

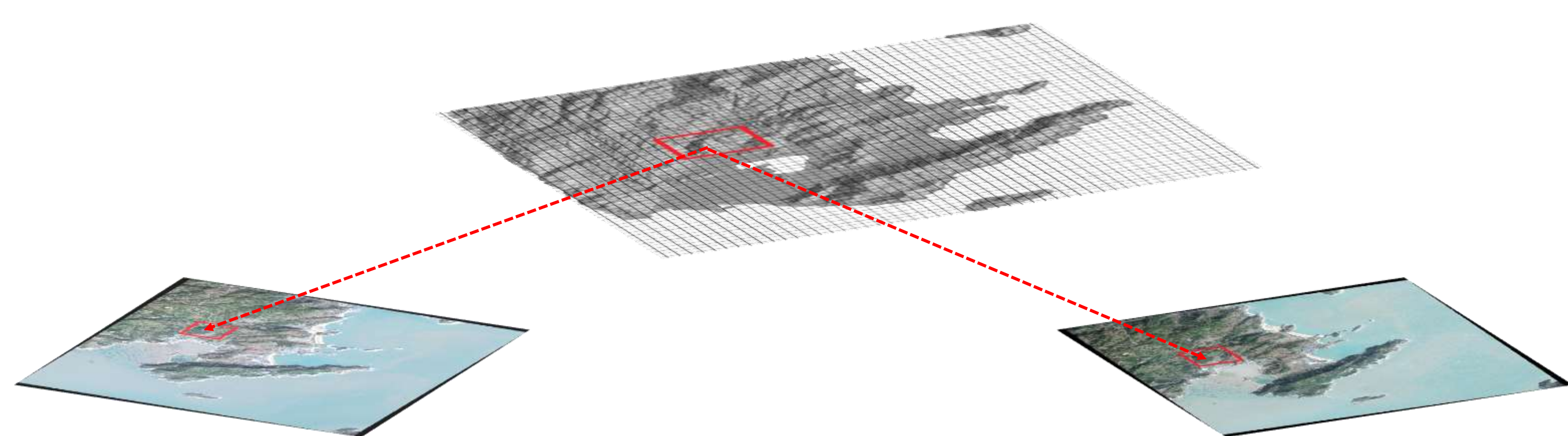
Efficient Multiview Satellite Stereo

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Goal

- Enabling use of multi-pass satellite images
- By-pass limitation of RPC camera models
- Boost efficiency of dense satellite stereo problems
- Leveraging semantics to improve stereo accuracy

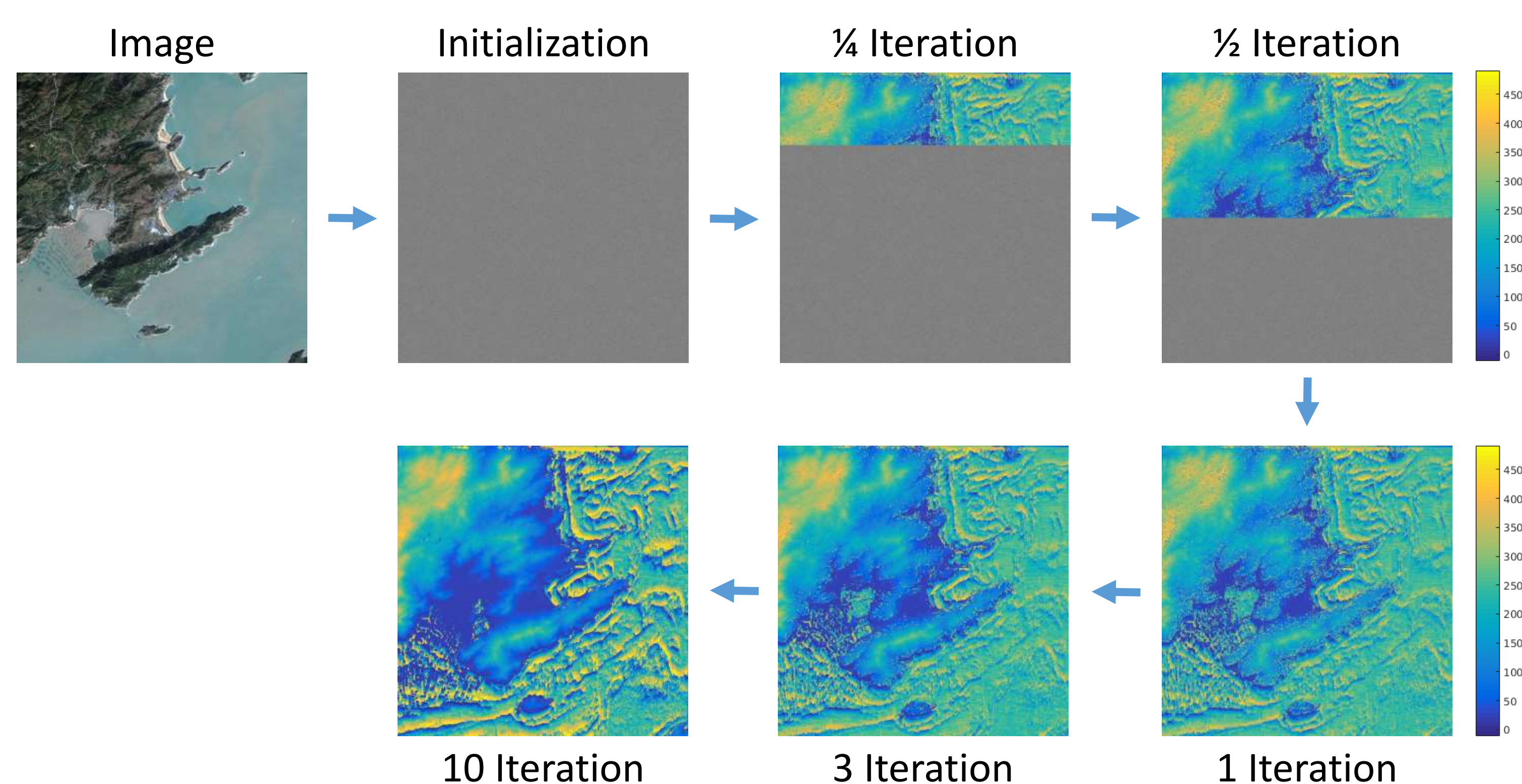
Formulation



- Represent geospatial region by a vector grid
- Fit a local 3D plane at each grid point
- Project local plane to satellite image to accumulate photo-consistency
- Enforce smoothness amongst nearby planes
- Formulate an MRF over the vector grid
- Enforce smoothness of semantic labels in MRF

Optimization

- Predict raw satellite semantic labels by neural networks
- MRF inference via PatchMatch Belief Propagation
- Parallel inference to boost efficiency



Performance

	Dataset	Resolution	View	SGM	BidPMBP	GridPMBP
Time	Xiapu	26.2 Mpx	2	0.48 Hours	0.57 Hours	0.18 Hours
	Bengaluru	66.1 Mpx	5	9.73 Hours	5.75 Hours	1.78 Hours
	Zarqa	58.7 Mpx	7	12.96 Hours	7.66 Hours	2.37 Hours
Memory	Xiapu	26.2 Mpx	2	1.8 GB	1.4 GB	1.4 GB
	Bengaluru	66.1 Mpx	5	11.3 GB	8.8 GB	8.8 GB
	Zarqa	58.7 Mpx	7	12.0 GB	9.4 GB	9.4 GB

Semantic Map

	Bengaluru	Bengaluru	Bengaluru	Zarqa	Zarqa
Images					
Neural Network Labels					
Joint PMBP Labels					

Height Map

	Image	SGM	BidPMBP	GridPMBP
Xiapu				
Xiapu				
Bengaluru				
Bengaluru				