Satellite-based post-storm disaster monitoring with high-resolution SAR data

Demo Day Handout
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The project with Live-EO provides an opportunity to demo the use of imagery from a growing number of satellites for quick insights into the extent of the damage from a tornado or windstorm at Ameren and FortisBC.
About the Technology

- LiveEO identifies storm damages to the grid in near real time using AI-based change detection
- High-resolution synthetic aperture radar (SAR) data in 3 m and 0.5 m resolutions is used for this purpose, because it is not affected by cloud cover
- Individual detections and heatmaps of damage extent are provided shortly after the event
Project Scope

Questions:
1. How long does it take to task and capture synthetic-aperture radar (SAR) satellite imagery?
2. What is the time period required to acquire and analyze the imagery?
3. How accurate are the analytics used to detect changes in the ROW, such as downed trees and damaged utility assets?

Proof of speed
- When notified about a storm, LiveEO acquires satellite imagery
- LiveEO performs rapid AI-based change detection and delivers results
- After successful project:
  ● Automation of storm notification
  ● Large-scale coverage
  ● Integrating results in damage cleanup processes

Proof of accuracy
- Utility acquires ground truth data in the analyzed location
- LiveEO performs comparison and provides accuracy report
Learnings to Date

Options for timing of before-storm image capture:

- **Immediately before storm**
  - *Pro:* Few issues with different directions / viewing angles
  - *Con:* Potential delays in non-automated process

- **Set point in time in advance**
  - *Pro:* Only post-storm image needs to be captured in time
  - *Con:* Restrictions on post-storm imagery that can be used, higher likelihood of false positive detections

- **In advance with option to acquire additional image before storm**
  - *Pro:* Highest reduction of uncertainty
  - *Con:* Potentially higher imagery costs

Current main challenge: pre-storm image timing

Scope Changes

- Larger number of AOIs and imagery acquisitions for FortisBC

Other challenges

- Missed one storm because of delays in data sharing
Learnings to Date

- Ameren notified LiveEO of a storm in the Peoria area in mid-August
- The proof of speed has been successfully performed

1. Before the storm
   - Notification 1.5h
   - Operator confirmation 5.5h
   - Pre-storm acquisition

2. After the storm
   - Post-storm acquisition 17h
   - Result delivery
Learnings to Date

- Pre-storm and post-storm images were taken in opposing orbits, resulting in viewing angle and direction differences
- This led to an increase in false positives
- 32% of AOI has been detected as changes
Learnings to Date

Examples for plausible changes:
Adjustments and next steps

- LiveEO will perform an additional analysis for Ameren, in which imagery with matching directions and angles will be used.
- Pre-storm imagery for the next analyses has been acquired for both Ameren and FortisBC.
- We are currently waiting for suitable storm events to occur.
- The project team has agreed to make accuracy the priority for the next analyses if there is a trade off with speed (e.g. where it comes to acquisition times).
Our Team

Ameren Representatives:
Scott Hixson, Grid of the Future and Analytics Solutions Manager
Travis Herman, Contractor Services Supervisor

FortisBC Representative:
Mike Leyland, Manager, Innovative Initiatives

LiveEO Representative:
Dennis Schmargon, Head of Business Development

EPRI Representative:
Jared Green, Sr. Technical Leader

Our Team Meetings

Biweekly, Thursday 10:30 AM EDT
To get added to meeting, contact Jared Green (jgreen@epri.com)