

Satellite SAR-Based Road Passability Monitoring Service

FORUM8

14th CPWC H.N.Z

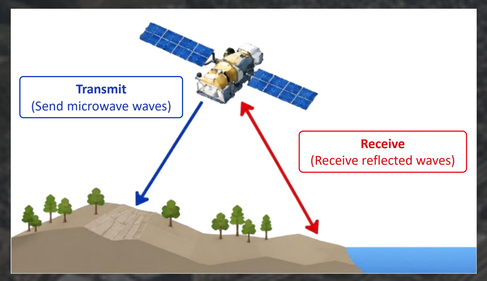
Background

“Seeing every road from space, so you always know which way is open.”
During disasters, landslides and road collapses can block important roads.
Wide-area field surveys take time and manpower.
Road passability monitoring service shortens the time needed to grasp road conditions.

System

Monitors and detects road passability using Tellus SAR satellite images (ALOS-2).

＜Features of SAR satellite images＞
- Observable day and night
- Observable regardless of weather
- Captures subtle changes on the ground surface
- Image analysis requires specialized knowledge



1. SAR Data Collection

Collect disaster data and SAR images.
Collect SAR images from three different days to capture land-type changes and build the machine learning model.
Crop the target area from the SAR image and calculate the backscatter coefficients (dB).







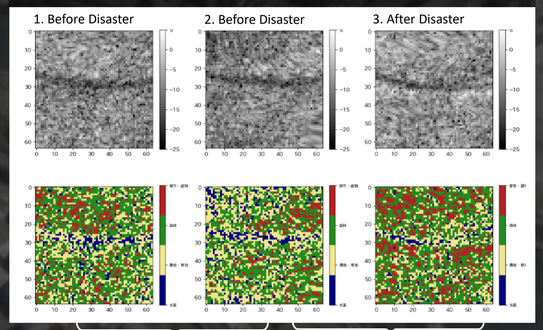
Land Type	Backscatter Coefficient (dB)
Water Surface	-25 to -15dB
Farmland / Grassland	-15 to -10dB
Forest	-10 to -5dB
Urban / Buildings	-5 to +10dB

2. Feature Extraction

Extract change signals by calculating backscatter and classifying land types.



Backscatter Images & Land Type Maps



Change: 126 pixels　Change: 432 pixels
Change Ratio: 3.4x

3. Machine Learning Model (AI)

Select features, then train and validate the model.

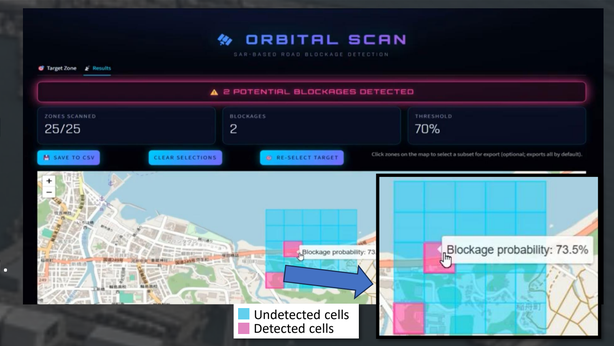
- **Model**
  Logistic regression with forward feature selection
- **Features**
  12 signals as features
  [four land types × three time points]
- **Validation**
  Leave-One-Out cross-validation

Confidence Threshold	Target Maps	Coverage	Accuracy
≥ 50% (all cases)	114	100.0%	74.6%
≥ 60%	61	53.5%	73.8%
≥ 70%	26	22.8%	80.8%

4. Detection & Visualization

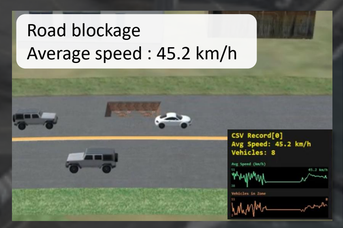
Load SAR images from different dates and select the target area.

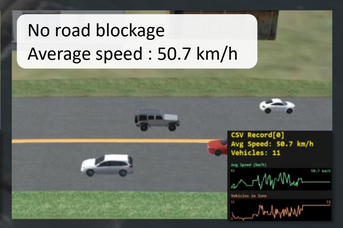
- Split the target area into cells and estimate road blockage probability using the trained model.
- Export high-probability cells to a CSV file.
- The exported CSV file is passed to our UC-win/Road plugin and used for the simulation.



5. Evaluation in UC-win/Road

Reproduce the blockages and evaluate their impact on traffic.
Load the CSV file and place road obstacles where the road blockage probability is high.
Measure the average speed of surrounding vehicles.





Conclusions

＜**Service Value**＞
- **Monitor Road Conditions Fast**
  Monitor wide areas quickly and know which roads are passable.
- **Choose safe route**
  Avoid blocked roads and plan safe alternative routes.
- **Predict delays by simulation**
  Estimate travel delays with UC-win/Road to support planning.

“When roads stay open, lives keep moving.”

