Generalized Transformation of Earth Science Datasets for 3D Narrative Visualization

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Motivations

- Many Earth science narrative data visualizations do not fully utilize the dimensionality of immersive technology.
- Recreating natural phenomena in explorable, realistic 3D worlds can solve this and bolster the storytelling.
- Provide guidelines for transforming Earth data into 3D immersive narrative visualizations that balance the complexities of the data and the visualization while taking advantage of the data's built-in dimensionality.
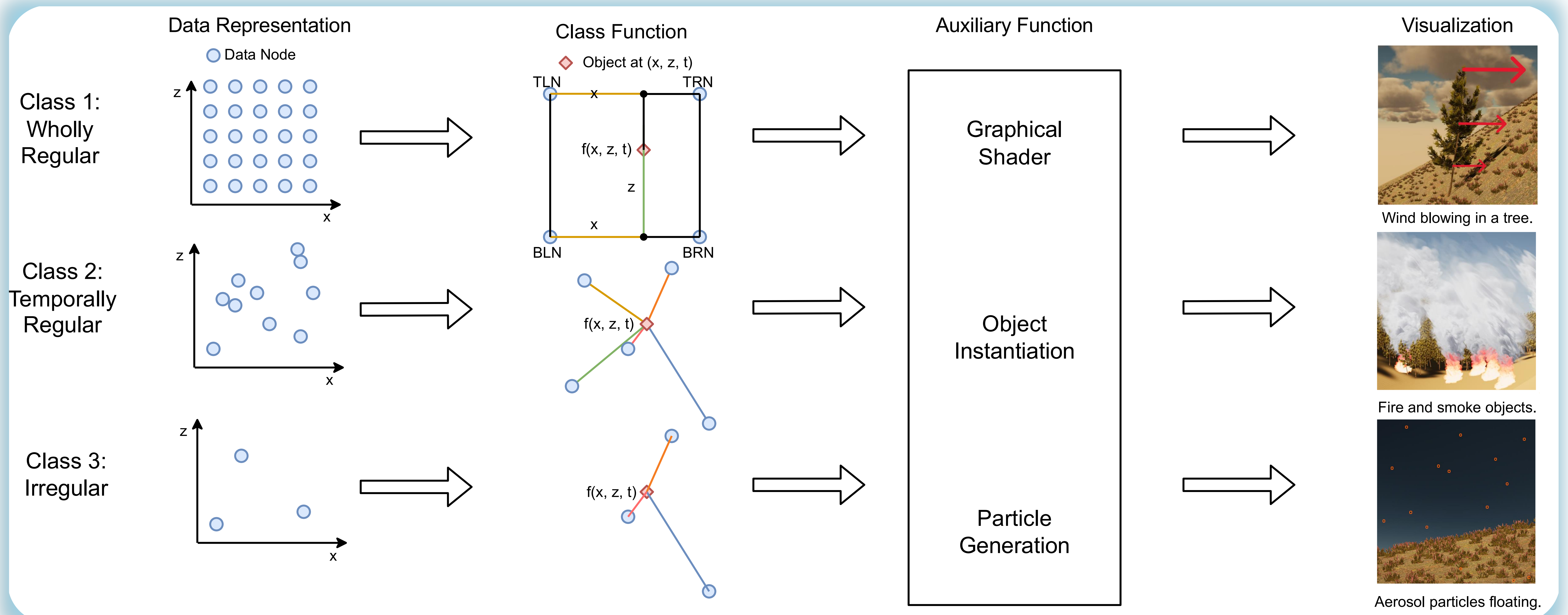

Figure 1. Classification model with the three classes, respective transformation functions, and pipelines to visuals.
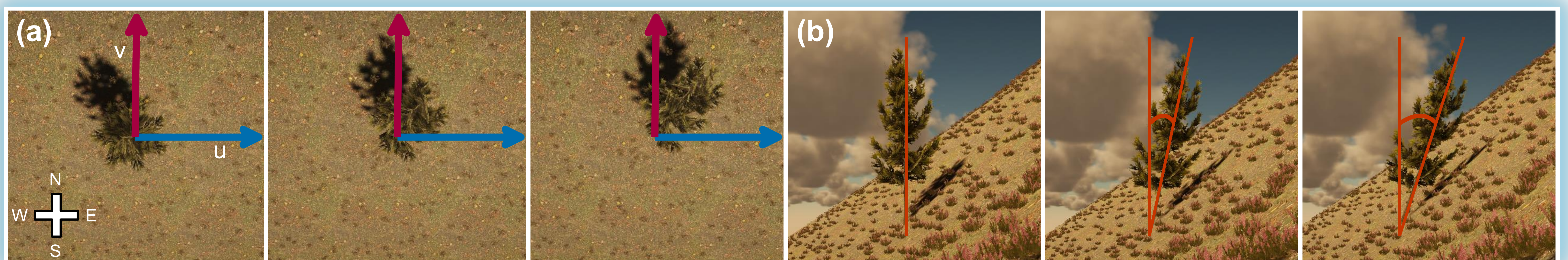

Figure 2. Wind data transformed into motion in trees showing (a) the direction from the top and (b) speed from the side.

Considerations

- Follow the purpose of narrative visualizations: effective storytelling.
- Consider the spatio-temporal structure of the datasets: uniformity.
- Realize the original natural phenomena: discrete or continuous, etc.
- Know performance ceilings: many complex data layers leads to issues.

Classification

- Class 1: Wholly Regular: grid-like structure both spatially and temporally.
- Class 2: Temporally Regular: scattered spatially and uniform temporally.
- Class 3: Irregular: scattered through spatial and temporal dimensions.

Use Cases

1. MERRA-2 ASM for wind direction and speed, using bilinear interpolation.
2. MODIS Thermal Anomalies for fire, using inverse distance weighting.
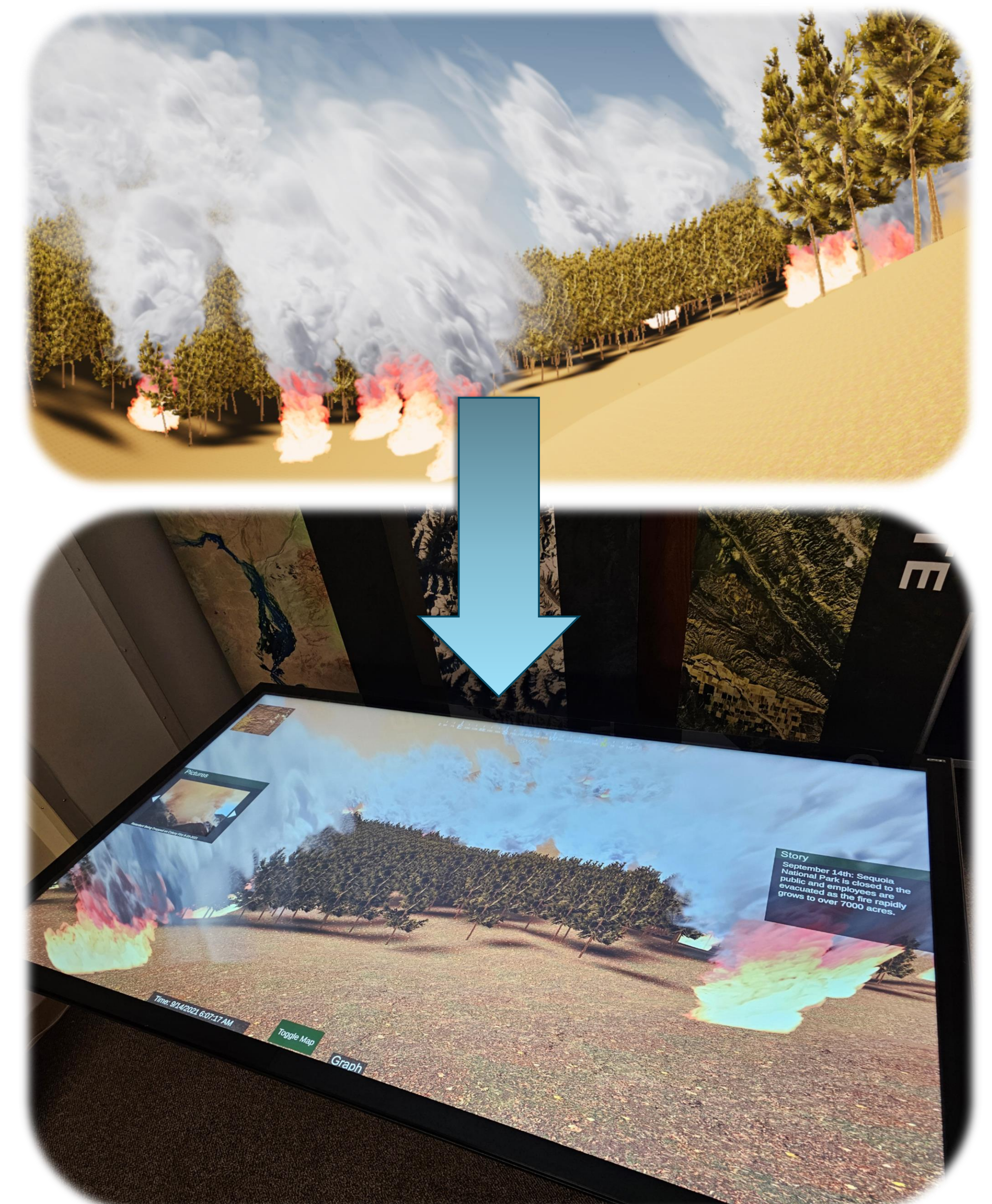3. OMNO2G for nitrogen dioxide, using inverse distance weighting.

Figure 3. Wildfire visualization being deployed to tabletop display.

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