FACEBOOK SURROUND 360

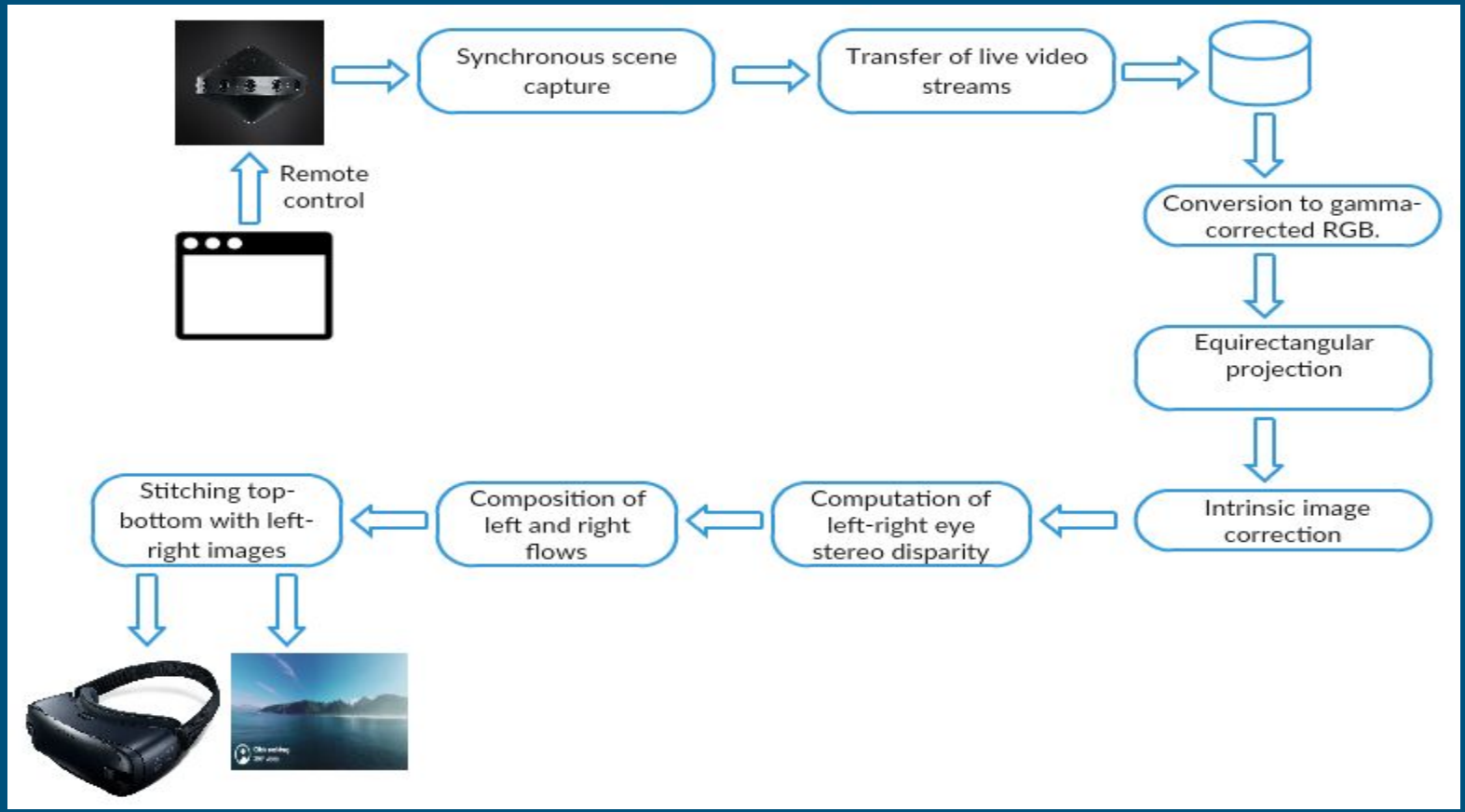
A durable and high quality 3D-360 camera system

MOTIVATION

- Connecting through VR is an amazing, immersive experience
- Facebook’s contribution to 3D-360 ecosystem.
- Open sourcing the camera design and stitching code
- Unlock ideas and innovate faster

GENERAL ABSTRACT

Surround360 is a hardware and software system for capturing and rendering 3D (stereo) 360 videos and photos, suitable for viewing in VR.



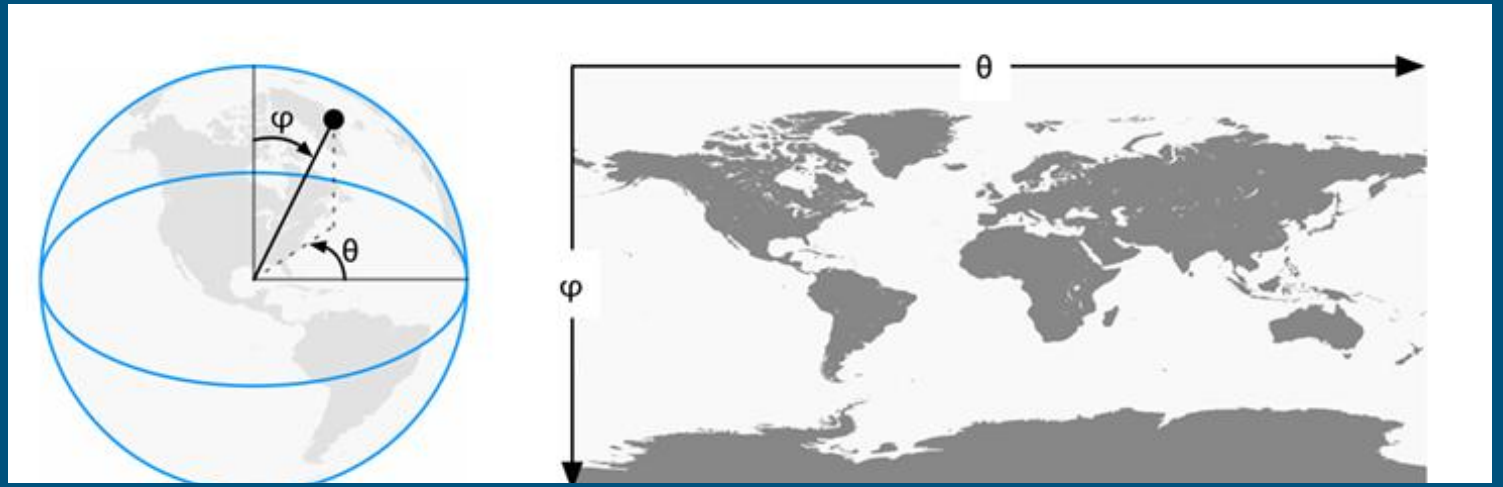
ARCHITECTURE

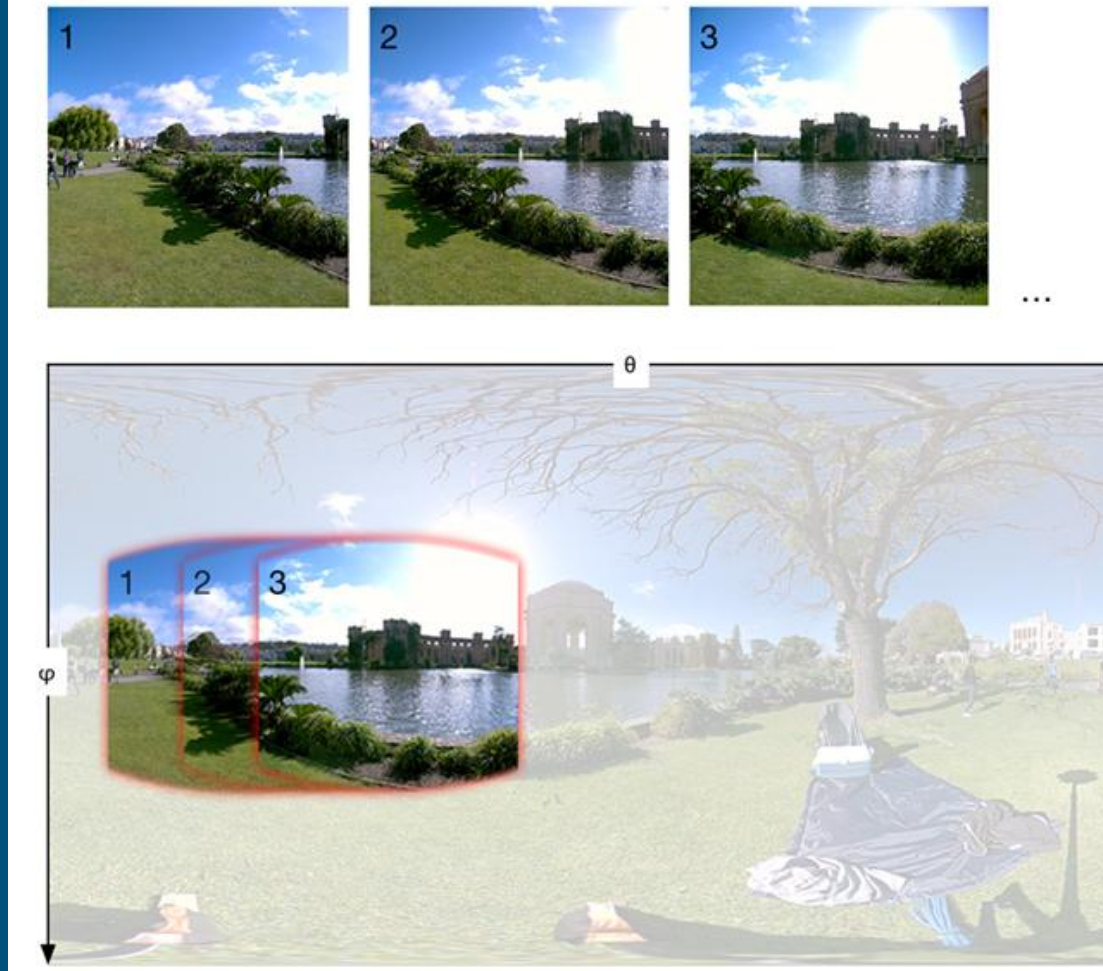
METHODOLOGY

- Capture and storage
  - Synchronous screen capture
  - Transfer of live video streams from all cameras to disk
- Stitching
  - Conversion of raw Bayer input images to gamma-corrected RGB

METHODOLOGY

- Equirectangular projection

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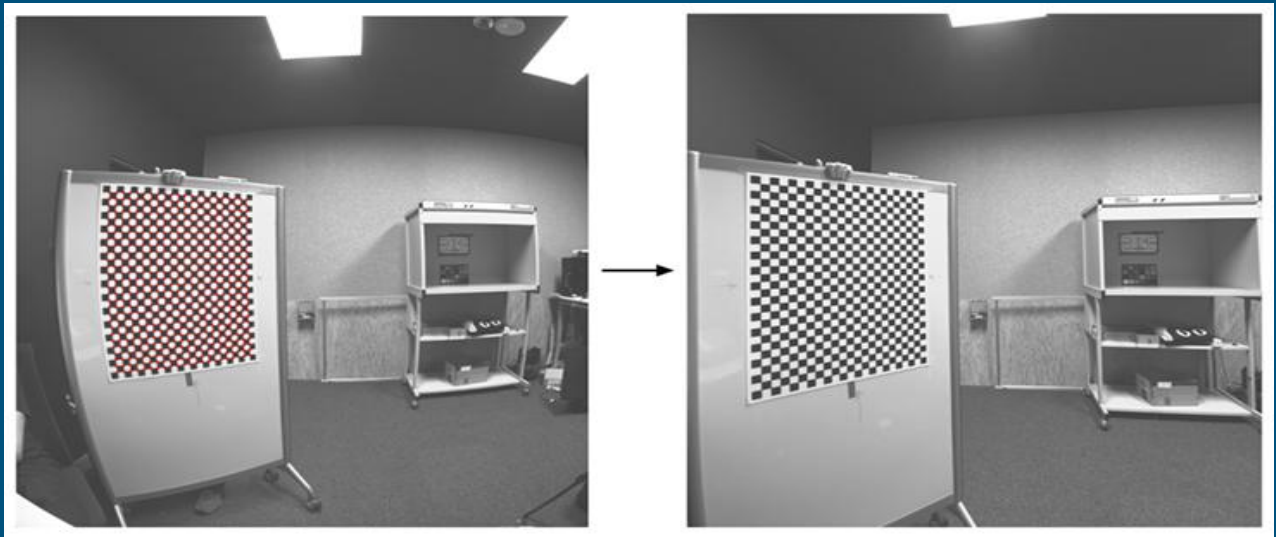
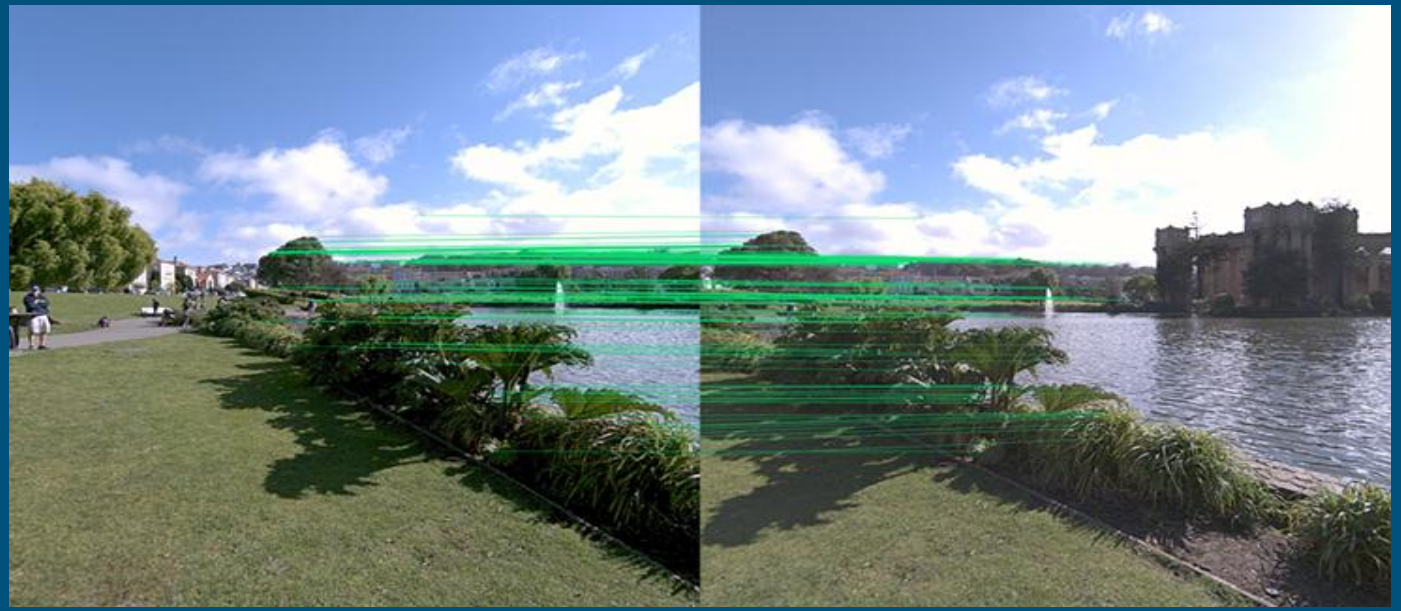
METHODOLOGY

- Intrinsic image correction to remove lens distortion



METHODOLOGY

- Correct for rotational or translational misalignment of the camera/lens/mounting system



METHODOLOGY

- Computation of left-right eye stereo disparity and composition of left and right flows.

METHODOLOGY

- Stitch the top camera with the side camera left/right images
- 2 bottom images are fused and then stitched to left/right images

SPECIFICATIONS

- Hardware
  - 17 globally synchronized cameras
    - 14 wide-angle lens
    - 3 fisheye lens
  - Aluminium chassis
  - VR headsets such as the Oculus Rift and Gear VR
- Software and storage
  - Linux-based PC
  - 8-way level-5 RAID SSD disk system
  - HTML browser

SIMILAR APPLICATIONS

Monoscopic 360

- Resultant images are flat and much like a still photo
  - 2 or more cameras
- Stitching errors can be tolerated

Stereoscopic 360

- 3D-360 video
  - 2 cameras - left and right eye
  - 10 - 20 cameras in every direction
- Stitching must be near perfect

SIMILAR APPLICATIONS

Facebook 360

- Very durable
- Very expensive
- Requires some knowledge to put together
- 360-degree video is spherical
- High quality video

Kodak SP360

- Excellent durability
  - Dust, shock, freeze proof
- Easy motion-detection
- 360-degree video is circular
- 360-degree video is poor

SIMILAR APPLICATIONS

Facebook 360

- Setup is tedious
- Better stitching
- Browser or VR
- High quality video
- Hard to carry

Samsung Gear 360

- Very easy to setup and use
- Can connect and edit wirelessly
- Familiar to Samsung users
- Poor stitching
- Only compatible with samsung flagships
- Blur quality
- Hard to carry

SIMILAR APPLICATIONS

Facebook Surround 360

- Less portable
- No real-time preview
- Sturdy camera
- Expensive

LG 360 CAM

- Highly portable
- Real-time live preview via smartphone app
- Easy to accidentally damage the device
- Less expensive

ADVANTAGES

- Open source
- Durable, high quality
- Reduces post-production effort and time
- Building on top of an optical flow algorithm produces superior results
- Professional-grade end-to-end system
- Off-the-shelf hardware
- Benefits VR content producers and artists
- Allows for minutes to hours of continuous capture

DRAWBACKS

- Not available for purchase
- More cameras
  - Increase in the volume of captured data (120GB/min) and bandwidth
- Expensive
- Less portability

How it is superior than the existing applications?

- All the existing 3D-360 video cameras
  - Proprietary
  - Available only by special request
  - Fundamentally unreliable as an end-to-end system
  - Cameras overheat
  - Longer stitching time
- Provides 360-degree x 180-degree coverage

THANK YOU!