Optimization of Spectral Data Acquisition for Electron Microscopy

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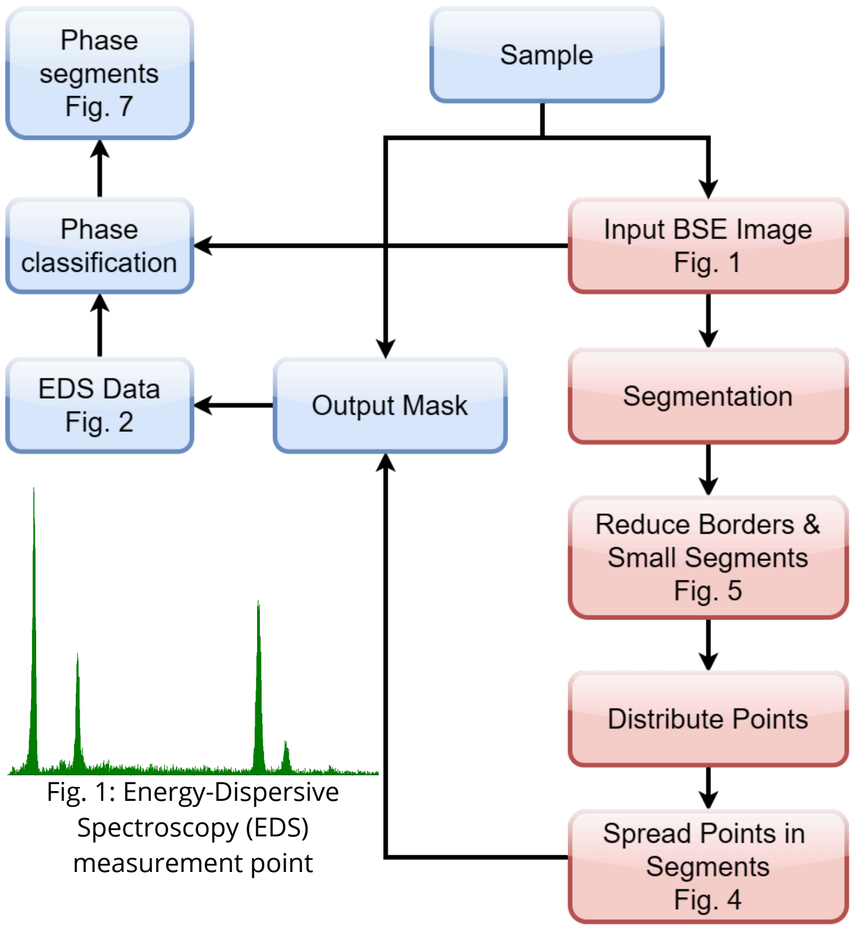

Fig. 1: Energy-Dispersive Spectroscopy (EDS) measurement point

Fig 2: Diagram of the internal workings of the proposed method.

Motivation

- Scanning every pixel with EDS can be a time-consuming process.
- Proposed method employs BSE imaging to effectively decrease the number of EDS measurement points.
- This approach boosts efficiency in automated mineralogy systems, enhancing elemental analysis for intricate samples.
- There is significant potential for accurate compositional analysis in automated mineralogy and materials science.

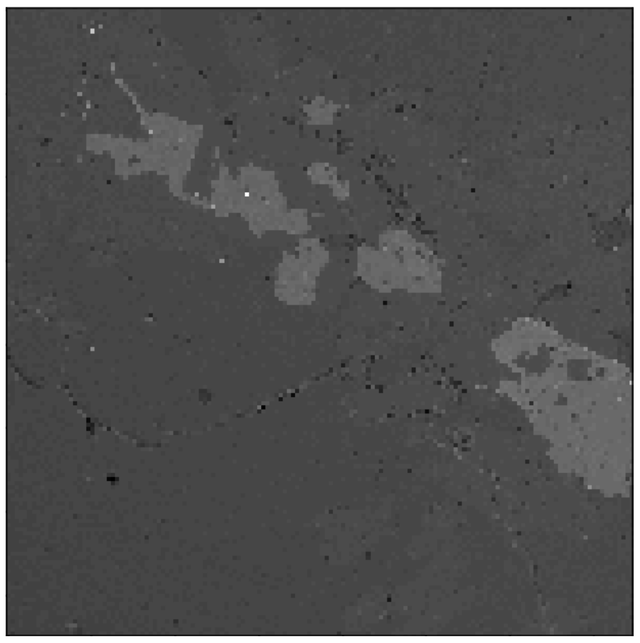

Fig. 3: Backscattered Electron (BSE) image

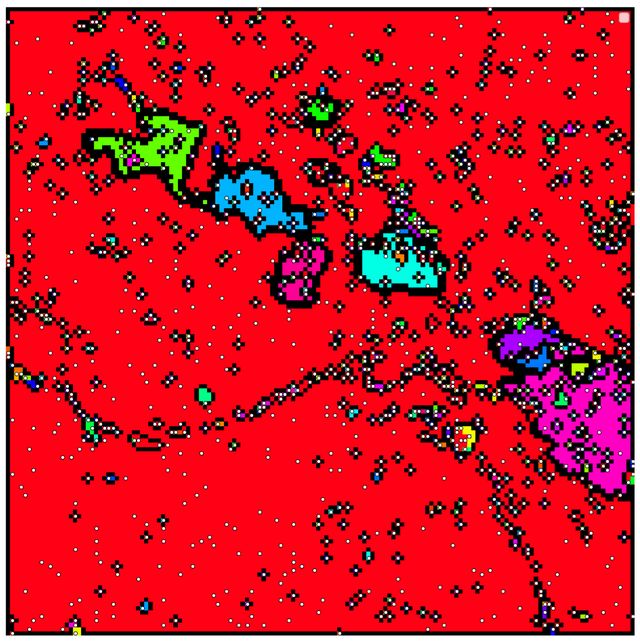

Fig. 4: proposed method segmentation example

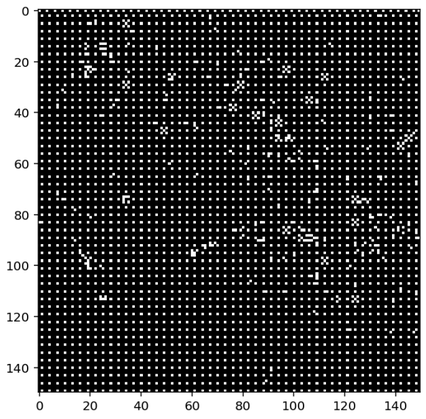

Fig. 5: TIMA point selection example (2644 points)

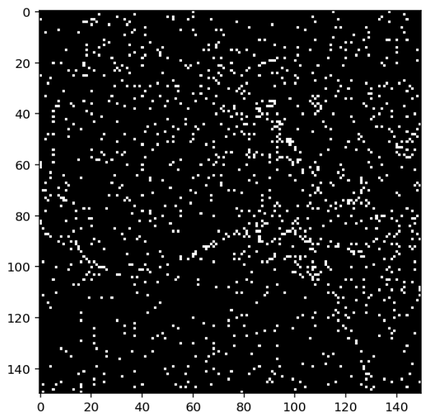

Fig. 6: proposed method point selection example (1243 points)

Proposed Solution

- Exclude segment edges and transitional areas to prevent mixed spectra.
- Ensure points are placed in regions with uniform material properties.
- Implement adaptive, non-grid-based point placement within segments.
- Enable dynamic adjustments of parameters like point density and segmentation threshold.

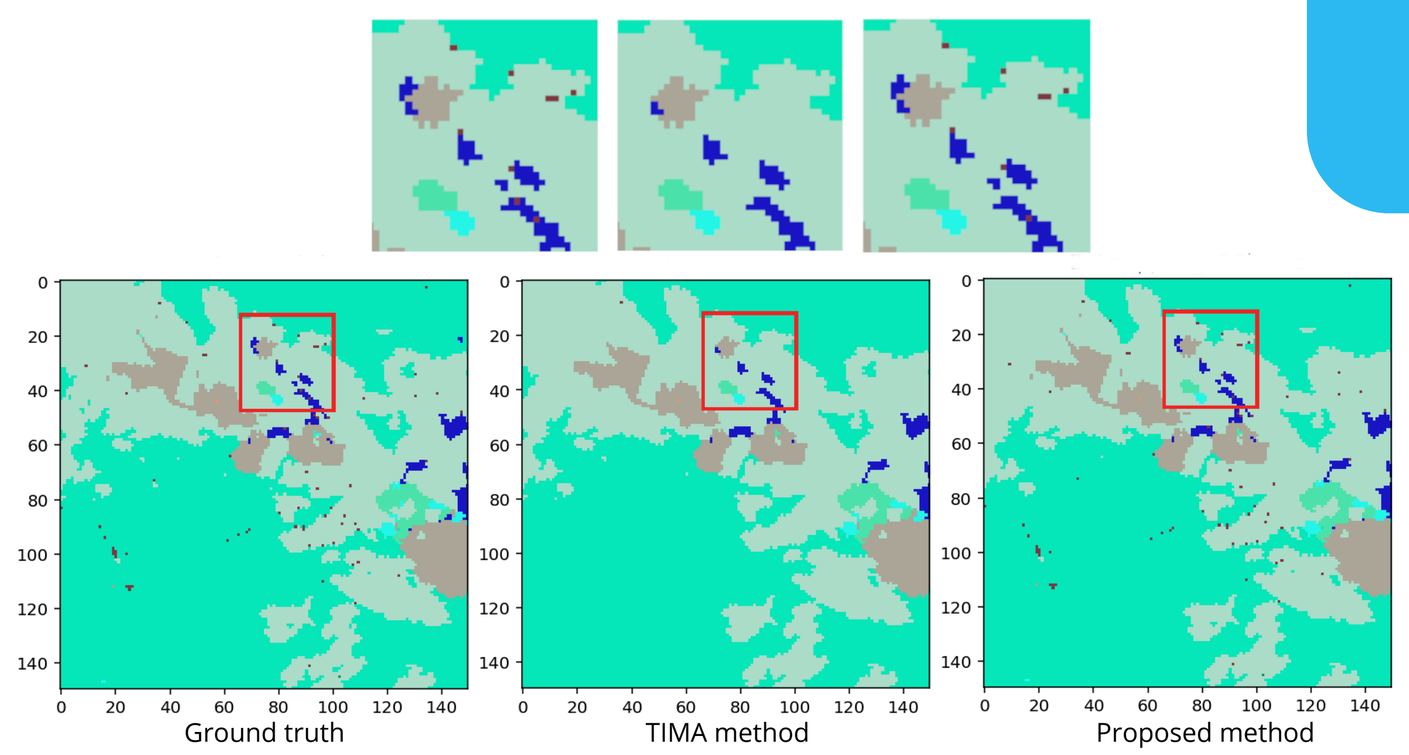

Fig. 7: comparison between the TIMA Method and the New Method regarding phase identification.

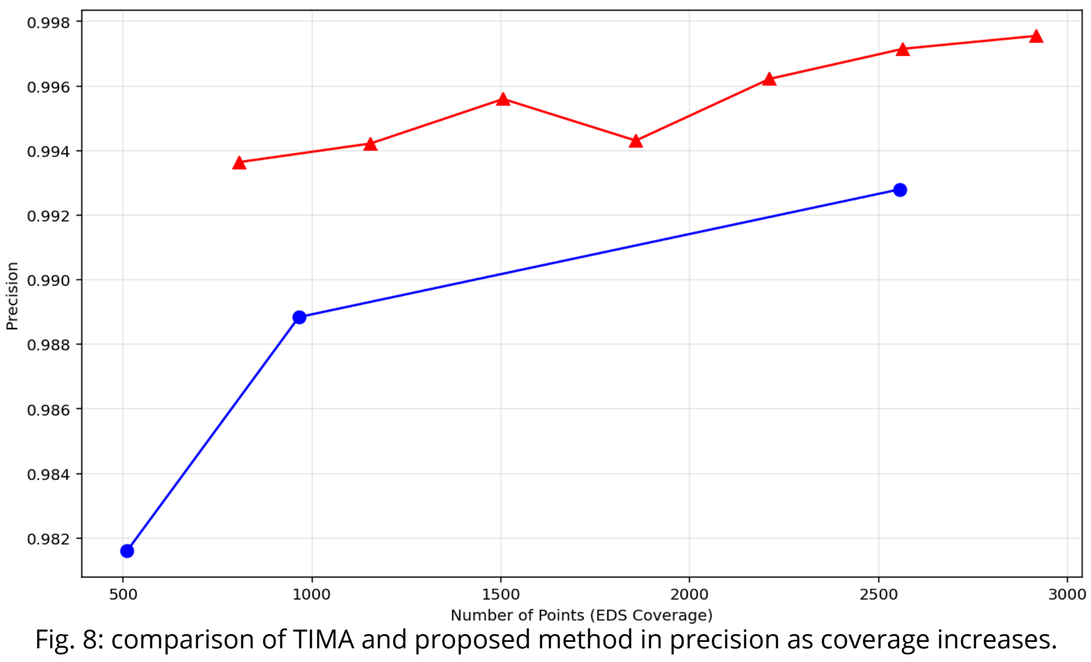

Fig. 8: comparison of TIMA and proposed method in precision as coverage increases.

Goals

- Optimize the location of EDS points
- Improve overall efficiency
- Ensure high accuracy
- Variable parameters integration for fine-tuning the method

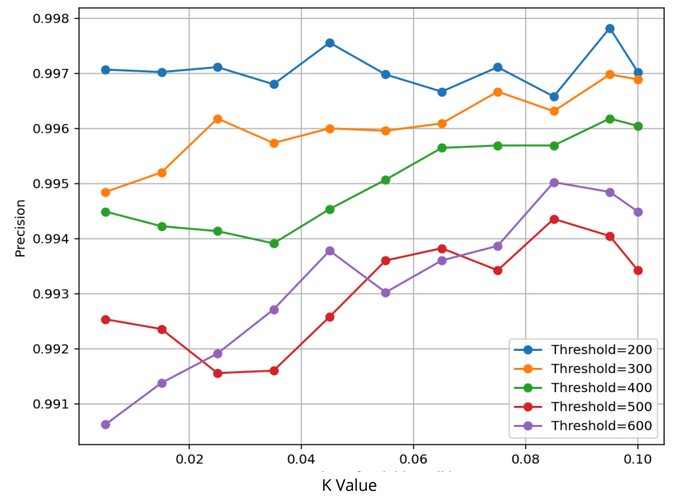

Fig. 9: impact of adjustable segmentation threshold and point density on precision

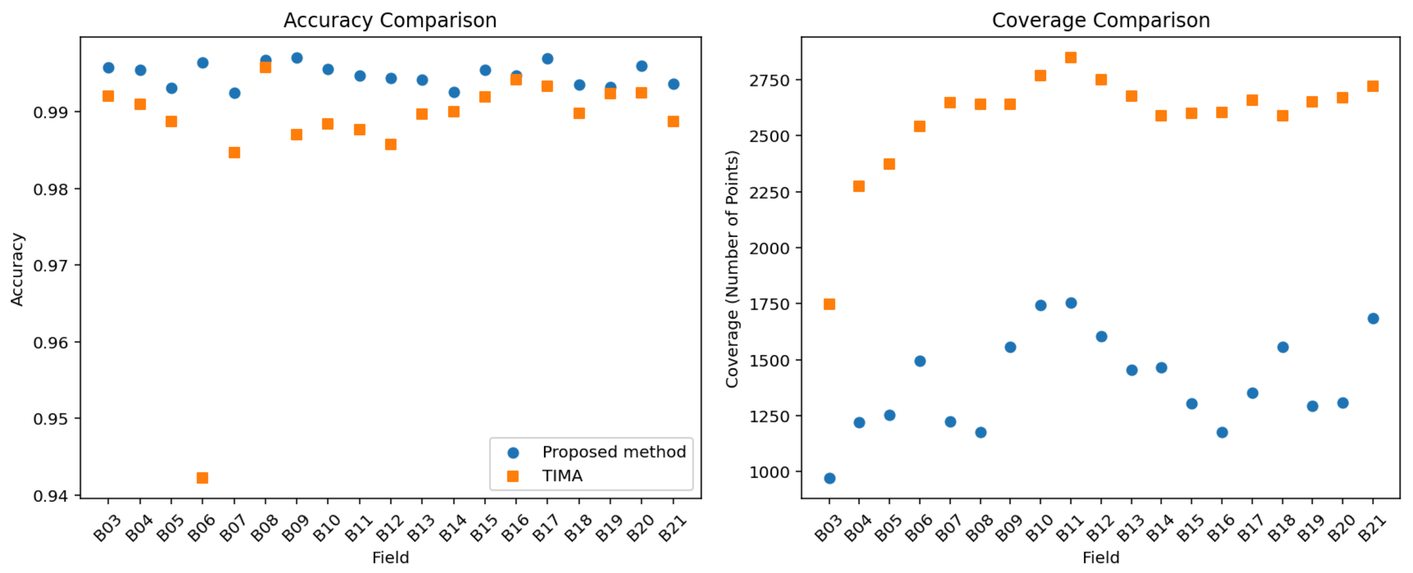

Fig. 10: comparison of the TIMA method and the proposed method in terms of precision and coverage.

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