SAR SYMPOSIUM

Automatic Object Recognition in High Resolution SAR imagery

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SAR-ATR: What is it about?



Annotated object list

- Object class
- Position
- Confidence level

Formats

- XML
- ESRI Shapefile
- GeoJSON

Definition of Terms (according to STANAG 3769)

ATR = Automatic Target Detection / Recognition / Identification

Imagery Interpretation Levels:

Detection

Discovering of the existence of an object, but without recognition of the object

Recognition

Ability to fix the identify of a feature or object on imagery within a group type, i.g. tanker, cargo vessel

Identification

Ability to place the identify to a feature or object on imagery as a precise type, i.g. "Frigate xy Class"





ΝΕΧΤ

CO3D Zephyr TerraSAR-X Neo

RADAR CONSTELLATION

OPTICAL CONSTELLATION

Constellation - Earth Observation:

An unrivalled constellation



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Operational benefits of AI / ML

Microsoft's Deep Learning Project Outperforms Humans In Image Recognition

Michael Thomsen Former Contributor © I write about tech, video games, science and culture.

TECH

Follow

https://www.forbes.com/sites/michaelthomsen/2015/02/19/microsofts-deep-learningproject-outperforms-humans-in-image-recognition/?sh=c5acbfd740ba BUT: question is not if ATR is better than an human analyst Key is if ATR provides operational benefits compared to a solution without ATR, e.g. by

- workload reduction
- scanning through large data sets
- improvement of insights (e.g. by data fusion)



Imagery



...

Automatic Target Recognition with Artificial Intelligence



IMINT analytics

Operator Assistance to determine action

Airbus SAR-ATR Landscape



and the

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ATR-Toolbox: Off-The-Shelf Detectors

		Generic Vessels	Military Aircraft RUS/CHN	Naval Vessels RUS/CHN	Generic Aircraft	Merchant Vessels	Military Vehicles
Performance	Areas-conditions	Surveillance Litoral + open sea	Site Monitoring Asian and Russian realm	Site Monitoring Harbour waters	Surveillance Asian and Russian realm	Surveillance Litoral + open sea	Site Monitoring Asian and Russian realm
	Sensor / Image Mode	TerraSAR-X SM, SC WSC	TerraSAR-X ST	TerraSAR-X ST	TerraSAR-X ST	TerraSAR-X SM	TerraSAR-X ST
	Test dataset	>50 images > 500 objects	>100 images >3000 objects	>15 images >300 objects	>5 images >300 objects	evaluation in progress	evaluation in progress
	Recall	>90%	>80%	>80%	>80%	evaluation in progress	evaluation in progress
	Precision	>90%	>80%	>95%	>90%	evaluation in progress	evaluation in progress
	Operational maturity	high	high	medium	medium	medium	low
	IMINT App						Allous Detence and Space 2022

Fast analysis/ flexible implementation



- Applied on full TerraSAR-X StripMap scene (3m ground resolution)
- No input image preparation or masking
- Quasi-simultaneous availability of image and analytics
- Running on COTS Hardware

Use Case: Naval Vessels Detection

DANALYTICS





https://www.linkedin.com/posts/airbus-defence-and-space---intelligence_up42-radarconstellation-earthobservation-activity-6744534286021472256-r8ii/



Specific Challenges for SAR-based ML







Imagery Database

ARANALYTICS SYMPOSIUM





Limited annotated

SAR Simulation



Conclusions

- SAR-ATR can provide operational benefits for dedicated use cases
- Airbus provides efficient training + near-realtime execution tools
- Airbus supports the key topics for operational benefits of AI-based ATR capabilities





Thank you

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