



Panoramic Photography in ANRA's Water Quality Monitoring Program

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Disclaimer

The equipment and software referred to in this presentation are identified for informational purposes only. Identification of specific products does not imply recommendation of or endorsement by the Angelina and Neches River Authority, nor does it imply that the products so identified are necessarily the best available for the purpose. All information presented regarding equipment and software, including specifications and photographs, were acquired from publicly-available sources.



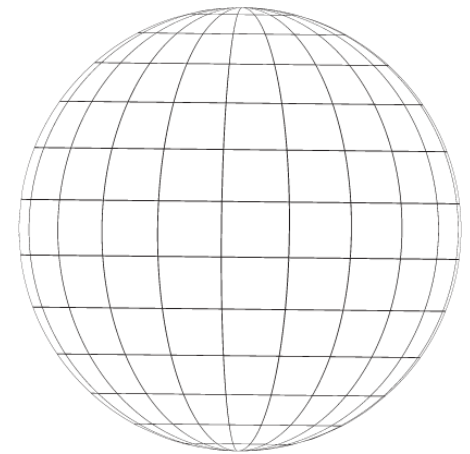
Background

- As part of our routine monitoring activities, standard practice has been to take photographs of the areas upstream and downstream of the monitoring station.
- Beginning in the second quarter of FY 2011, we began creating panoramic images at our monitoring stations.
- The panoramic images have a 360° field of view and can be viewed interactively in a web browser.
- Initially these panoramas were captured using a smartphone.
- Currently we're using a digital SLR camera, fisheye lens, specialized rotating tripod mount, and a professional software suite to create and publish the panoramas.



Basic Terminology

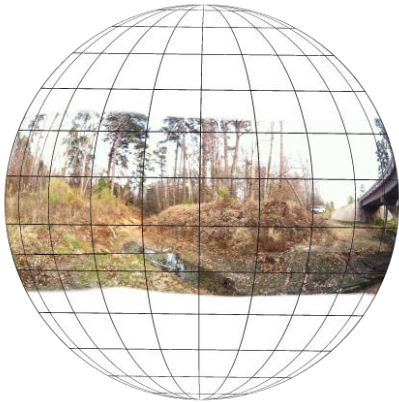
- Field of View (FOV), Zenith, Nadir
 - When we talk about panoramas, we use the term **Field of View** to describe how much of the scene we can capture.
 - FOV is described as two numbers; a Horizontal FOV and a Vertical FOV.
 - To help visualize what the numbers represent, imagine standing directly in the center of a sphere, looking at the inside surface.
 - We recognize 180 degrees of surface from the highest point (the **Zenith**) to the lowest point (the **Nadir**). 180 degrees is the Maximum Vertical FOV.
 - We also recognize 360 degrees of surface horizontally around the equatorial line (we'll call this the horizon) 360 degrees is the Maximum Horizontal FOV.



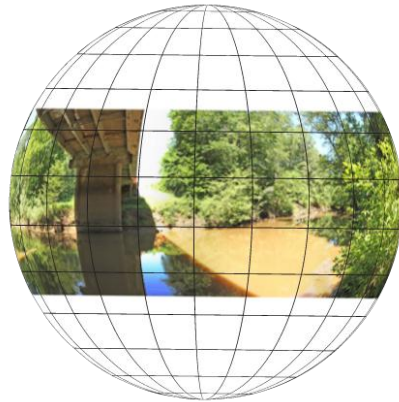


Basic Terminology

All of the panoramas that we will discuss today cover the full 360 degrees of Horizontal Field of View, but the Vertical Field of View varies depending on the equipment and methodology.



iPhone
43° VFOV



DSLR 18mm Lens
45° VFOV



DSLR Fisheye Lens
146° VFOV



DSLR Fisheye Lens
w/ Zenith & Nadir
Full 180° VFOV



Benefits and Potential Uses of Panoramic Photographs

- Upstream, Downstream, Left Bank, and Right Bank photographs combined into one interactive image (useful for RUAA process).
- If creating fully spherical panoramas, you have the ability to view the zenith (canopy) and nadir (substrate).
- Interactive nature of the panoramas allows for rotating and zooming in order to better observe such things as weather/cloud coverage, pool reach, drought effects, pollution sources or illegal dumping, signs of contact recreation, etc.
- Because each panorama is done in conjunction with a monitoring event, the panoramas can be linked back to monitoring data to determine representativeness of monitoring conditions.
- Panoramas are made publically available on ANRA's website.



Example of Panoramic Photograph Showing Contact Recreation Use

10630 – ANGELINA RIVER AT SH 21 (08-10-2011)

http://www.anra.org/divisions/water_quality/crp/monitoring_sites/10630/10630.html





Creating Panoramic Photographs

- Equipment

- Smartphone such as an iPhone or Android device, or
- Digital camera with a standard lens, or
- Digital camera with a wide-angle or fisheye lens

- Accessories

- Tripod
- Panoramic rotator (a specialized tripod mount designed for capturing panoramas)

- Software

- Mobile Apps (Occipital 360, Microsoft Photosynth, DerManDar)
- PC/Mac/Linux software (AutoPano, PTgui, Hugin, Microsoft ICE, Enfuse GUI)

- Considerations

- Wind making items in scene move
- Taking photos on a moving platform (such as a boat)
- Taking photos with widely varying light (such as under a bridge on a sunny day)

- Process

- **Smartphone**
 - Capture Panorama
 - Upload to website
- **Digital Camera**
 - Take photographs
 - Blend exposures
 - Stitch photographs
 - Convert to web-compatible format
 - Upload to website



Example of a Panorama Created Using a Digital Camera with a Standard Lens

10865 – NECHES RIVER AT US 69 (04-12-2011)

http://www.anra.org/divisions/water_quality/crp/monitoring_sites/10585/10585.html



Panorama compiled from 16 individual images

File Size:	18 MB
Pixel Dimensions:	15754 X 7877

ANGELINA & NECHES RIVER AUTHORITY



Example of a Panorama Created Using a Digital Camera with a Fisheye Lens

10478 – CEDAR CREEK AT FM 2497 (08-02-2011)

http://www.anra.org/divisions/water_quality/crp/monitoring_sites/10478/10478.html



Panorama compiled from 7 individual images

File Size:	16.6 MB
Pixel Dimensions:	12334 X 6167



Equipment Currently Used by ANRA

Camera

- Canon EOS Rebel T2i 18 MP CMOS APS-C Digital SLR Camera



- Current Price (as of 12/1/11): **\$605.00**

Fisheye Lens

- Rokinon FE8M-C 8mm F3.5 Fisheye Lens for Canon



- Current Price (as of 12/1/11): **\$249.00**



Accessories Currently Used by ANRA

Panoramic Rotating Head

- Nodal Ninja 3 MKII



- Current Price (as of 12/1/11): **\$209.95**

Tripod

- Dolica AX620B100 62-Inch Proline Tripod and Ball Head



- Current Price (as of 12/1/11): **\$39.25**



Software Currently Used by ANRA

Image Stitching Software

- Kolor AutoPano Giga 2.5



autopano giga

- Current Price (as of 12/1/11): **\$268.00**

Virtual Tour Software

- Kolor PanoTour Pro 1.7



- Current Price (as of 12/1/11): **\$403.00**



- Kolor AutoPano Giga 2.5 + PanoTour Pro 1.7 Bundle
- Current Price (as of 12/1/11): **\$647.00**

www.kolor.com



Approximate Total Cost (Equipment and Software)



Camera	\$ 605
Fisheye Lens	\$ 250
Rotator	\$ 210
Tripod	\$ 40
Software	<u>\$ 650</u>
TOTAL	\$ 1,755



An example of potentially increased usefulness

- It is also possible to link panoramas together in order to “travel” upstream or downstream (similar to Google Street View)
- <http://test.anra.org/test/cedar/>





A Few More Interesting Examples



Attoyac at 21



Jack Creek at 2497



Lake Ratcliff



Piney Creek at 358



Future Plans – The Big Picture

- Work with other agencies (River Authorities, TCEQ, TSSWCB, etc.) to help them incorporate this process into their own monitoring plans
 - Provide technical assistance and/or training
 - Development of standard operating procedures
- Improve the usefulness of the data to the RUAA and WPP processes, TMDL, CRP, and SWQM programs, WQS, etc.
- Explore the possibility of creating a statewide inventory of monitoring site panoramic photographs (similar to what is being done with the Coordinated Monitoring Schedule)
 - Possible Issues:
 - Participation
 - Distributed vs. Consolidated approach
 - Technical considerations (steep learning curve, file transfers, hosting, etc.)
 - Resource allocation and staffing issues
 - Sources of funding



Questions? Comments?





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