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A Better Set of Eyes: Computer Vision Technology to Monitor Safety Zones and Automate Drill Pipe Tally

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Abstract

An indispensable item for every roughneck is the tally book, used to measure and count the drill pipe entering and exiting the wellbore. The current practice is for a crew member to measure the pipe with a pipe strap and enter the information, each time while tripping, into their tally book. This manual entry is prone to error, leading to potential mistakes in the calculated drilling depth and poorly sequenced lithologies, which in turn may contribute to an unsafe environment and drill bit damage due to inaccurate drillstring length. These mistakes often require an additional trip out of hole and increase the amount of nonproductive time. Computer vision technology has shown promise in other industries with its ability to automate similar recognition and counting tasks. A dual-use system has been developed where the same cameras for pipe counting can be used for red zone entry detection, holding the potential to enhance the overall safety of the drilling process.

A pilot application has been created serving dual applications: both counting and measuring the pipe entering the wellbore and detecting personnel movement in the red zone during pipe delivery operations. Each stage of the design process was intently developed, considering requirements for both functionalities of the system. Neural network detection algorithms, 3D localization, and drilling data signal processing all combined to interpret rig state and use the appropriate computer vision algorithms at the correct time. System practicalities such as camera placement, hardware and software robustness, and field-tested accuracy were considered. The system has been deployed for field testing in West Texas.

The system succeeded in both accurately maintaining a drill pipe count and detecting personnel in the red zone. The system is designed so that the neural network algorithms can be updated using newly collected data as new scenarios are encountered, such as new weather conditions, lighting environments, additional people on the rig floor, and other dynamic factors.

This computer vision technology is the first of its kind on a drilling rig. No other system has been developed that accomplishes not only one of the functions, but also two. Just as we have seen rapid improvements each year in driver assistance technology, the time has come to apply recent advancements in computer vision capabilities to increase the efficiency and overall safety of the rig.