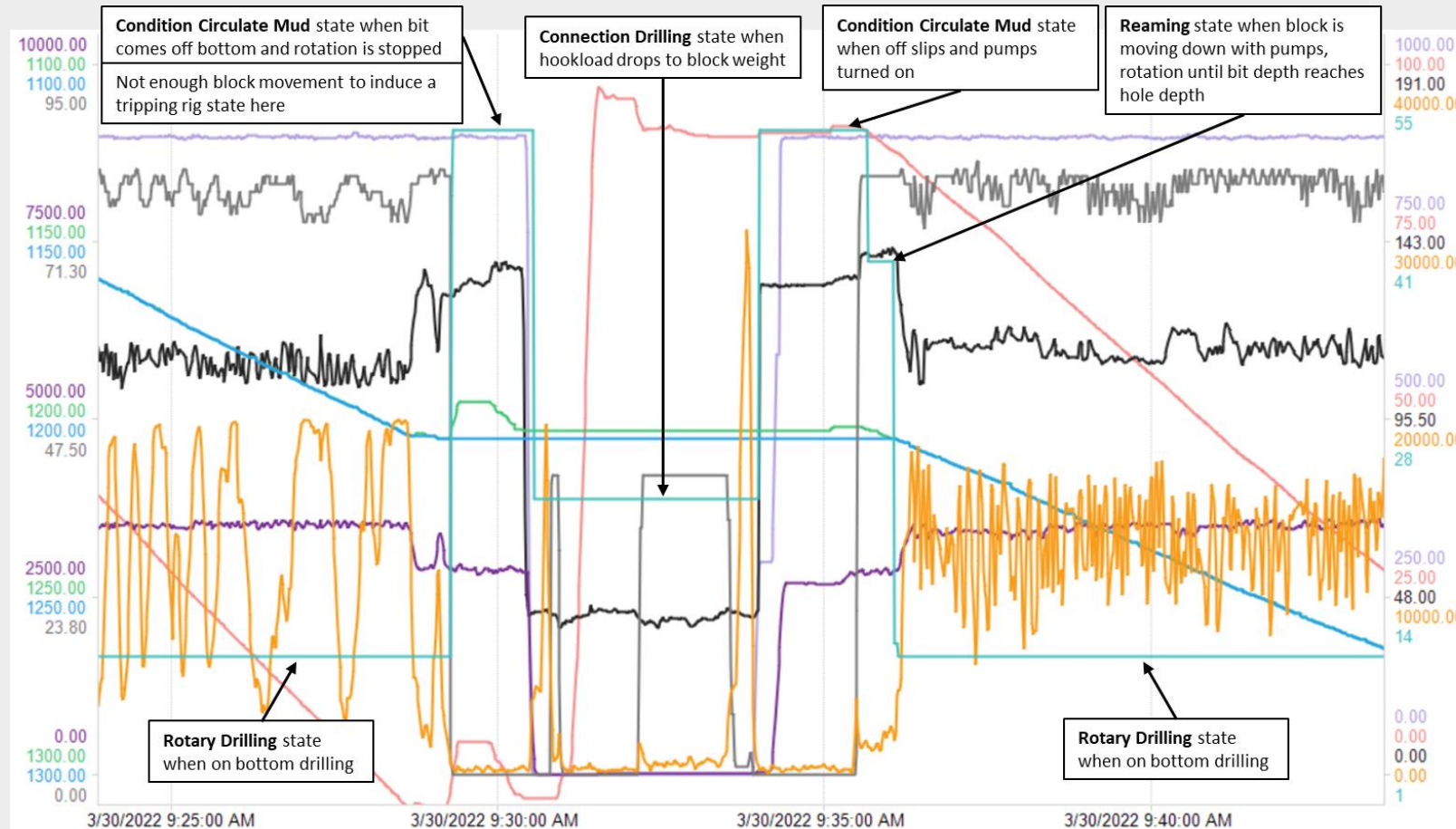


Real-Time Rig State Detection



Sentinel Rig State Number
Hole Depth (ft)
Bit Depth (ft)
Block Height (ft)
Hookload (klb)
Total Pump Output (gpm)
Torque (ft-lb)
RPM
Standpipe Pressure (psi)

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Rig States in Sentinel RT

Rig States	Definition
Undefined	An undefined state will result when sensor values are missing and/or the algorithm cannot determine any valid state from the available signatures.
Out of Hole	Drillstring and BHA are completely removed from the hole (bit depth should be close to zero, if properly reported). Covers making up/ laying down BHA.
Static	No change in bit depth or block height for a period of time, no circulation or rotation. Slips may be engaged or not.
Rotary Drilling	Making new hole using surface rotation or surface rotation + mud motor.
Slide Drilling	Making new hole using a mud motor without normal surface rotation.
Conn. Trip. In	Adding a joint of drillpipe to the string between two stands of running pipe into the hole.
Conn. Trip. Out	Removing a joint of drillpipe from the string between two stands of pulling pipe out of the hole.
Conn. Drilling	Adding a joint of drillpipe to the string between two stands of drilling.
Trip. In Circ	Running the drillstring into the hole with pumps on and no rotation.
Trip. In Not Circ	Running the drillstring into the hole with pumps off and no rotation.
Trip. Out Circ	Pulling the drillstring from the hole with pumps on and no rotation.
Trip. Out Not Circ	Pulling the drillstring from the hole with pumps off and no rotation.
Reaming	Running into hole with pumps on and pipe rotation.
Back Reaming	Pulling out of the hole with rotation and pumps on.
Cond. Circ. Mud	Pumps on with pipe rotating slowly or not rotating at all and no change in bit depth.
Break Mud	Pumping to break gelled-up mud after long static periods. Pipe rotation may be applied to break gels faster.
Pressure Test	Pumping at slow rate to test casing or formation integrity (leak-off test).

“Pseudo” Dynamic Bayesian Network

Features used as evidence in network

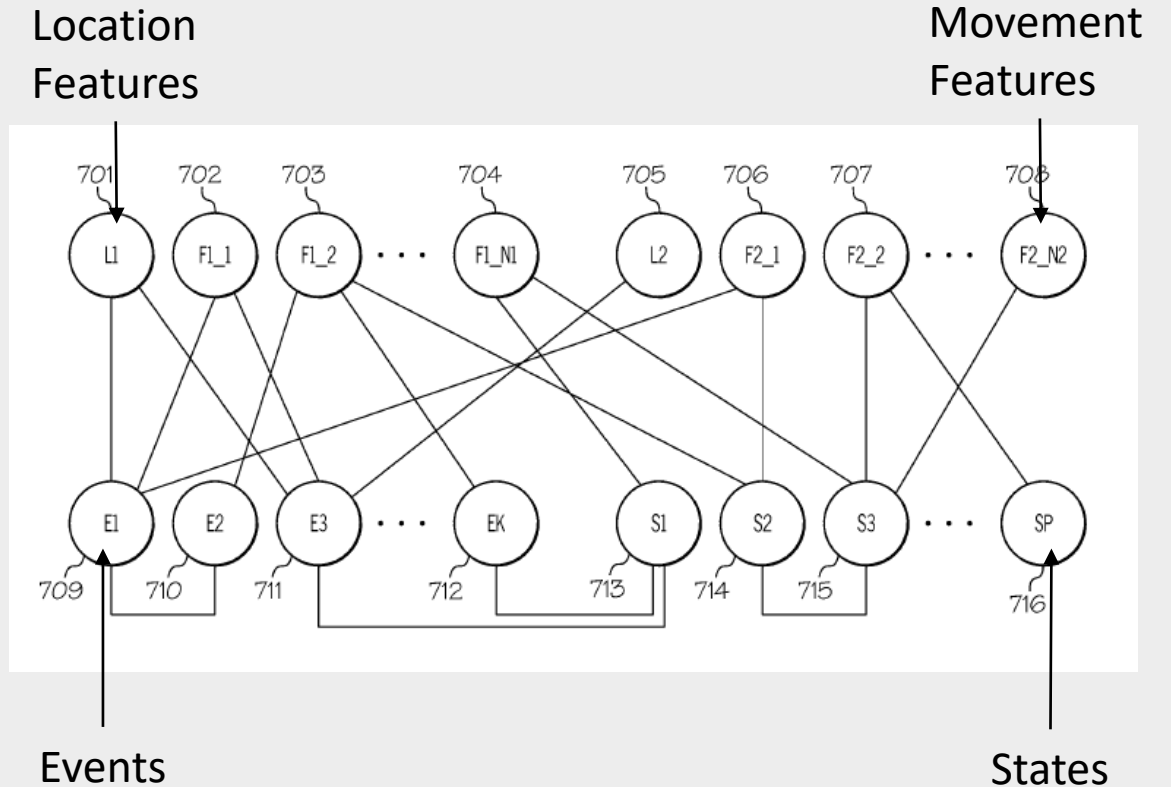
Location features: Real-time calculations or sensor data

Ex: ROP, hookload

Movement features: Transient behavior of data channels

Ex: WOB trend, torque trend

Examples of features in rig state engine: SPP, block height, RPM trend



Sentinel RT *Lite*

Sentinel RT™ *Lite*

*Crunching data for better
outcomes since 2015*

- Bayesian Network Based Real-Time Rig State Engine
- Greater than 98% Accuracy
- Real-Time S2S and W2W Outputs
- Back-end Engine that Integrates Into Your Software
- Runs on Any Platform: Windows, Linux, Mac OS
- Use in Any Workflow or System
- For Operators, Drilling Contractors, Service Providers, Consultants, etc.
- Free of Charge for Commercial Use

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OPTIMIZED REALTIME INTELLIGENCE

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Repository on Github

The screenshot shows the GitHub repository page for IntellicessInc/sentinel-rt-lite-saas. The repository is public and has 0 watchers. The main branch is 'main'. The repository contains 1 branch and 0 tags. The file list includes:

File	Commit Message	Commit Date
input_files	feat: Sentinel RT Lite SaaS v1	5 months ago
.gitignore	feat: reading from Union by streaming functionality integrated into S...	4 months ago
LICENSE.md	feat: license added	5 months ago
README.md	feat: Sentinel RT Lite SaaS v1	5 months ago
app_logger.py	feat: reading from Union by streaming functionality integrated into S...	4 months ago
brook_client.py	feat: Sentinel RT Lite SaaS v1	5 months ago
csv_jwlf_converter.py	feat: Sentinel RT Lite SaaS v1	5 months ago
data_service.py	feat: Sentinel RT Lite SaaS v1	5 months ago
file_utils.py	feat: Sentinel RT Lite SaaS v1	5 months ago
keycloak_client.py	feat: Sentinel RT Lite SaaS v1	5 months ago
properties.py	feat: reading from Union by streaming functionality integrated into S...	4 months ago
requirements.txt	feat: Sentinel RT Lite SaaS v1	5 months ago
sentinel_rt_lite_saas.py	fix: error events are only logged, they are not processed	2 weeks ago
union_client.py	fix: historical mode fix	2 months ago
utils.py	fix: Sentinel RT Lite SaaS should continue to work despite occasional...	last month

<https://github.com/IntellicessInc/sentinel-rt-lite-saas>

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