RTK GPS, Lidar & Augmented Reality Devices integrated for Stratigraphic Modeling

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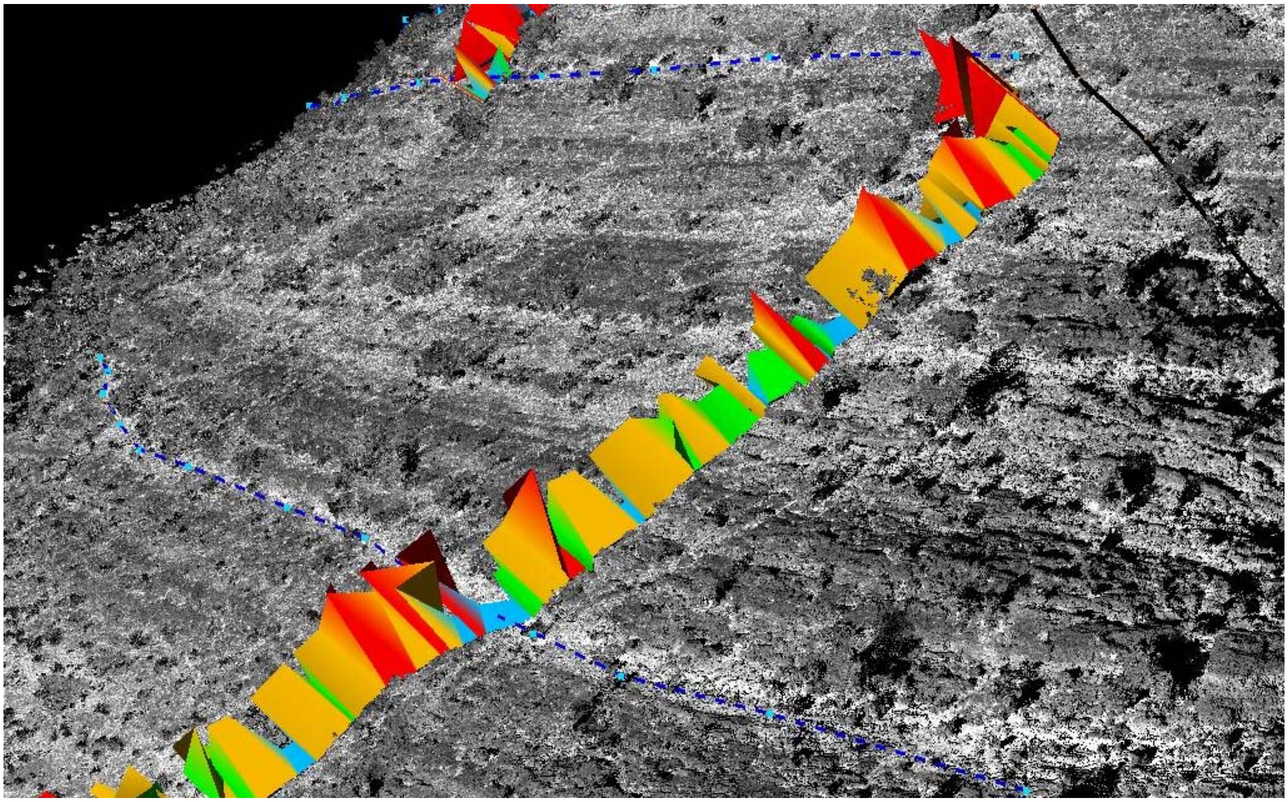
Outcrop-based modeling of reservoir analogous strata has long been a preferred technique utilized to understand sub-surface, sub-seismic and interwell heterogeneity in the petroleum industry. Historically, the methodologies employed focused collecting field data such as photographs, measured stratigraphic sections, gps, lidar, etc. and be compiled in the laboratory for construction of a digital outcrop model. The objective of these studies is to more closely link the observations of the geologist in the field to the needs of the reservoir engineer down-stream in the hydrocarbon production line. An important part of this process is to present the geological data in a format that both the geologist and the engineer can utilize.

Recent software developments have focused on building common computer “portals” to integrate geological and engineering tools. This common working environment can also be taken one step further into the observation and interpretation realm of the geologist by bringing more of the laboratory into the field via hands-free, heads-up displays for field visualization and interpretation during data acquisition. In this study we incorporate terrestrial scanning lidar, RTK GPS and in-field visualization (augmented reality) to collect and interpret Permo-Triassic carbonate strata for the purposes of developing a field-scale model of hydrocarbon production with a focus on vertical and lateral heterogeneities. The data and technology will also be used for training purposes for future studies.

The integration of these technologies in the field has presented the user with the unique ability to not only acquire and interpret data directly in the field but also to review and add new data types to the model in real time. This combined effort greatly reduced the work-hours required to construct a 3D stratigraphic model and will likely become the preferred methodology for field-based studies in the future. Potential applications for this technology fusion include hydrocarbon exploration and production, hydrologic modeling, mineral management, or any discipline requiring accurate and efficient data collection and interpretation in real time.

Lidar scanning and head-mounted display allow data processing and interpretation directly in the field.



Lidar point-cloud intensity is being calibrated to rock-type in conjunction with stratigraphic sections and stratal bed-tracing located with RTK GPS in the field. Colors associated with sub-vertical section are associated to rock type as mapped in the field and calibrated to laser intensity.