Constant Innovation

Paradigm is continually investing in extending the Stratimagic technologies, as well as improving the usability and efficiency of the solution in order to maintain and extend its leadership position in the market. These improvements include:

- A new user interface that maximizes the user’s flexibility through easy layout management and the ability to create multiple pages for different tasks in multiple domains. It enables automated facies recomputation when an analysis interval is modified by the user, and automatic update of all panel contents when one of the panels is modified.

- New machine learning algorithms for supervised and unsupervised facies classification directly in SeisEarth Integrated Canvas.

Industry Leadership in Seismic Facies Classification

Paradigm, the industry pioneer and de facto standard for computer-aided seismic facies classification, significantly enhances the description of a formation or reservoir, and accelerates the stratigraphic interpretation of 2D and 3D seismic data from multiple surveys. Stratimagic’s automated classification methods are used in all type of geological settings and for various purposes, from drilling risk analysis (geohazards) to 4D projects.

The application’s primary classification scheme (Neural Network Technology) establishes a proven foundation for recovering “hierarchical structure” from seismic data, and results in more meaningful geologic interpretation.

Stratimagic seismic facies maps allow geoscientists to rapidly gain insight into the depositional setting of large datasets in new areas. Companies credit Stratimagic with their success in quickly identifying the most promising prospects in a new petroleum play.

Seismic facies map blended with fault-enhanced attribute extraction over the interval of interest (Barnett Shale)

Stratimagic™
A truly geological interpretation of seismic data
**Enriched Interpretation**

The first pass at analyzing a specific interval is typically done using an unsupervised method, through Neural Network Technology. The resulting map is an objective view of data heterogeneity, which can often be compared to contemporary depositional systems obtained from satellite images. Stratimagic can work on combinations of various attributes, for single or multiple seismic volumes and/or multiple 2D surveys.

**Advanced Seismic Facies**

A wealth of additional information can be extracted using supervised classification. The interpreter takes control and has the ability to select the real seismic traces to be used as references, typically at well locations representative of specific reservoirs or geological characteristics.

**Integrated Seismic Propagator**

Classification processes require an accurate tracking of the seismic events that define the interval of interest. The Paradigm Seismic Propagator is designed specifically for this purpose, and provides rapid and precise results.

**Well Calibration**

The calibration of Stratimagic classes to well data is performed in a dedicated module that incorporates the class models from the classification process and associates them with synthetic seismograms from existing wells.

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**SeisFacies Multi-attribute Seismic Classification**

**Calibration to Reservoir**

Seismic and well data are two different measurements of the same subsurface. Paradigm SeisFacies™, an extension of the Stratimagic solution, brings a wealth of technologies and processes to extract as much information as possible from existing seismic attributes.
Seismic facies volume displayed in 3D Canvas with blended seismic attributes and wells (data courtesy of the Colorado School of Mines)

This feeds into well data calibration workflows, resulting in highly detailed quantitative property volumes characterizing complex, heterogeneous reservoirs such as fluvialite, deltaic, slope and turbidite regimes.

**Accurate Reservoir Models**

Seismic facies information can be associated with electrofacies data (from the Paradigm Geolog™ petrophysical analysis system) to deliver calibrated, quantitative 3D representations of rock and fluid properties in heterogeneous environments. The Paradigm SKUA-GOCAD™ modeling technology has all the capabilities needed to leverage results from Stratimagic and SeisFacies, and use them in a comprehensive reservoir modeling workflow.

**An Exhaustive Investigation**

Numerous attributes are derived and/or extracted from seismic data by generating new volumes, and extracting within an interval or along a map. Interpreters working against tight deadlines are often challenged to make full use of all the information at hand, and there is a risk that some important features may be overlooked for lack of time and tools to systematically review all the data.

SeisFacies is the solution to this problem, offering a wide array of advanced technologies that support systematic investigative workflows. SeisFacies ensures that all available attribute data is put to use towards a comprehensive characterization of a prospect or reservoir.

**Multi-attribute Classification**

SeisFacies performs multi-attribute classification and calibration of either maps, trace segments within seismic intervals, or multiple volumes of seismic samples. Sharing the same intuitive interface as Stratimagic, SeisFacies classifications can apply Hierarchical Clustering, Neural Network or Hybrid methods.

**Zonation**

SeisFacies offers a simple method for reducing the size of seismic sample datasets, using a controlling auxiliary seismic volume to generate seismic layers (zones), thus reducing the number of samples.

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**Principal Component Analysis (PCA)**

PCA is a statistical process used for data reduction. It identifies redundant information and keeps only correlated information that contributes to further classification. PCA analyzes the relationships between a rich set of attributes and extracts the principal elongation directions, to reduce the number of input variables. The user selects the number of principal components that are needed.
**Calibration**

The calibration feature in SeisFacies offers mathematical operators, such as well property-to-seismic attribute relationships and other user-defined formulas. These can be applied to data subsets to produce new volumes and/or maps.

**Fusion**

Fusion is a mixed attribute classification methodology that combines two input volumes or maps into an output seismic volume or map containing a combination of the data. An interesting use is to mix structural and stratigraphic attributes.

**Visualization and Validation**

SeisFacies is closely linked to the Paradigm VoxelGeo™ voxel interpretation system to present classification results using selective sculpting tools, color coding and transparency. Complex intra-reservoir zones can be highlighted and mapped in 3D.

SeisFacies interfaces to the crossplotting capabilities of the extensive Paradigm interpretation suite, making it possible to segregate classes, control the color coding of maps and 3D volumes, and define in detail the boundaries separating different groups of data characteristics.

**Epos Integration**

Stratimagic is integrated into the Paradigm Epos™ infrastructure and data management framework, and seismic facies classification results are instantly available for use by other Epos-based applications.

Stratimagic functionality is also available directly in integrated Canvas in three workflows for interpreters:

- Waveform classification: an unsupervised and semi-supervised classification algorithm for seismic facies analysis that excels at pattern recognition
- Rock type classification: A supervised classification algorithm that finds relationships between facies defined at wells and seismic data (prestack, poststack and attributes) to create facies volumes and their probability of occurrence.
- Attribute clustering: A new unsupervised classification algorithm for prestack, poststack and attribute seismic data that can be used to calculate facies volumes, do AVO analysis or identify anomalies in the data.

▲ SeisFacies displayed in 3D Canvas; extraction of the facies distribution along a specific proportional slice
Features

■ Multi-panel visualization
■ Advanced layout management and easy page configuration
■ Support for multiple 2D/3D surveys
■ Support for multi-domain sessions
■ Specific data types for stratigraphic interpretation and classification
■ Surface and interval attribute calculations
■ Multi-attribute classification methods
■ Seismic facies smoothing

Stratimagic

■ Unsupervised and supervised Neural Network technology based on the Kohonen Self-Organizing Maps (SOM) approach
■ Trace model visualization and editing

SeisFacies

■ Stratigraphic slices
■ Support for scripting

Interoperability

All Epos™-based applications enable interoperability with third-party data stores, including:

■ RESQML 2.0.1
■ OpenWorks® R5000.10
■ GeoFrame® 2012
■ Petrel* 2017 & 2016
■ Standalone connectivity with Petrel via RESQML

(*is a mark of Schlumberger)

System specifications

■ Microsoft® Windows® 7, 8.1, 10
■ 64-bit Red Hat® Enterprise Linux® 6.8 and subsequent minor releases, and 7.1 and subsequent minor releases

The Paradigm Advantage

■ The patented Neural Network technology for seismic facies classification reveals geologically significant features and depositional geometries.
■ 2D and 3D multi-survey processes are fully supported, for better regional consistency.
■ A large library of processes is available to evaluate, combine and interpret multi-attribute datasets.
■ Stratimagic and SeisFacies quickly sift through large amounts of seismic data to extract geological features of interest to geoscientists.

www.emerson.com/paradigm

Stratimagic incorporates the SISMAGE™ technologies developed and patented by Total.
SeisFacies incorporates technologies and methods developed by Eni Agip Division.

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