WTIC – Crowd Sourcing Projects

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Crowd Sourcing Visibility Information

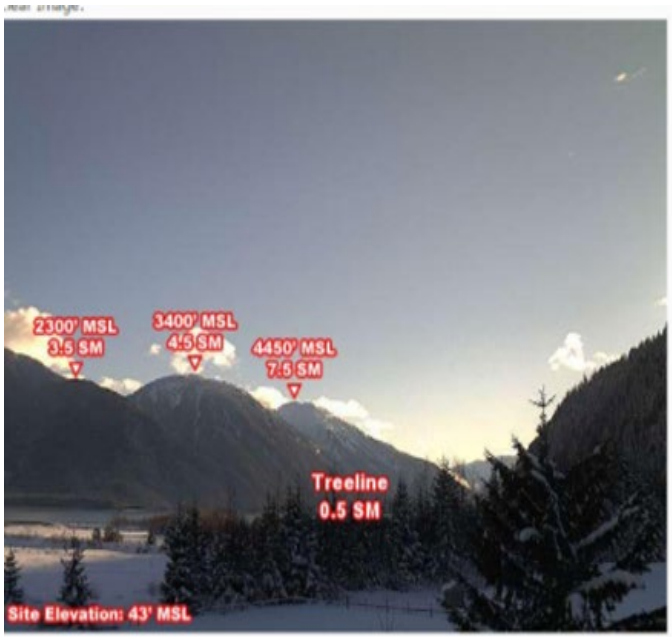
- **Goals**
  - Determine whether Crowd Sourcing weather information using cameras produces useful visibility information
  - Prototype Crowd Source architecture for visibility information using Alaska Webcams
  - Evaluate outputs of crowd sourcing for pilot utility
    - Investigate potential for use as model observation inputs
    - Compare utility of crowd source output to Webcam images

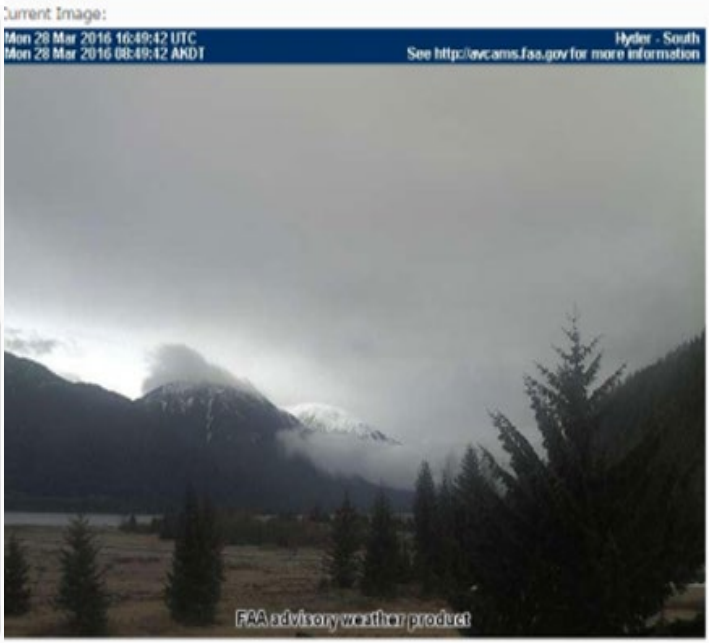
Crowd Sourcing Visibility Information

- **Human Intelligence Task - Example**

Instructions

For the images below, use the clear air image as a reference and estimate the ground visibility (in Statute Miles) in the current image. If the image is entirely obscured, set a value of 0.0. If the visibility exceeds the scale, just set the maximum value of the scale.





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Crowd Sourcing Visibility Findings

- **Summary of Findings**

  - 81.4% of the visibility results were within 20% of the ASOS visibility
  - 16.5% were between 20% and 50%
  - 2% were more than 50% from ASOS visibility
  - ASOS results may not always provide maximum utility to pilots in “challenging” visibility conditions
    - Pilot assessments of visibility conditions varied greatly
  - Some cameras are not good choices for crowd sourcing

Crowd Sourcing Visibility Findings

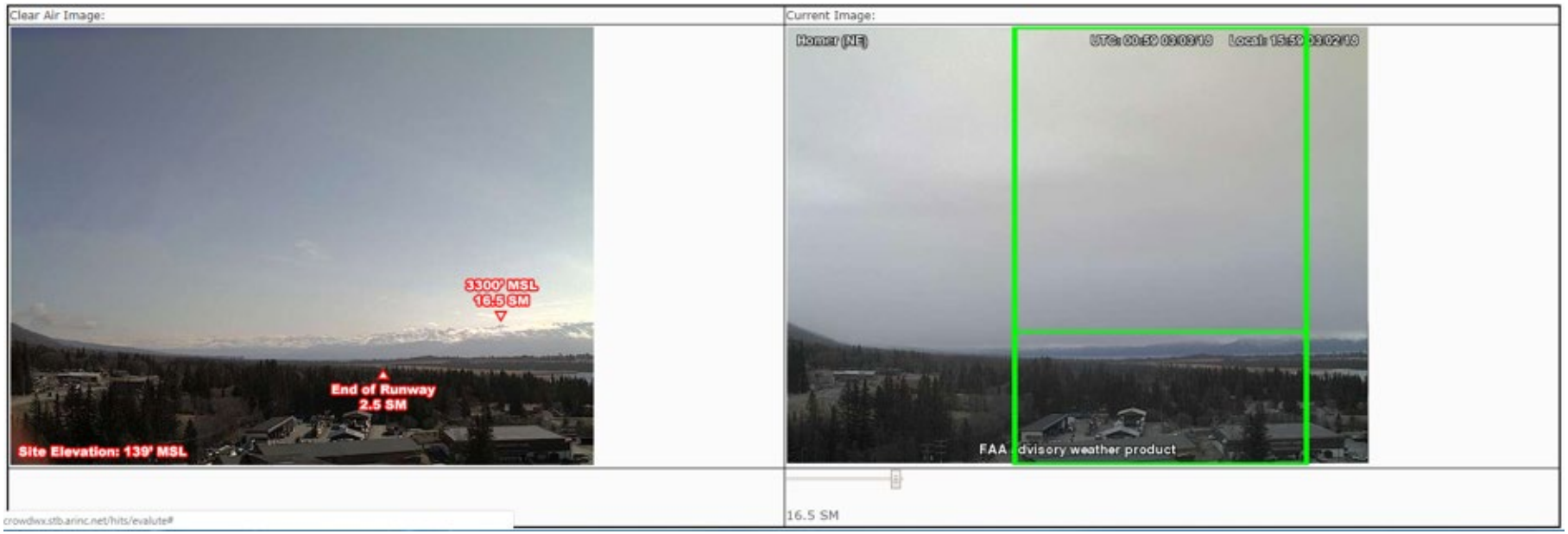
- Recently completed successful demonstration of hybrid solution using edge detection software and crowd sourcing
  - Edge detection used to measure visibility in certain conditions, monitors for changing conditions, and controls switch for sending images to the crowd to process when needed
  - Hybrid solution significantly reduced the amount of crowd sourcing needed
  - Looking at ways to get “volunteer” crowds to further lower costs
  - “Selective crowd” likely to result in faster convergence and high confidence
  - Adding additional logic to maximize quality and efficiency, and minimize costs

Crowd Sourcing - Ceiling

- Goal: Determine whether crowd-sourcing can be used to get useful ceiling information.
- A web-based interface was created for the selective crowd to provide ceiling assessments on Alaska Camera images.
- The strategy is to allow the crowd worker use the mouse to select the bottom of clouds relative to the marker location.

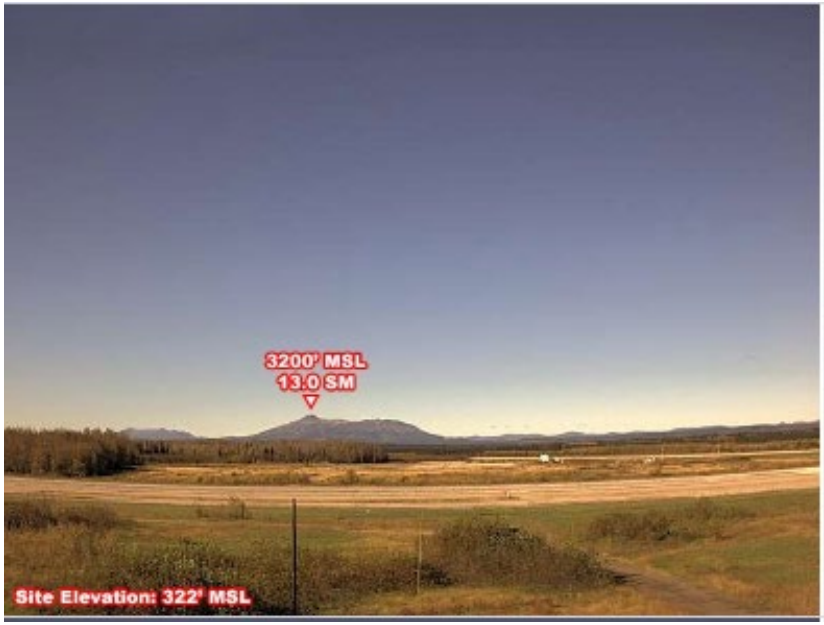
Crowd Sourcing - Ceiling

- Ceiling Assessment Interface



Crowd Sourcing - Ceiling

- Ceiling 3122 ft. MSL at Marker location



walterc	10191-1520439660	10191	2018-03-07T16:21:00	2018-09-14T20:20:00	2018-09-14T20:20:00	2.5	3122

Crowd Sourcing Wind Information

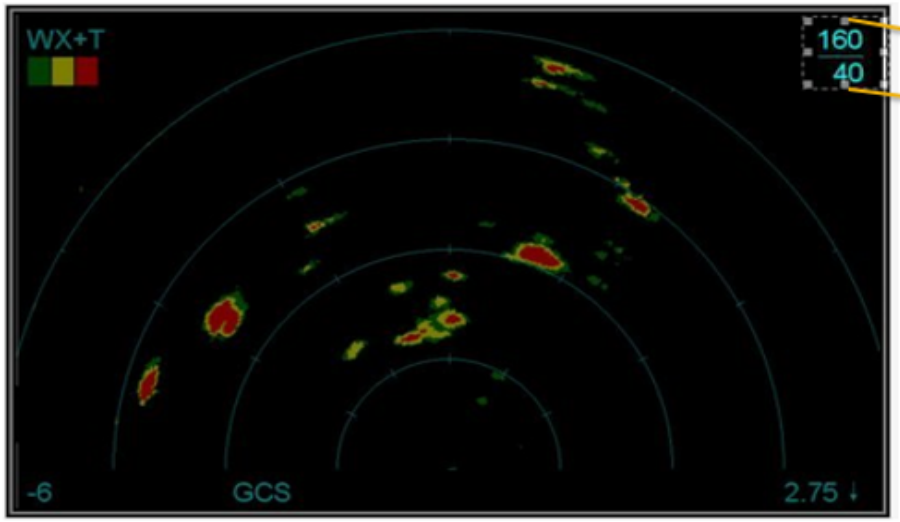
- Research employing convolutional neural network (CNN) machine learning techniques to determine answers to the questions:
  - What are the key challenges involved in automating the determination of surface wind speed and direction over runways at uncontrolled airports using a single web camera?
  - What are the requirements on the configuration/placement of the web camera in relation to the wind sock to obtain the highest quality information?
  - What is the expected reproducibility of the results?

Crowd Sourcing Wind Information

- Successful feasibility study using Harris Helios product and analytics to calculate wind speed and direction via a camera pointed at a wind sock
- Study identified camera position and performance for optimum results
- Analytics also detected issues with windsocks
- Additional imagery and training of analytics would improve results
- Applications and additional research under review

Crowd Sourcing – “Photo PIREPs”

- Forward Looking Radar – Optical Character Recognition



Source WxR Image Graphic

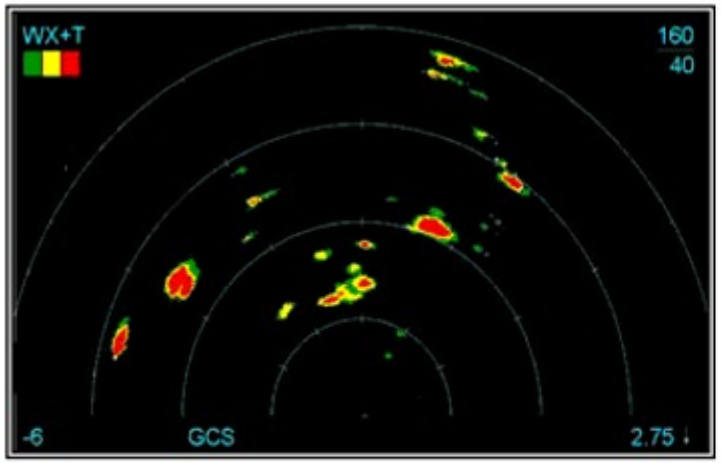
http://www.newocr.com/

160
40

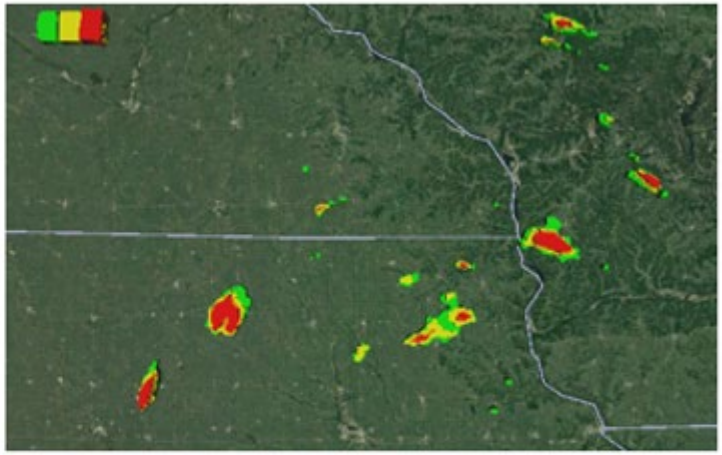
FreeWare OCR software extracting Range and Range Ring Distance Information from Source Image

Crowd Sourcing – “Photo PIREPs”

- Forward Looking Radar – Object Classification



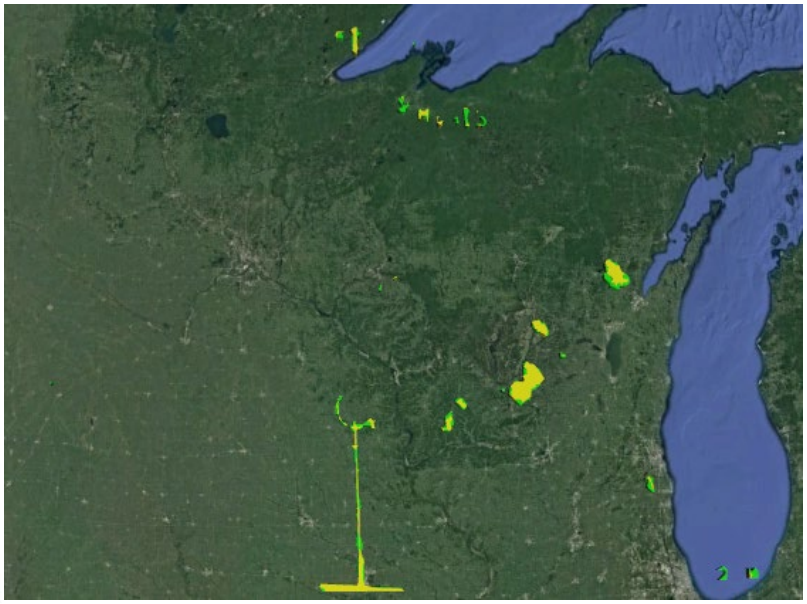
Source WxR Image Graphic



Weather Cells Segmented and Georeferenced (Displayed in Google Earth)

Crowd Sourcing – “Photo PIREPs”

Pilot photo on Airbus A320 (High glare)



Weather Extraction Results (Missing weather due to glare)

Crowd Source - Challenges

- System for storage and dissemination
  - Cloud, CSS Wx, NWS, third parties, airlines???
- What should be used as “truth” or “goodness rating” for crowd sourcing outputs
- How much airborne Wx radar coverage provides benefit in Alaska or other remote areas
- Availability of free crowd labor
- Should crowd sourcing trying to emulate ASOS or enhance utility of information for pilots

“MET Visibility” versus “Aviation Visibility”

ASOS = 4 mi

CrS = 3.8 mi

“MET Visibility” versus “Aviation Visibility”

ASOS = 9 mi

CrS = 2.0 mi

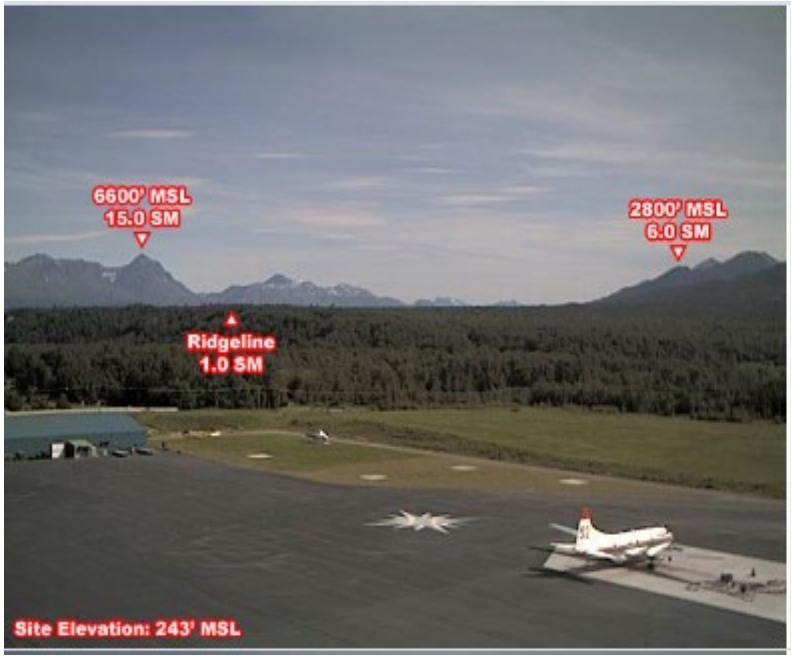
NOTE: MAX ASOS visibility is 10 miles

“MET Visibility” versus “Aviation Visibility”

ASOS = 1 mi

CrS = 1.0 mi

“MET Visibility” versus “Aviation Visibility”



ASOS = 8 mi

CrS = 2.0 mi

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“MET Visibility” versus “Aviation Visibility”

- Can crowd sourcing provide more utility than “MET Visibility?”

ASOS = 8 mi

CrS = 2.0 mi

Mtn obs at 6 Mi, 15 mi