heavy rain will not only obscure the camera lenses but in some cases also dampen the feeling of immersion in the final product.



Drone-mounted shots

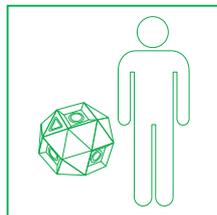
If drone-mounted shots are planned, it is the project partners' responsibility to ensure safe handling of the camera equipment. Renters of the equipment will be liable for any damages and/or excessive wear and tear of the camera kits.



2.2.3.1 Steady/fixed camera shots and possibilities/limitations

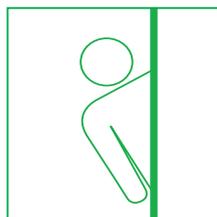
When filming there are two ways to handle the camera rigs: From a steady/fixed point (i.e. a tripod or other surface-mounted object) or from a moving surface (i.e. head-mounted, backpack-mounted or drone-attached).

When shooting from a fixed point, please consider the following:



Humans

The camera rigs film in 360 degrees. That means that any humans visible within the camera range will be captured. This is not desirable, as any human depiction in the GeoVR experience will not only require a model release form signed by every person captured on camera, but will also diminish the desired impact of the “solo journey through the wilderness” we aim for in GeoVR.



Hide from view

Both camera rigs can be remotely activated, either by physical remote or smartphone-based applications. Instructions on how are provided in chapter 3.2. It is advised to “hide” from the camera before pressing record to avoid, but should this be impossible, we recommend filming for an extended period of time and “move” around the camera rig; not staying in the same spot throughout the shoot. That way it will be possible to edit people out from the final cut by cutting and re-stitching the video.



Looping video

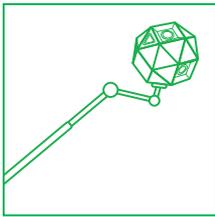
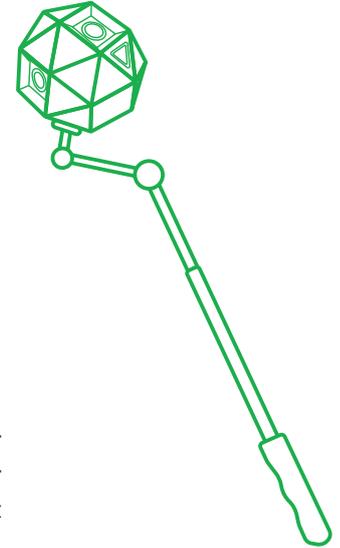
Please be advised that the video you shoot will be set on automatic loop/replay should the user choose to stay on the same hotspot for an extended period of time. Each video loop will last for approximately four minutes. We therefore recommend that natural phenomena like birds flying, rocks falling or the like be captured going in and out of frame, so there will be no “chops” in the loop. We aim to make the loop as seamless as possible.



2.2.3.2 Handheld/moving shots and possibilities/limitations

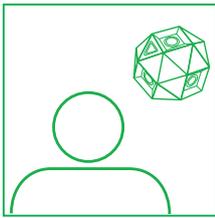
Moving shots are a bit trickier than steady shots, as the camera rigs are naturally sensitive to movement.

When shooting from a moving point, please take into consideration the following:



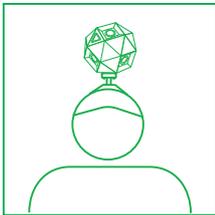
Extension rig

A hand carried camera rig should be attached to an extension rig, preferably with a built-in gimbal. As per December 2016 neither Magma Geopark nor Doublethink offer such equipment for partner rental purposes. Should the need arise, we will help guide procurement processes or alternatively include rental options for such equipment.



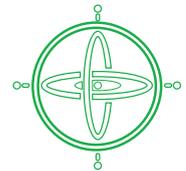
Keep the rig above head level

When carrying the rig and walking, make sure to keep the rig above head level, so that the only “blind spot” will be directly beneath the camera. This will maximize scenery capture and effectively mask the human carrying the rig. Unwanted scenes can be removed in post production but will require work in addition to time estimates.



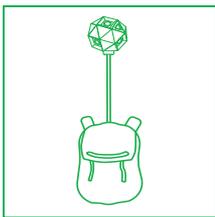
Attached to a head

As the camera rig is to be attached on top of a human head, a special gimbal head unit will be needed to reduce jittering and camera shake.



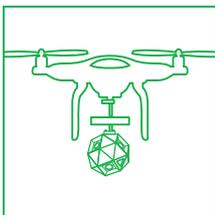
What is a Gimbal?

A gimbal a contrivance, consisting of a ring or base on an axis, that permits an object, as a camera, mounted in or on it to tilt freely in any direction, in effect suspending the object so that it will remain horizontal even when its support is tipped.



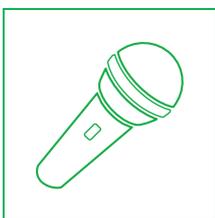
Backpack attached

If the camera is to be carried in a backpack while shooting, a special backpack-designed extension rod with gimbal is required.



Drone attached

Drone attachment will create a certain degree of camera shake. This will be adjusted for optimal results in postproduction.



Sound recording

The GoPro cameras have dual microphones, designed to “take the edge” off wind noise. We have decided to not include extra external microphones to reduce the technical hurdles for the partners involved, as sound recording should be sufficient. If needed extra “nature sounds” can be added in post production.



2.2.4 Media that can be included

The 360-degree films will themselves cover video and audio content, and the aim is to capture nature scenes as realistically as possible. However, not all content can be captured on camera. Some natural phenomena might be seasonal. Some might occur sporadically over the course of time, and some might require night time filming with specialized equipment to be captured on camera.

Whether or not this applies to your specific location(s) is for the project partners to know. If they do, they might be vital to the storytelling for your location, and if it is to be included in the partners themselves must provide the footage to be imported into the geoVR experience.

If such media is to be included, please adhere the following guidelines:

Video formats

Video files must be submitted in either MPEG4 (.mp4) or H.264 format (.mov) with a 1920x1080 resolution, preferably with a 25fps minimum. In addition, the following movie file criteria are preferred, although not required unless specified: Progressive and uncompressed with 48,000 Hz, Stereo 16-bit sound.



Photographs/illustrations

Photographs/stills must be submitted in high quality. See 2.41.

Please keep in mind that the photos will be enlarged in the geoVR experience, and low-res and/or blurred pictures will have their negative qualities multiplied a significant number of times when transferred to geoVR.



Music and sound effects

Music and/or sound effects added to those sounds captured by the camera rigs are not preferably supplied by the project partners. Should this be necessary, please refer to the sound quality preferences listed above, under "video files".





2.2.5 Important information on drone filming

Geoparks can be massive, and some Drifting Apart partners might want to employ drones to ensure they capture both the vastness and beauty in a proper way. Before you do, there are some key things to remember. Here is a check list.

Drone flying in general:

- If you haven't flown a drone before, we recommend leaving it to professionals for this project. Making a drone lift off is easy, but keeping it steady in mid-air while flying on a designated path is very hard.
- The project's success is depending on a certain level of video material quality. Inexperienced drone pilots will have a hard time producing content
- Many countries or specific areas require official licenses to fly over and not to mention film. Having a drone flying license might also be required, as will insurance. Please make sure all criteria are met by either yourself or drone pilot partners.
- Whenever a drone run is complete, play back the footage to ensure that the planned scenes have been shot according to plan and that there is no "jello" (i.e. wobbly/shaky parts) anywhere. Jello shots are very hard and time consuming to stabilize in post-production. A suitably designed vibration mount for the video pod is required. Hard mounting of the pod and mounting pole can eliminate the "jello" effect, but the video will be unusable.
- The drone air frame needs to be designed specifically to carry the video camera payload. Hexacopters are often suitable, as they have a good power/weight ratio. Hexacopters also give some level of redundancy should a rotor fail in flight. We recommend dual batteries be mounted for all drones.
- As for weight: It is desirable that the drone be designed and built to stay under 7kg, total weight. This allows for flights to be made in a controlled airspace
- The drone must be equipped with remotely raisable landing gear so it won't obscure the footage mid-air.

Drone filming tech tips:

- As much of the aircraft and its systems need to be kept out of shot as possible, batteries and other devices should be carried above the level of the rotors. The pole carrying the camera pod should be fixed directly in the centre of gravity under the aircraft. Too long a pole and the camera pod will have a pendulum effect; too short and too much of the drone will be in shot. About 0,5 meters is fine.
- Keeping the airframe a single color, mostly black, makes it easier to mask the aircraft out in post if required.
- Keep the operator out of shot as best you can. Unlike other forms of aerial video it is near impossible to keep the operator out of shot when droning. One of the main reasons for this is that the pilot, by law must keep the drone in view at all times. This therefore requires some thought to the positioning of the flight personnel during recording etc.
- As most video pods are attached to poles hanging low underneath the drone, landing the drone can be a challenge. Hand launch and landing is an option, or a specially designed landing support is the preferred method for safety reasons.
- Low sun or strong contrast days should be avoided for 360 degree video, especially aerial. The cameras pointing towards strong light sources will always be over exposed. Even light is better for 360 videos, and a high sun position is preferred.
- All camera settings must be the same, settings are limited on GoPro's, but typically GoPro's will be set for 1440p, 48fps and Protune, and manual WB.
- The GoPro Wi-Fi remote should be set to use 2.4 GHz for control of the drone. (Normal control frequency for most drones). To monitor the drones systems in flight, a flight camera and OSD will be required, broadcast to the ground video monitor and pilot view using 5.8 GHz.
- The GoPro rig must be powered by the drone's batteries using suitable adapters and cable loom.

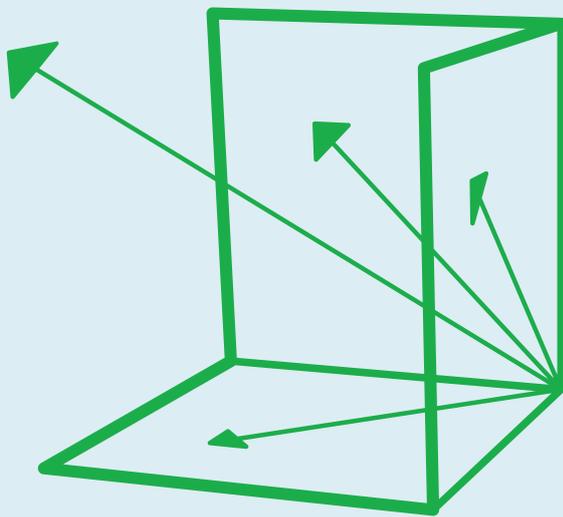


2.2.6 Technical aspects

If you plan to use the DA GoPro camera kits for drone shots, it's important to remember a few key points:

Drone filming tech tips:

- The combined weight of the six GoPro Session 4 cameras and the 3D printed rig is approximately 0,7 kilos. The gimbal is extra, so one should use a drone with a minimum lift capacity of 1,0-1,2 kilos.
- **DO NOT PUSH DRONE LIFT CAPACITY LIMITS.** Should you do so you'll risk overheating the rotor engines, possibly causing a mid-flight malfunction. Also, battery time will be significantly reduced when carrying a gimbal with a camera rig. "Hobby" drones will not be suitable; you will need at least semi-professional drones to fly the rig. Please keep this in mind.
- Sound recorded while drone filming will be more or less useless in the final product, seeing how the rotors make too much noise. So if you plan to film anything to capture specific sounds, please refrain from using a drone mounted rig.



2.3 The 3D animation part

The geoVR experience will include a significant amount of 3D generated content, either made from scratch or based on input provided by the respective partners.

This is how we will showcase what no living creature can ever experience; phenomena that might have happened millions of years ago.

This is how we plan to transport the users back in time to learn and experience how our world came to be.

Pilot studies we have carried out show that a vast majority of users find 3D scenes to be even more exciting than real footage or still pictures. As such we recommend including 3D animations whenever possible.



Immersion is all about sensory stimulation. The more senses we fool the more intense the immersion becomes. geoVR will stimulate the eyes, the ears and touch.

But who knows where we go from there.



2.3.1 geoVR and 3D: The road to immersiveness

The concept of virtual reality is exciting, and one of the most exciting aspects is its ability to immerse the user like nothing they have experienced before. As the geoVR project will aim to showcase facts, not fiction, a balance must be struck between what we choose to show as real footage and what we choose to emulate using 3D graphics and animations.

The quest for grand experiences

If done right, 3D environments can surpass the immersion caused by real footage.

Why? Mainly because the human mind subconsciously “knows” that when the eyes see something “real”, you’re not really there. It feels real, you can act real, but it’s not. And the mind keeps that thought lingering, no matter how high quality the footage might be.

Truly unreal realities

3D environments, on the other hand, are able to suspend reality at any given time. Also, the human mind is clever enough to realize that whatever is perceived is not real, no matter how good the graphics are. As a result, it “lets go”, allowing it to be fully immersed and open for input. That is why high quality 3D environments are effective for learning.

Which is after all one of the main objectives of the geoVR project.



3D content can really help put your point across, but needs detailed planning to do so.

2.3.2 What you need to know

The project partners will need to be directly involved in the production of the 3D content itself, as your input is vital to enable a concrete and realistic scene for every geopark location.

For that to happen, each project partner will need to do for their individual 3D hotspots what you must do for the live footage hotspots:

1

Draw an outline of the story to be told

2

Supply as much factual information on the topic/scene/location as possible

3

Emphasize the most important aspects to be focused on

4

Provide all available documentation of the area to DT or other technical providers. This can include pictures, texts, videos or other reference sources.

5

If any relevant data, such as point clouds, pre-rendered graphics, CAD-styled illustrations exist, please make them available to the geoVR technical staff.

All partners will be kept up to date on their respective 3d hotspot developments through either direct communication or via the dedicated geoVR development blog online.



2.3.3 The detailed steps of an animation

Creating high quality 3D content is both time consuming and meticulous work, and has much in common with producing a regular movie. A common list of steps needs to be followed precisely.

To create a high quality 3D scenes, anything between 50 and 500 working hours might be needed. It all depends on the availability of background material, partner commitment and dialogue frequency and preferred detail level. Several DA project partners have requested 3D scenes, and in order for Doublethink to provide quotes, we have based our estimates on an average time expenditure of 118 hours per scene.

In order for all partners to fully understand what it takes here is a list of vital parts of creating a high quality and immersive 3D scene. It is based on the estimated 118 hour average.

- A storyboard development (7hrs)
- Data acquisition/references (7hrs)
- Basic modelling based on existing topographical maps (7hrs)
 - or: • Conversion of LiDar data to 3D objects (7hrs)
- Basic modelling of assets (rocks, trees etc.) (14hrs)
- Basic modelling of important landmarks (25hrs)
- Texturing and detail (14hrs)
- Lighting and light effects (7hrs)
- Animation (21hrs)
- Editing (7hrs)
- Sound design (6hrs)
- Rendering and compositing (10hrs)

We must emphasize that actual time expenditure and price might be lower or higher depending on scope, ambition, detail level and ready material.





2.4 The 2D digital content part

As previously explained, each partner location in the geoVR experience will include a given number of hotspots. These hotspots fall under three subcategories: The “live footage” category explained in chapter 2.2, the 3D content category explained in chapter 2.3, and a 2D category aimed at conveyed knowledge and facts through non-animated text- and photographic content.

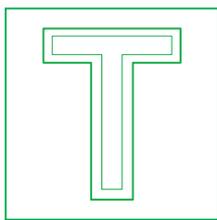
These 2D hotspots are meant to be “breathing stops” between the live footage and 3D hotspots in each location. Here you will be able to provide the user with the following:

- Indepth facts and figures not easily conveyed in the other hotspots
- Questions and challenges to make the user reflect more on the experiences had so far
- Provide information, trivia and/or facts not covered by the other hotspots, but still important to the geopark location as a whole
- If applicable, links and/or information on sponsor of the geoVR experience, wither local or general.

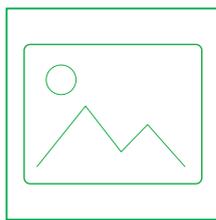


2.4.1 Media that can be included

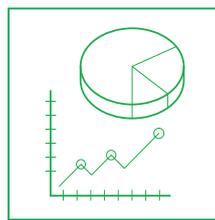
As the content is designed to be “flat”, or in 2D, the content and media that is to be included in these hotspots can consist of the following:



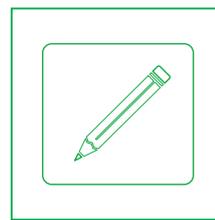
Text



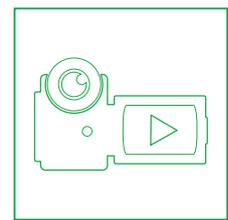
Still photos



Graphs and charts



Illustrations and
2D drawings



Video

Text must be provided proofread and approved by geopark officials.

Text must be provided in the following languages:

- Norwegian
- English
- German
- Spanish

Please bear in mind that the text will be displayed like a keynote slide inside the geoVR. As such, general presentation rules apply:

- Bullet points are easier to read
- Language should be directed towards a young audience.
- Headings are important

The geoVR experience is first and foremost meant to be a visual stimulation; it is designed to tempt and stimulate its users to learn more. As such it is more a tool for the partners to encourage further exploration, and not be a standalone solution.

Also, with VR being so immersive, user senses are heavily stimulated during use, and “overloading” the user with too much information during their first try can be counterproductive; it is better to “portion” it out in small doses.

Please keep this in mind when composing your text messages and/or choose to include graphs, graphics or other data-heavy information points.

Please refer to details in pt. 2.5 and its subpoints to see specifications regarding file formats and technical requirements.

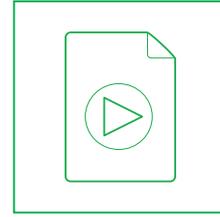


2.5 File format specifications

In order to create a uniform, universally appealing and user-friendly solution, all content must be as streamlined and identical, technically speaking, as possible. Any deviations from the format and/or guidelines presented here will ultimately result in a sub-standard final product, and thus the guidelines presented here must be followed precisely and to a tee.

Should you have any questions regarding these guidelines, please contact Doublethink as soon as possible to avoid having to redo any work.

Note: These specifications are for 2D hotspots in particular, but cover all geoVR media in general.



2.5.1 Movie formats and specifications

Formats supported:

.mp4 and .h264

Resolution required:

- Minimum 1920x1080p (Full HD) (4K resolution is preferred)
- 30 FPS minimum

Length:

60 seconds maximum length per movie file



2.5.2 Sound formats and specifications

Formats supported:

.wav and .aiff (uncompressed)

Resolution required:

16 bit, 22kHz

Length:

60 seconds maximum length

Note:

No reverb, room acoustics or echo effects must be added.



2.5.3 Picture formats and specifications

Formats supported:

.tiff and .png (raw formats)

Resolution required:

Minimum 1920x1080p (Full HD)
(4K resolution is preferred)

Amount:

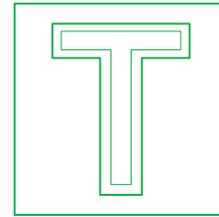
No more than 2 pictures per hotspot

Shooting instructions:

- Use low ISO settings
- No camera shake/use tripod
- 60 seconds maximum length

Note:

- No photo post processing/editing must be done prior to sending it to DT.
- As a rule of thumb, no pictures that have ever been copied in or out of any Microsoft Office document is usable in the geoVR digital environment.



2.5.4 Textual information and inline graphics

Formats supported:

.doc, .docx and .txt

Tags:

Every text file must come with a minimum of 2 tags for indexing (i.e. "meteorite" or "glacier"). These tags can be put at the start, inside the document file.

Content:

- Every hotspot text must have a heading, containing max. 35 characters
- Any bolding/emphasizing must be done prior to sending, within the text file - i.e. "The glacier is **10.000 years old**"
- English is the native language of geoVR; all texts must be submitted in English.

Note:

Graphs and charts must be delivered in picture format, not as integrated parts of Microsoft Office documents, and preferably on transparent background; .png, .tiff or .psd.

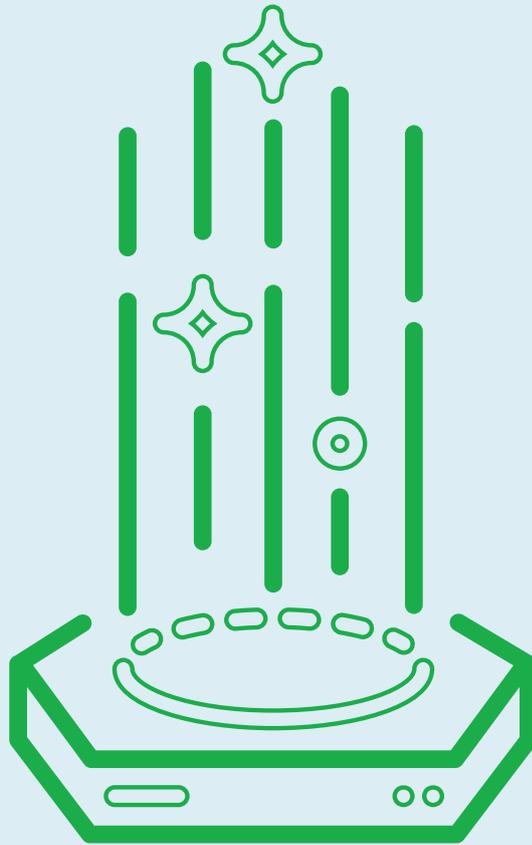
2.5.5 File names - IMPORTANT!



There will be literally hundreds, maybe even more, files to organize in the geoVR DA project. To avoid confusion and/or lost files, ALL files must be renamed using the same file name structure. The files must be renamed like this:

DA_geopark_location_hotspot_1.filename

Example: DA_magma_jossingfjord_vistapoint_1.png



2.6 Current and future use

All the content and materials provided by the partners will be sewn together for use in the geoVR experience. As of May 2016, plans include fixed geoVR stations in a number of locations in Norway and internationally.

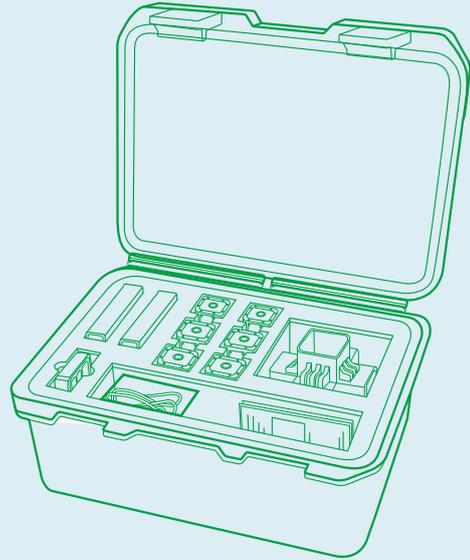
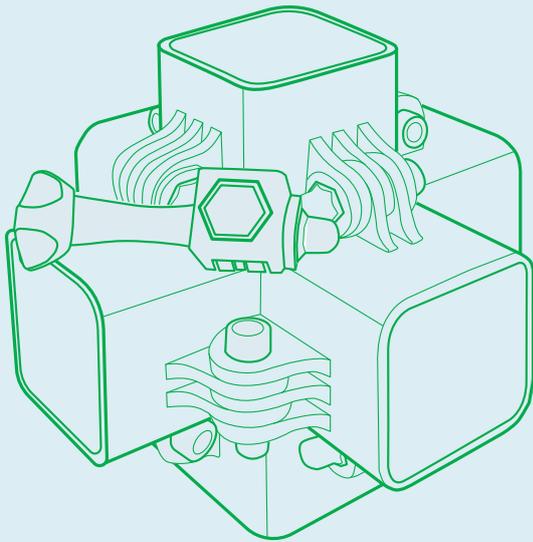
Long-term plans might expand the use and distribution of both the geoVR experience and the content within. Also, as the system develops further, parts of the content might be extracted for use in other geoVR-related solutions.



3.0 How to create content

In this chapter, we will guide you through how to use the available camera rigs and equipment. Methods, techniques and hardware vary greatly from the Sphericam to the GoPro kit.

Please refer to the correct chapter for the equipment at hand.



3.1 The GoPro Kit explained

A powerful option

The GoPro kit (GPK) is a specially designed, custom made camera kit for capture of 360 degree video. Unlike the SpheroCam, the GPK does not offer a single, pre-stitched video feed for post-production, but rather requires a manual extraction of the video footage from each of the six cameras after shooting. Although more time consuming, this method allows for easier postproduction measures for each viewpoint within the stitched spherical video. The kit comes with a pre-paired remote to allow simultaneous recording start on all six cameras.

The video captured by the GPK is of a slightly lower quality than what the SpheroCam offers, but not much. It is an adequate replacement in instances where the SpheroCam is unavailable for the project partners.

The GPK comes in a rugged hardcase with custom inserts. It is of vital importance that the equipment is handled with care and that the equipment parts are placed securely in the allotted slots before and after shoots, as well as under transport.

The GPK is property of Doublethink AS, not Magma Geopark. The project partners have liability for excessive wear and tear of the equipment during rental periods.

The full kit will be available in from April 2016 and will include:

- 1x Heavy duty transportation case with custom inserts
- 6x GoPro Hero4 Session cameras
- 6x 64gb MicroSD memory cards
- 6x MicroSD to SD Card adaptors
- 6x USB connector cables
- 1x GoPro Remote control for automated recording start of all six cameras at once
- 1x Custom made 360 camera rig
- 1x bag of extra screw/connector assemblies and hex key for the camera rig
- 1x GoPro Hero4 Session instruction manual
- 1x GoPro Smart Remote instruction manual
- 2x Silk cleaning cloths for camera lenses
- 2x 12.000mAh powerbanks w/dual USB outputs for on-the-go camera charging



Rental price for the kit is NOK 1.500,- per day ex VAT and transportation fees. For bookings and rental, please contact Pål/ Magma Geopark, who will refer the necessary details to DT prior to shipping.

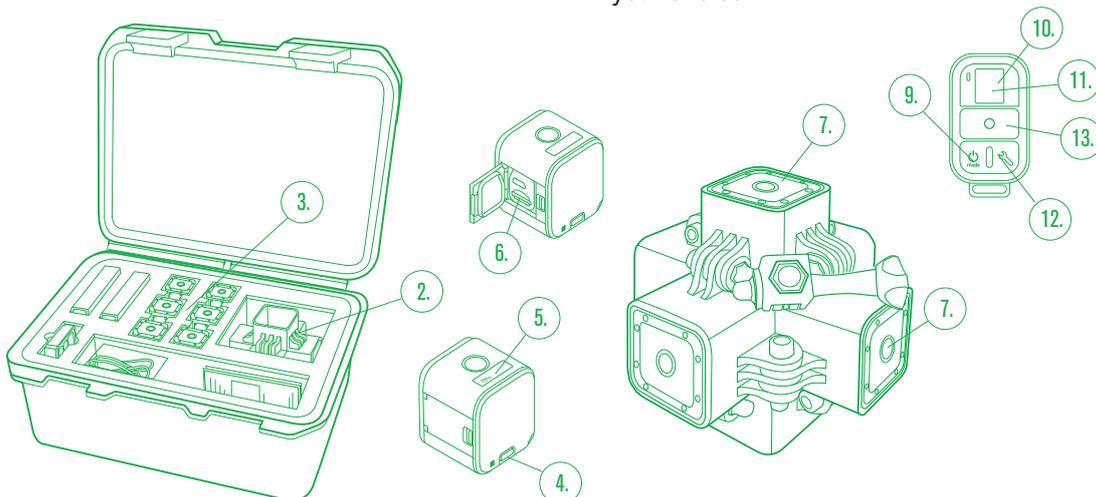
To avoid expedited shipping and transportation fees, double bookings and other unplanned circumstances, please book a minimum of ten days in advance prior to your planned shoots.



3.1.1 Setup and settings before shooting

To ready the GPK for shooting, follow these assembly steps carefully:

1. Open the transportation case. The code for the combination lock is 9-9-8-7
2. Take out the black plastic rig and the six GoPro cameras
3. Press the power button (the small button on the lower back) once on each camera to ensure battery power is sufficient.
4. If battery level is below approximately 70%, please recharge the camera before use.
5. Open the small latch on the right side of each camera to ensure that the memory card is properly installed.
6. Line up the cameras, all in "on" position. **Using the menu, make sure that each camera's shot mode is set to 1440p 30/25 Ultra Wide 1920x1440, 4:3 format, NOT 1080p SuperView. This is VERY important. Anything else will render the footage useless.** For reference, please see the included camera manual.
7. Take out the GoPro Smart Remote and press the main power button on the Smart Remote. Wireless pairing with all six cameras should have been done prior to shipping, but should one or more camera not be registered by the remote, please refer to the re-pairing process in the included Remote Manual
8. Check that the Smart Remote's battery is fully charged. If not, please charge it using the supplied USB charging cable. Do so by sliding and holding the latch lever, then pull the key out of the remote. The USB cable can then be attached.
9. The number of cameras connected will be shown in the display (i.e. "6 cams").
10. By pressing the "Settings" button, you will circle the various capture options. Press until you see the "Video" icon.
11. Press the record button and make sure that all six cameras start recording. If they do, press the record button once more to turn off recording.
12. Place all six cameras in the camera rig with lenses facing outward. Some might be a tight fit, but keep pushing until only the tip of the lens for each camera sticks out of its respective rig compartment.
13. Use a soft cloth to gently wipe all smudges from all six camera lenses.
14. Attach the camera rig to the fixture of your choice.





3.1.2 Things to consider before shooting



Although the GPK is IP67 certified and splash proof, optimal conditions for filming are clear skies, daylight and no rain.

The GoPro Hero4 Session cameras are equipped with two microphones each for sound recording; one in the front and one in the back, to better filter out wind noise. When assembled in the camera rig the back microphones will be even better shielded from weather conditions, but this will also slightly reduce the quality of the sounds recorded by those microphones. We therefore recommend shooting in wind still up to a maximum of medium breeze wind conditions.

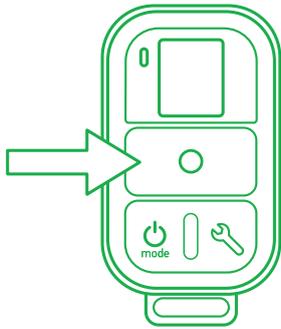
For other considerations when shooting, please refer to chapter 2.2.3 in the GVCCM.





3.2 GoPro: How to shoot

Shooting footage with the GPK is relatively straight forward after assembly:

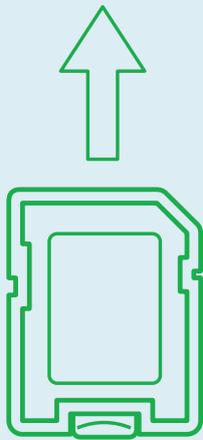


- 1** Press the record button on the remote once to start recording.
- 2** Press the record button on the remote once to stop the recording.

Note: When fully charged, each camera battery should be able to record continuously for approximately 1 hour and 30 minutes.

After you are done shooting your footage, the camera rig will need disassembly. To take the rig apart and place it back in the transport case, please follow these steps:

1. Make sure all cameras are off/not recording.
2. Take out the hex key supplied in the transport case
3. Unscrew all screws for any one of the six camera compartments in the camera rig.
4. Detach the loosened compartment from the other five.
5. You now have access to the back of all the cameras. Using your fingers or any other non-sharp object, gently push the cameras out of their individual compartments one by one.
6. When all six cameras are loose, please refasten the loosened camera compartment using the same screws and tools used to unfasten it.
7. Place all rig components in their respective inserts in the carry case.
8. Lock the case



3.3 Extracting files and sharing content

Once you have completed your shoot/shots, the files must be extracted and sent to Doublethink or other technical partners of the geoVR project. In addition, any and all other related materials for your location must be submitted along with it.

All files and source materials must be submitted electronically. Physical documents, photos or prints will not be accepted nor included in the geoVR solution.

In addition, we urge all partners to exhibit caution with the data recorded, both in terms of project exclusivity and personal privacy. Should any person, property or foreign object (read: not part of the natural scenery) be included, a release form must accompany the footage.

Should this not be included, the footage/material in question will be dismissed and not included in the final geoVR product.

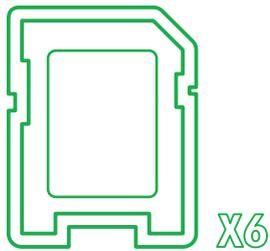


3.3.1 File transfers and services

To transfer the files after shooting, please follow these steps to ensure a safe and reliable transfer:

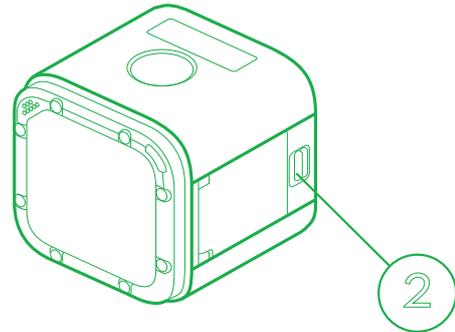
For the GoPro kit:

1



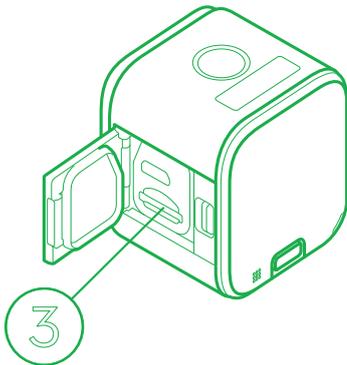
Take out the six SD card adaptors from the transport case

2



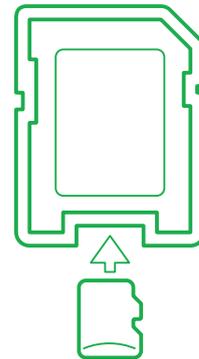
Open the latches on the right side of each camera

3



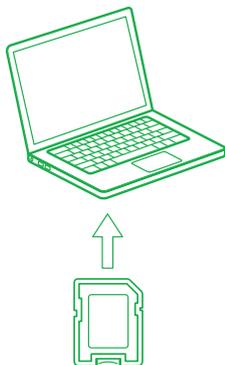
Push once, firmly, on each Micro SD card to release it from the camera.

4



Insert the Micro SD cards in the SD Card adaptors.

5



Use the SC cards adaptors with a suitable PC/computer to transfer the files to your computer.

6



geopark_location_hotspot_001

Label the extracted files in the following manner:
geopark_location_cam1_001
geopark_location_cam2_002 etc.

continued ->

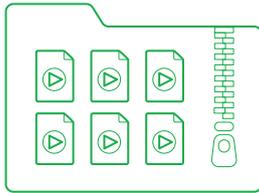


3.6.1 File transfers and services

/continued

For the GoPro kit:

7



geopark_location_hotspot_date (MMDDYY)

Compress the files in a single batch in .zip format. Rename the compressed file like this:
DA_geopark_location_hotspot_1.filename

8

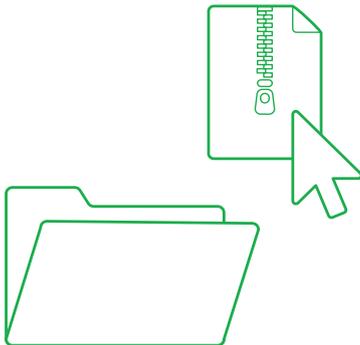


<http://cloud.doublethink.no/>

To transfer the files, please log on to:
cloud.doublethink.no/

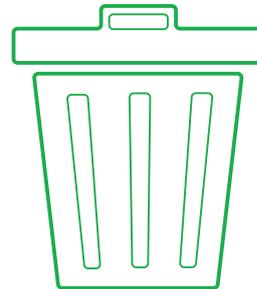
User name: **geovr**
Password: **360content**

9



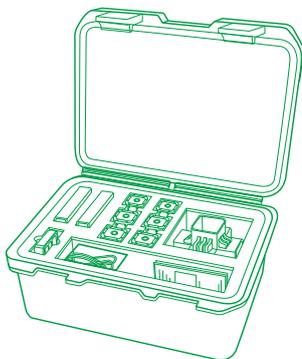
When access is granted, simply drag the files to the folder named "Approved content".

10



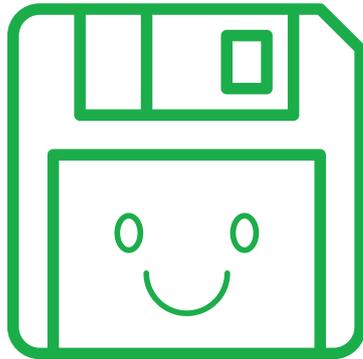
When finished, please delete all content from all memory cards

11



Place all camera kit components back in their respective inserts in the transport case and lock the case.

High fives are now encouraged.



3.3.2 Backups, security and what to remember

Local backup

Nothing is foolproof. This goes for any electronic device. We therefore recommend that all project partners keep a copy of the footage files, documentation, digital imagery and other relevant material locally until the geoVR project has been fully realized.

Partner backup

In addition, we recommend that each project partner keeps a record of all the material designated to be part of the geoVR project in case some files go missing, become corrupted or otherwise suddenly unavailable for the technical partners.

That way it will be easier to go through the archives to locate copies or duplicates.

Encrypted server

We would also like to assure the project partners that all submitted information will be kept on a secure and encrypted server.

No specific partner information will be disclosed to any other party except the technical partner or Magma Geopark without consent.



3.4 How to record voiceover tracks

geoVR will need a voice track for every location to both be fully accessible and offer the best user experiences.

To provide the users with the best experience possible, and also enable more user to benefit from the geoVR experience, the original project partners have agreed that a voice track should be available for every location.

The main language of the geoVR solutions is English, but partners in non-English speaking countries are free to include a second voice over track for their respective languages. A user menu option will then be added to choose between languages. An English track must be provided, however.

As budget limitations excludes the use of professional voice actors in the project, each partner will be responsible for providing their own tracks. Specifications for this is listed in 3.4.1. It is very important that the guidelines are followed, as sub par recordings cannot be included in the final product.

3.4.1 Technical requirements & pointers

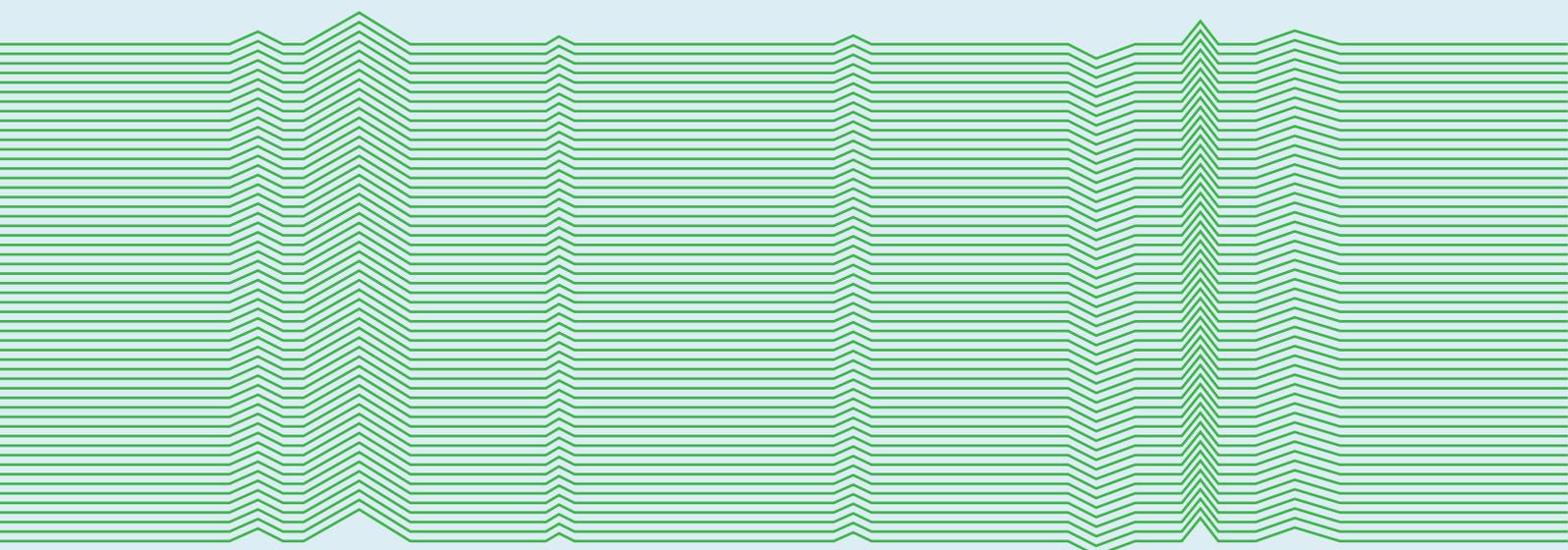
Should you choose to do the voiceover tracks yourselves, there are a few strict guidelines for optimal end results:

- Recording environment must be acoustically treated so no room ambience or reflections can be heard in the recording.
- To catch and remove plosives and breathing noises a Pop-filter should be used during recording.
- Its advisable to use a directional large diaphragm condenser microphone. Dynamic microphones are very sensitive to user and microphone ranges, and is therefore not advised.
- Recording volume should peak at between -18db - 12db. Lower volumes than this produce noticeable hiss or noise in the recordings when limiting for loudness, and are undesirable.
- To achieve gain between -18db - 12db a pre-amplifier should be utilized.
- To reduce fluctuations in volume and create an even signal when recording, a compressor with a low ratio of 3:1 with a threshold of around -24 db, attack time between 1 - 5ms (2ms standard) and release time between 10 - 15ms (12ms standard) should be used. Makeup gain is applied to achieve the -12db range.
- Breaths, clicks, pops, clothing- and mouth noises and sticky lips should not be heard in the recording. **Please remember to speak slowly and clearly at all times!**
- Files should be delivered in wav or aiff format. 24bit, 48000 - 96000 hz.





4.0 Technical information



Working with virtual reality has become easier in recent years, but it is still a medium that requires a high level of both technical expertise and specialized hardware and software.

In this segment we will try to explain, in simpler terms, what some of those elements are.



4.1 A list of common VR abbreviations, phrases and specifications

HMD: Head mounted display

HMDs are the current form of hardware delivering VR experiences to users. It's typically goggles or a helmet of some type, the kind you strap to your face or put on your head. That's where you're viewing the VR experience. For the geoVR, the first iteration plans to implement use of the Oculus Rift, one of the major brands in the VR world.

Head tracking

This term refers to the sensors that keep up with the movement of the user's head and move the images being displayed so that they match the position of the head. In short, if you're wearing an Oculus Rift, for example, head tracking is what lets you look to the left, right, up, or down, and see the world that's been built in those directions. Head tracking is what allows you to explore the geoVR menus and scenery in full 360.

Eye tracking

Eye tracking is similar to head tracking, but matches leans on where the user's eyes are looking. Some HMDs integrate eye tracking within the headset, but the technology is still in its first stages of development.

Field of view (FOV)

Field of view is the angle of degrees in a visual field. Having a higher field of view is important because it contributes to the user having a feeling of immersion in a VR experience. The viewing angle for a healthy human eye is about 200 degrees. So, the bigger that angle is, the more immersive it feels. This does not affect the planned geoVR experience, though, as it is to be designed for full 360 head movement.

Latency

If you try a VR experience the visuals don't quite keep up with how quickly you turn your head, that's latency. It's unpleasant, because that's not something that happens in the real world. That lag is an oft-cited

complaint about VR experiences that aren't up to par for a variety of reasons, but the latest HMDs on the market, combined with powerful PC hardware, reduce latency problems considerably.

Simulator sickness

Simulator sickness is a "conflict" between what your brain and body think they're doing. Your eyes think they move, but your body says "No we are not" and you get nauseated. Science Magazine suggests that this disparity is interpreted as a toxin, and the human body does what it can to get that toxin out, ergo, vomiting. However: Everyone has different thresholds, not everyone gets sick, or as sick as someone else might. For geoVR, we have planned a solution that keeps the possibilities of motion sickness to a minimum.

"Judder"

Outside of virtual reality, judder is a significant shaking. But as for VR it's often referred to as a combination of "smearing" and "strobing" of the visuals inside the HMD.

Refresh rate

When enjoying a virtual reality experience, you're actually looking at a series of images. The refresh rate is how fast those images get updated. Higher refresh rates cut down on lag, and cutting down on lag means there's less of a chance of getting sick. It also means more responsive experiences. The ideal refresh rate for VR is 60 frames per second, but that's not always easy to achieve, as it depends on a number of factors, from hardware to software.

Haptics

Haptics is another word for tactile feedback. In VR, that would mean users feeling like they're touching something that's not really there. Haptics can only be achieved using external peripherals like gloves, pressure suits, wind cannons or other elements.



/continued

Presence

Like previously stated: The goal of VR is to create immersion. Presence is what's achieved when that happens. In other words: It's the feeling user get when the VR experience is very good.

Social VR

This term refers to a type of app that aims to create a shared VR space where users can interact with each other and even participate in activities. This does not yet apply to geoVR, but can be implemented in the future.

Cinematic VR

Cinematic VR is VR that is created using "real" image and footage, not just 3D environments. CVR is a large part of geoVR.

360 video

There is actually a difference between virtual reality and 360-degree video, though the two overlap. The latter is less immersive and typically keeps the viewer in a fixed point surrounded by roughly 360 degrees of video. This is what you get when you try VR through YouTube or many mobile phone-based HMDs.

Stitching

Stitching is the process of taking footage from different cameras and combining that footage into spherical video. The process usually involves reorienting video, placing seams, and generally editing it so that it looks like one continuous view, rather than a patchwork of angles. For geoVR, that step is eliminated when using the Sphericam but needed when using the GoPro kit.

VR face

The slightly embarrassing, slack-jawed look people get on their face when they wear an HMD. It's a joy to watch, and very often a good photo op.

MR - Mixed Reality

"Mixed reality" (MR), sometimes referred to as hybrid reality, is the merging of real and virtual worlds to produce new environments and visualizations where physical and digital objects co-exist and interact in real time. Mixed reality takes place not only in the physical world or the virtual world, but is a mix of reality and virtual reality, encompassing both augmented reality and augmented virtuality.



5.0 Disclaimer

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6.0 Service and support

For any questions related to the geoVR project in general, please contact:

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6.1 Revisions, content updates and accessibility

The GVCCM will be updated as the geoVR project advances. Should a revision of the GVCCM become available, a new PDF download link will be announced to all active project partners through Magma Geopark.

An updated download link will also be available on the developer blog at:

<http://developer.doublethink.no/Magma/>

A printed version of the GVCCM will be available in a limited run. The run will be repeated should major updates and/or revisions be made. For a printed copy of the manual, please contact Magma Geopark.

Good luck, and thank you for contributing to opening up the treasures of the world to a brand new audience.

Best regards,

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