Torchlight: Automating the Art of Tactical Wildfire Mapping

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Fort McMurray 2016
Gap analysis and background

Fort McMurray highlighted many issues we were already aware of

“…infrared perimeter mapping services were not available when requested, which prevented the use of this tool in the first few days when smoke was a major issue in determining the location of the wildfire perimeter. … This speaks to the need to make these arrangements sooner or in advance of the fire season whenever possible.”

“Satellite images are not available in real time and are not generally used to support ongoing suppression activities; rather they are available for single points in time and are useful for strategy and planning.”
Tactical Wildfire Mapping Systems (TWFMS)

- In 2017 the Canadian Forest Service launched Canada’s first national tactical fire mapping service

- NIROPS/Aircraft 3-like product

- It is ONLY available for emergency situations, where there is an imminent threat to life, infrastructure or values

- In 2017 TWFMS was first deployed for “proof of concept” to support the state of emergency in BC, beginning the first week of July

- That deployment persisted for 72 days
  - Data provided 58 days
  - ~215 separate maps produced
The primary outputs are high resolution fire perimeters.

Shown here as compared to MODIS buffered hotspots.
Tactical Wildfire Mapping Systems (TWFMS)

- also provides polygons mapping areas of:
  - Intense heat (possibly flaming)
  - Scattered heat (dense smouldering)
  - Isolated heat (isolated smouldering or spot fires)

- Products are delivered as GIS shapefiles and as google earth kmz files for easy distribution
The precision will allow you to known which side of the road its on…. For when that is an important factor.
Tactical Wildfire Mapping Systems (TWFMS)

- Heat based product, vulnerable to cloud obscuration
- No cost to end user

BUT...

- The first deployment required over 2000 man-hours to accommodate the 72 day state of emergency....
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Information NOT Imagery

Intense Heat  = flaming combustion
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Scattered Heat = smoldering combustion
Information NOT Imagery

- **Intense Heat** = flaming combustion
- **Scattered Heat** = smoldering combustion
- **Isolated Heat** = small heat clusters at least 10m from other clusters
Torchlight: Automating the art of tactical wildfire mapping

- Emergency use only
- Overnight tactical mapping service with data delivery prior to 7am local time
- Data released as shapefiles and as kmz files
- Requires little human intervention, and soon will be fully automated
- Uses a blend of computer vision and contextual remote sensing algorithms
- Highly efficient (executes in under 5min on fires up to 100K ha)
- Adaptable to most forms of airborne IR and is currently being modified for alternative data sources
A sign in Alban, Ont., says what many residents of the area are thinking as firefighters continue to battle a blaze south of Sudbury. (Francis Ferland/CBC)
PAR-33 Torchlight Deployment
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Critical Successes:

1. The province dedicated people from their R&D division to facilitate data distribution and tech-transfer

2. Data was delivered directly to the IMTs as well as to other departments

3. Kmz maps were directly imported into crews avenza app and used on the fire line

4. Smoke prevented conventional mapping

5. Torchlight was used to brief the highest levels of government

6. The province documented feedback and uses thoroughly

7. A joint AAR is being held in Nov

8. SOP guidelines for other provinces are being developed for use next year
Enhancements to the algorithms

• Converting to stand-alone python script

• Adding a contextual filter to the front end to enhance sensitivity
  ○ And possibly a new category of “cooling”

• Human structure detection and classification
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Thank you

Questions?