



SECOORA

Technical Session 1: Hardware

Friday, October 11, 9:00 - 9:40 AM

Session overview

Lead(s) = Theo Jass, SECOORA; Paul Ganev & Dennis Murphy, Surfline;
Jeremy Cothran, USC

Format

Case study then short presentations on topics followed by open discussions
(interactive discussions with slides)

Topics

Case study: Yaquina Bay, Oregon (NANOOS)

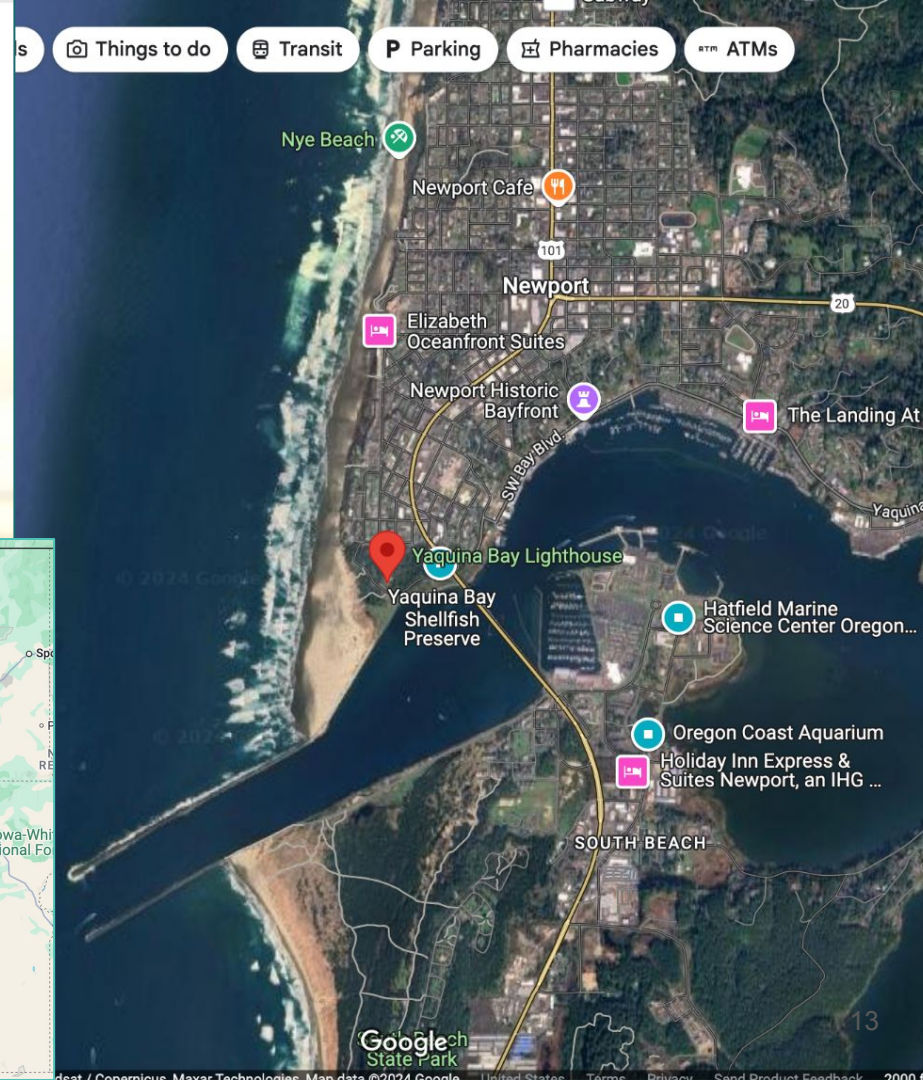
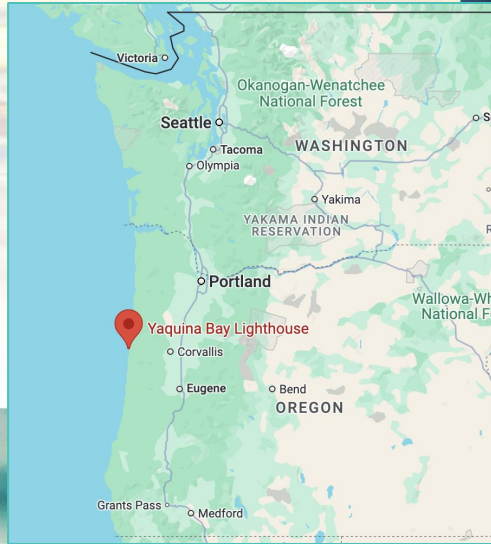
Hardware: framerate, resolution, field of view, types of cameras, etc.

- a. What tech is good & also cost-effective?
- b. Durability?



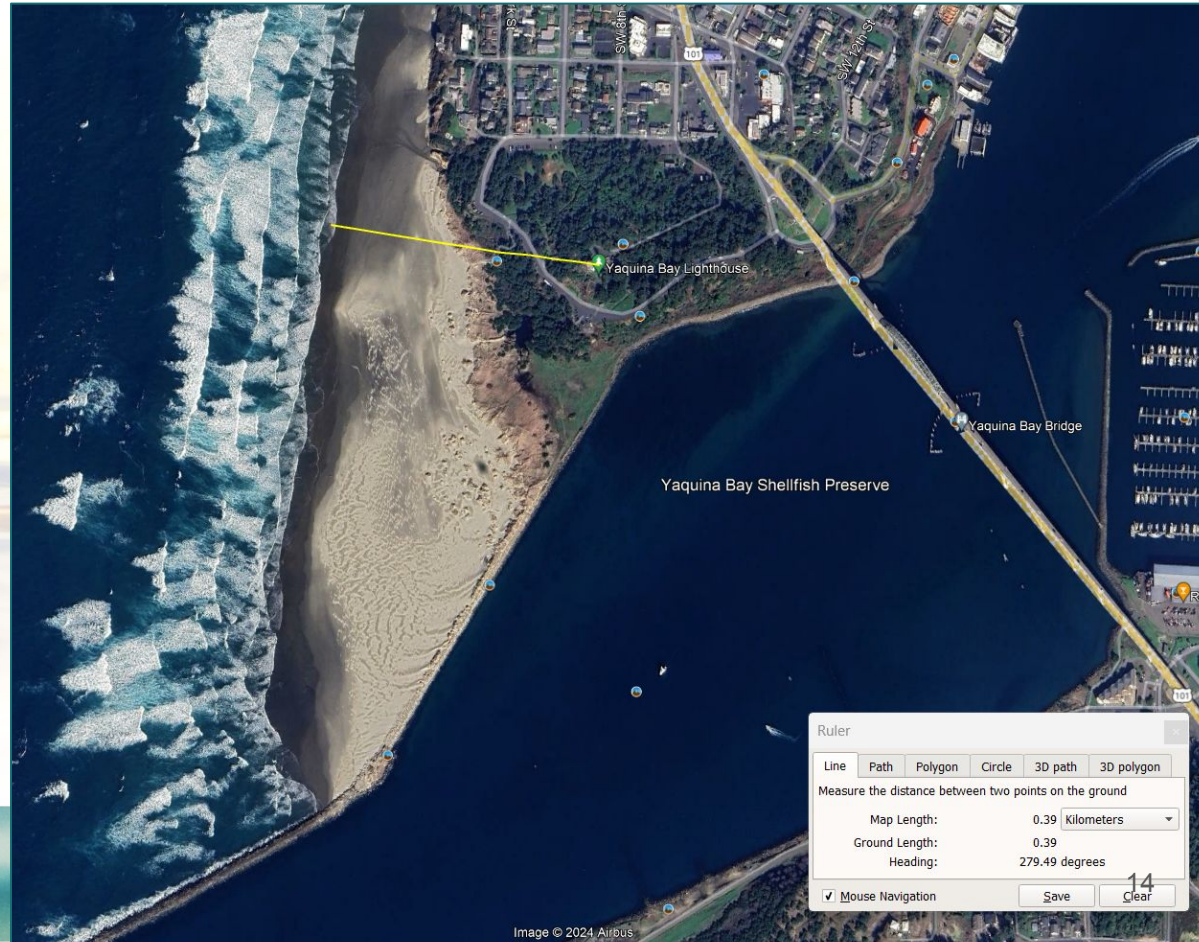
Case study: Yaquina Bay, NANOOS

- [Newport, OR](#)
- Rip currents
- Beach Use
- Steep bluffs = erosion but not much flooding



Case study: Yaquina Bay, NANOOS

- Distance to shoreline = ~400m
- ~60m above MLLW
- Field of view: west or northwest of lighthouse, to see the beach on the outer coast



Case study: Yaquina Bay, NANOOS

- On [USCG tower](#) next to Yaquina Bay Lighthouse
- Colocated with X-band radar
- USCG camera there for other purposes (DOT tripcheck) = new installation
- Power available w/ USCG office



Yaquina photos (thanks Randy!)



Site photo



Yaquina photos (thanks Randy!)



USCG camera



Yaquina photos (thanks Randy!)



227 degree angle



Yaquina photos (thanks Randy!)



248 degree angle



Yaquina photos (thanks Randy!)



269 degree angle



Yaquina photos (thanks Randy!)



331 degree angle



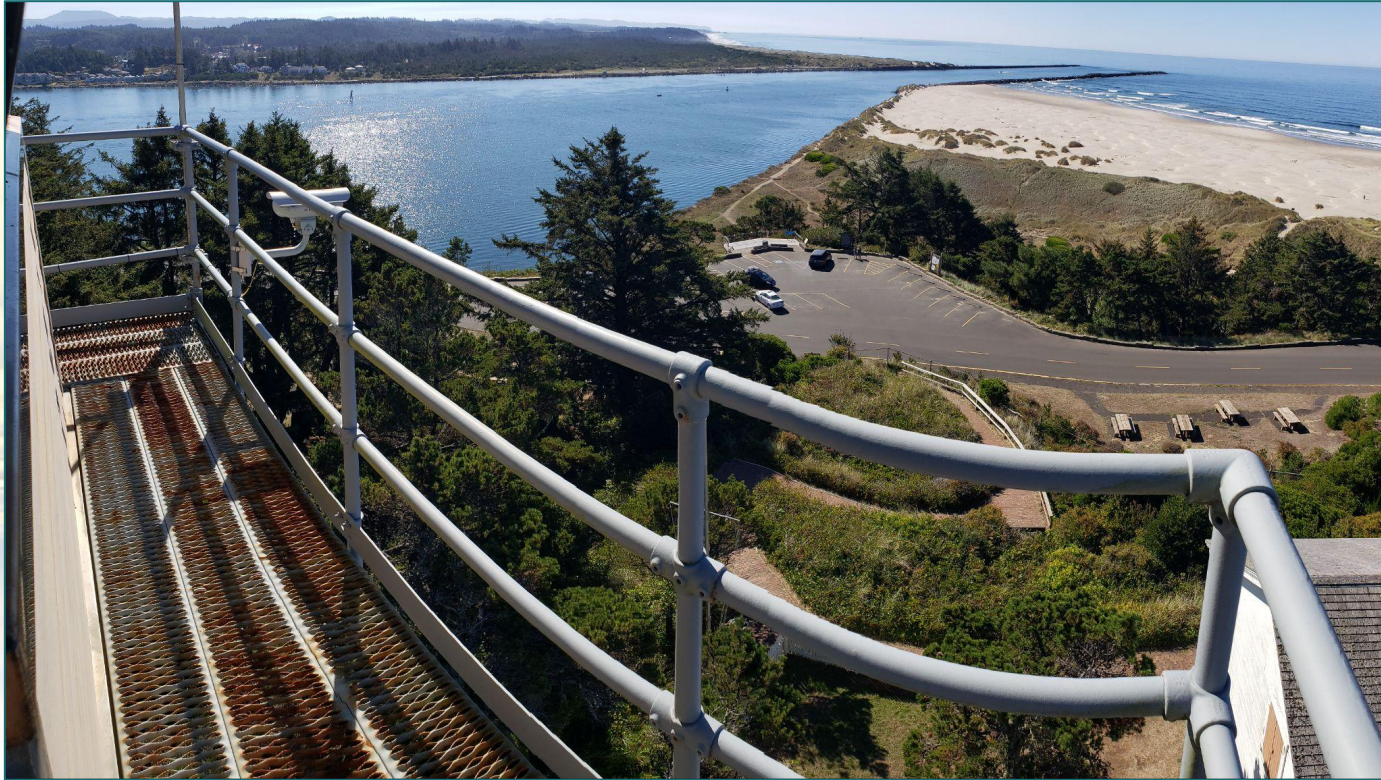
Yaquina photos (thanks Randy!)



347 degree angle



Yaquina photos (thanks Randy!)

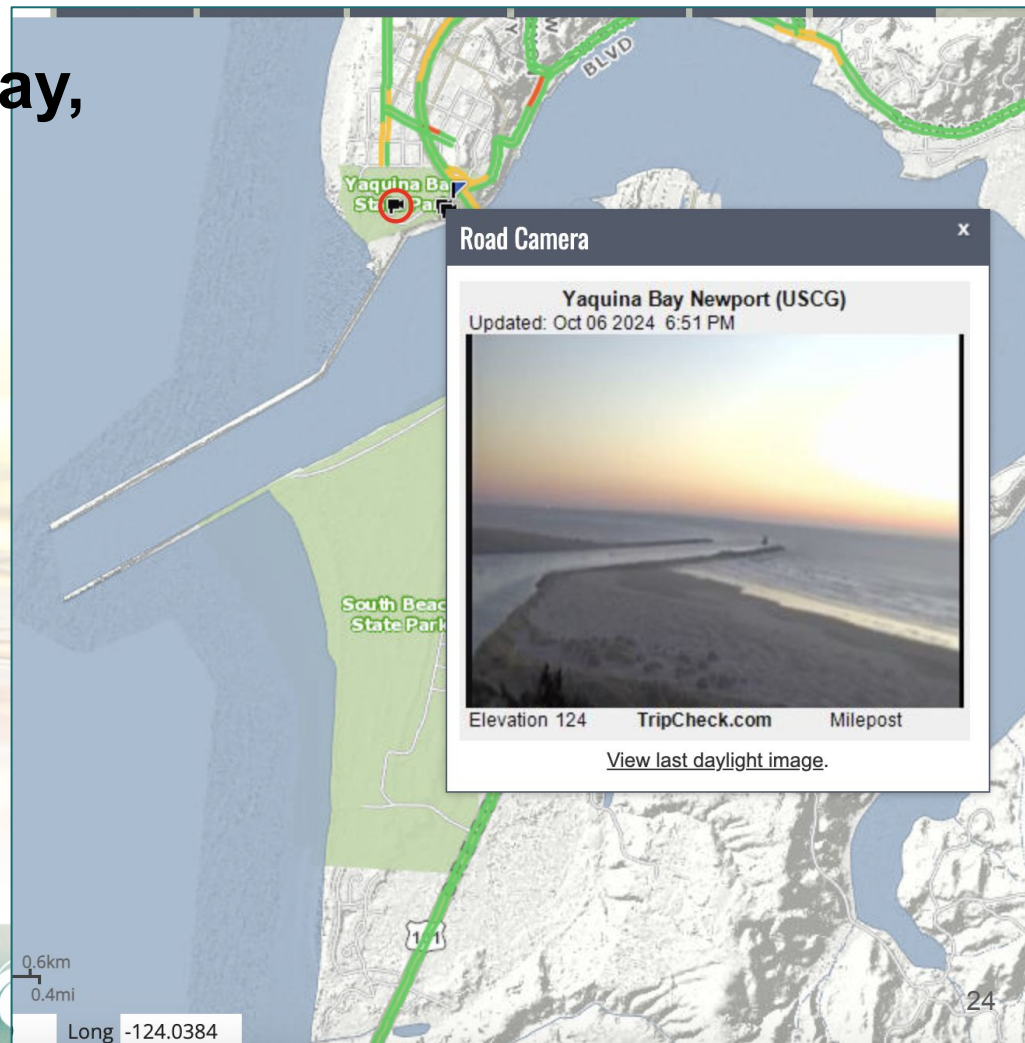


Front rail panoramic view



Case study: Yaquina Bay, NANOOS

- TripCheck camera = low resolution
- Some fog & glare in the photo



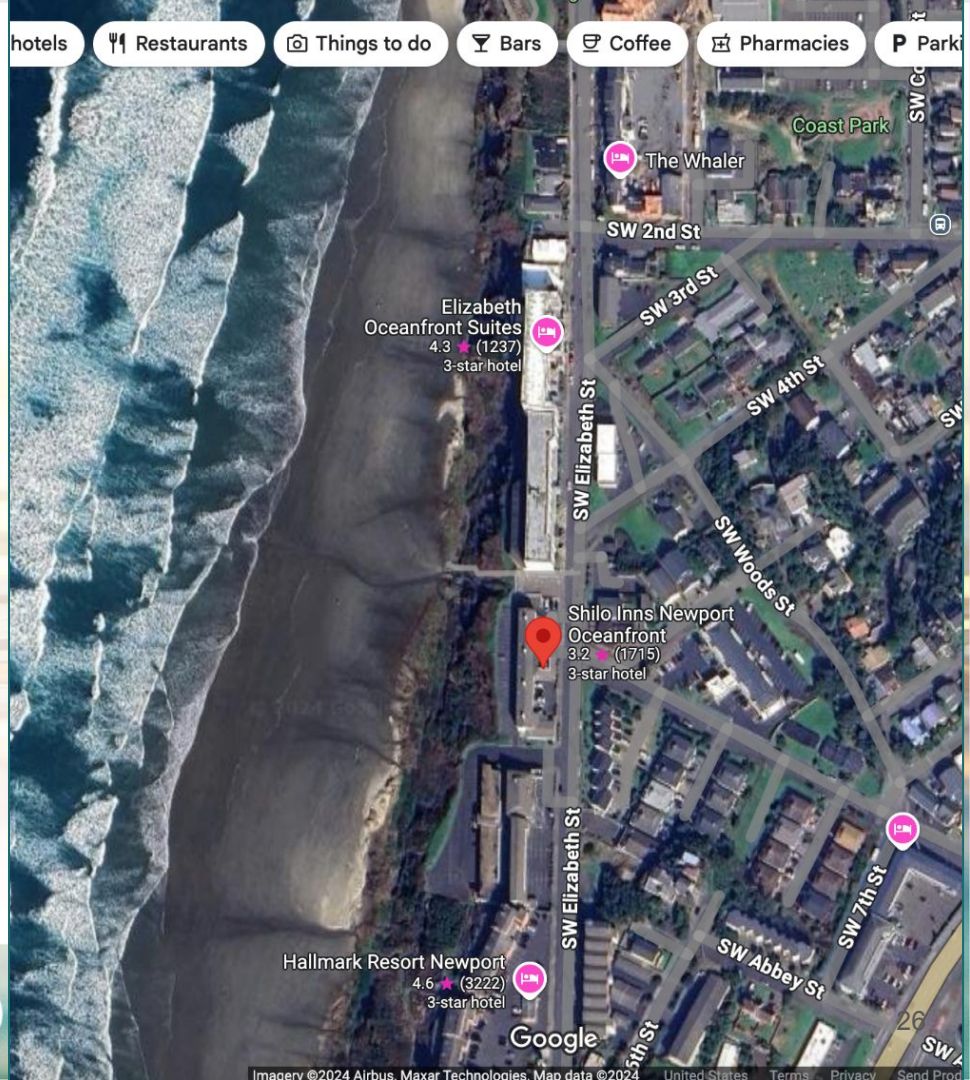
Considerations & challenges: Yaquina Bay

- Distance from surf for rips?
- Zoom- camera shake?
 - Focal length/zoom of camera
- Sample footage for resolution
- Polarizing filter for glare?
- View?
- Partners: USCG?



Yaquina Bay: backup site

- If the view from the tower is not ideal for rip currents, we could approach [Shilo Inns](#).
- OSU has had temporary cameras on the roof there before- they may be open to a permanent installation.

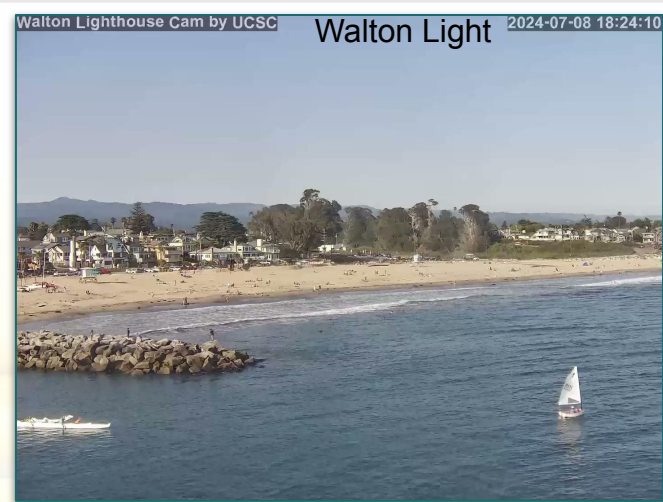


Technical requirements for different product applications

<u>Application</u>	<u>Video/ snapshot</u>	<u>Elevation</u>	<u>PTZ</u>	<u>Other</u>
Rip current detection	Video	As high as possible, close to surf zone	Stationary cams preferred. If PTZ, hold 10+ minutes in any 1 position.	<ul style="list-style-type: none"> • Disable built-in AI for people detection & tracking • Prefer cams with options for glare reduction (e.g. polarizing filter mounts, or dome material).
Urban/ infrastructure flood monitoring	Snapshot or video	Higher preferred	PTZ cams acceptable to maximize coverage. Hold 10+ minutes in any 1 position	-
Wave runup, shoreline tracking, erosion observations	Video desirable, snapshots can provide some info	High = max view area; Low still useful	Stationary cams preferred. If PTZ, hold 10+ minutes in any 1 position	-
People or animal counting	Snapshot or video	High = max view area; Low still useful	PTZ cams acceptable to maximize coverage. Hold 10+ minutes in any 1 position	<ul style="list-style-type: none"> • Counted objects w/in 100yds

Framerate: frames per second

- Min/max requirements
 - Default = 20 fps
- By application
- Still images/snapshots
 - Common intervals = 1, 10, 15 min
 - Default = 10 min
 - Consider changes during events
- Tradeoffs w/ bandwidth, data storage
- Streaming video preferred- benefits greatest range of uses
- Snapshot cams still useful, may be preferred for some use cases



Resolution: how many pixels?

- “# MP” vs “#####p” vs “##### x #####”
- Minimum requirements
 - 2 MP/1920x1080 minimum
 - 4-8 MP adequate w/in 100yds
 - 5 MP/2560x1920 = good balance between data size & image quality
- Some cameras have higher capabilities than we are using- this is inefficient
- ~30x30px for object detection
- Rips need context & depend on angle
- Tradeoffs w/ data storage

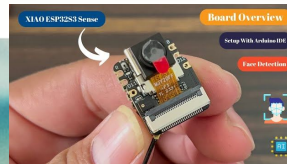


WebCOOS framerate & resolution

Camera	Photo resolution	Photo p	Video resolution	Video p	Video FPS
Oak Island east	2048 × 1536	1536	2048 × 1536	1536	20
Oak Island west	2048 × 1536	1536	2048 × 1536	1536	20
Currituck Hampton inn	2688 × 1520	1520	2688 × 1520	1520	20
Currituck Sailfish	2688 × 1520	1520	2688 × 1520	1520	20
Sheraton Waikiki	1920 × 1080	1080	1920 × 1080	1080	20
Beaufort Duke Marine lab	1920 × 1080	1080	1920 × 1080	1080	10
Charleston Harbor	1920 × 1080	1080	1920 × 1080	1080	10
Holland MI	1920 × 1080	1080	1920 × 1080	1080	25
Jennette's North	2592 × 1944	1944	2592 × 1944	1944	30
Jennette's South	2592 × 1944	1944	2592 × 1944	1944	28
North inlet Winyah bay	1920 × 1080	1080	1920 × 1080	1080	25
Point Reyes TMMC	1920 × 1080	1080	1920 × 1080	1080	15
SC Maritime museum	1536 × 576	576	1536 × 576	576	20
UNCW dock North	3840 × 2160	2160	1920 × 1080	1080	5
UNCW dock south	3840 × 2160	2160	1920 × 1080	1080	5
Walton Light	2560 × 1920	1920	1440 × 1080	1080	5
Cocoa beach	2560 × 1440	1440	1920 × 1080	1080	5
Horace Caldwell TX	1920 × 1080	1080	1920 × 1080	1080	15
Masonboro	1920 × 1080	1080	1920 × 1080	1080	5
Folly 6th	3280 × 2464	2464	-	-	-
Rosemont Peace 1	3280 × 2464	2464	-	-	-
Rosemont Peace 2	2560 × 1920	1920	-	-	-
Rosemont Peonie	2560 × 1920	1920	-	-	-
LAMC	2560 × 1920	1920	-	-	-

Types of cameras

- IP/Network cameras
- Currently in WebCOOS:
 - Fixed-view
 - Bullet
 - Pan-Tilt-Zoom (PTZ)
 - Dual/Panoramic/wide-angle: up to 180deg FOV
- Not currently in WebCOOS:
 - Dome
 - Turret
 - Fisheye
- More expensive PTZ (pan-tilt-zoom) cams or scientific grade [Argus cams](#) often provide the best quality imagery (resolution, limited distortion, etc.)
- Inexpensive cams (security cams, trail cams, raspberry pi home built cams) can still provide useful imagery
- Microprocessors can be paired w/ other sensors - rain gauge, water level(acoustic distance)



Features: what is required?

- IR/night vision
 - Can use night vision to see overnight flooding (Charleston, Beaufort)
 - For 24/7 recording, need IR/NV or good ambient lighting
 - Motion sensors/night vision may not be desirable if camera is powered w/ solar + battery.
- Motion sensors?
- Varifocal lens
- Optical vs Digital zoom
 - Optical can be OK if absolutely needed
 - Camera shake will be more noticeable with greater optical zoom.
 - Digital should be avoided.
- NVR (Network Video Recorder)
- ONVIF (Open Network Video Interface Forum) a global initiative standard (supported features) for IP-based communication
- Preferred included streaming protocol = RTSP (Real Time Streaming Protocol)
 - More easily allows access & capture of video feed w/ IP address, username, password



Durability: how long will it last?

- Indoor/outdoor rating
- IP rating: water resistance
 - IP66 = 100 L/min for 3min
 - IP67 = 1m deep for 30min
- IK rating: impact resistance
 - IK10 = “vandal resistant”
(20 J = 5kg from 40cm)
- Temperature ratings
- Warranties



UNCW CMS Dock S



Charleston Harbor



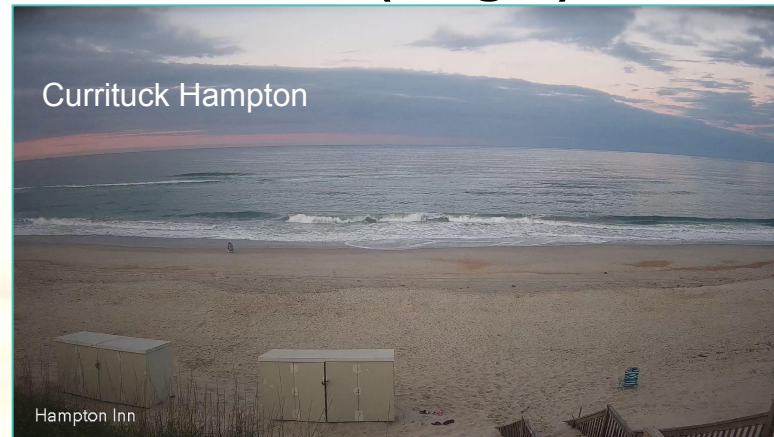
Compliance

- NDAA: National Defense Authorization Act 2019, section 889
 - 5 Chinese companies (& subsidiaries, affiliates, components, including HiSilicon chipset) prohibited
 - Some known “good” companies (though check on individual models before buying)
- TAA: Trade Agreements Act
- Buy American Act
- Special Award Conditions



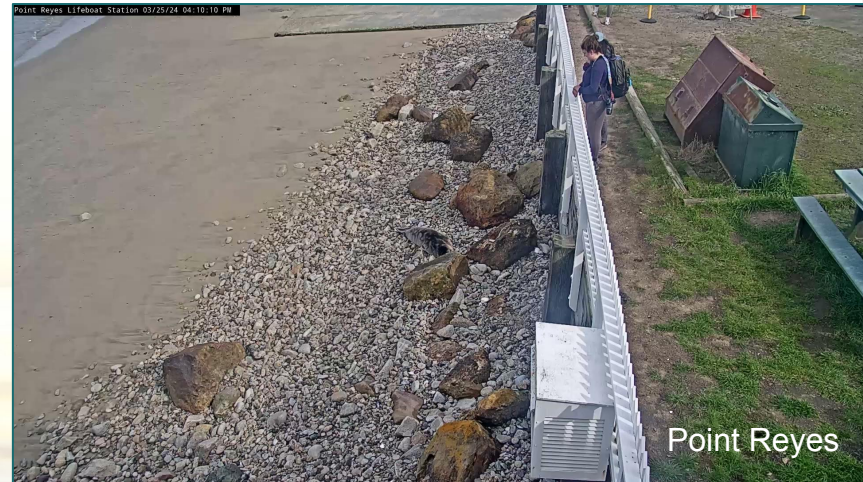
Field of View (FoV): what does the camera see? (Angle)

- Alongshore vs offshore vs vertical
- Area of interest straight in line with the cam, towards center of viewing area
 - Features on edge of the viewing area can be more distorted, have less pixel-per-feature resolution & move out of frame if camera shifts
- Avoid obstructions: fences, trees, buildings, paths, people, cars (Perm. structures can be measure points)
- Elevated camera pointing downward captures more details of interest
 - Minimizing occlusions
 - Greater focus on area of interest



Field of View (FoV): what does the camera see? (Zoom)

- Zoom/Fixed vs PTZ
- Generally less camera movement is better
 - For some uses (e.g. rip detection, shoreline tracking), stationary cams highly preferred
- Minimize zooming
 - Optical zoom can be OK
 - Camera shake more noticeable w/ greater optical zoom.
 - Avoid digital zoom



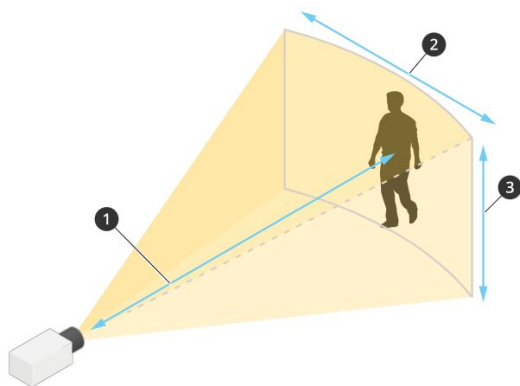
Field of View (FoV): what does the camera see? (Pan/tilt)

- P&T can be preferable w/ some use cases for max coverage (e.g. people or animal counting), but should be minimized if possible.
 - If panning/tilting, hold at set, consistent positions: 10+ minutes in any 1 position.
 - Times of holds should be consistent w/in the hour (e.g. :00 to :10 for position 1, from :10 to :20 for position 2, etc.) so the videos can be easily separated in post-processing.



Lens Selection and FoV

Focal length is fixed



Requirement	px/m	Fulfilled
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Detect	25	✓
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Observe	63	✓
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Recognize	125	✗
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Identify	250	✗
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Lens Selection

