Company Overview

- Organized and incorporated in the state of California in 2014.
- A minority woman owned small business limited liability corporation.
- Located in Oceanside, California with virtual offices throughout the State, Nation, and World.
- Currently 13 employees and 3 Contractors – 13 are software engineers.
- Serving domestic and international clients with mission and safety critical applications.
- Broad experience with government, industrial, and manufacturing industries with an emphasis on NASA.
- Over 50 years of Combined Experience Deploying PHM and Intelligent Systems Across Multiple Industries

Maria Walker CEO
Focus: to leverage AI Platforms for delivering “Situation Aware” software. SA software is cyber-physical software that leverages model-based reasoning and encapsulates insight and understanding regarding operation, availability, production, product quality, uncertainty, and adaptation.

...software that can intelligently and autonomously monitor, control, emulate, execute, or optimize actions that will successfully ensure safe, timely, and dependable results.

An AI Software Solutions company
EXHIBIT 2 | AI Will Be Ubiquitous in the Factory of the Future

- Machines self-optimize their parameters on the basis of material input and process parameters.
- Virtual agents verbally provide operators with information from IT systems upon request.
- Automated guided vehicles carry parts, detect obstacles, and adjust their routes.
- AI systems develop new products based on generative design principles.
- AI systems dynamically optimize warehouse utilization, taking into account material outflows, inflows, inventory levels, and turn rates.
- Robots use image recognition to automatically adapt to the changing locations of parts.
- AI systems detect quality defects through image recognition.
- AI systems predict maintenance needs by identifying failure patterns.
- AI systems predict quality issues by analyzing and learning from quality and process data.
- Assistant systems suggest solutions to incidents based on earlier failure reports.
- AI systems accurately predict future demand for products by learning from patterns in demand and environmental data.

D2K Solution History in Manufacturing

- Machine Health Assessment
- Physics of Failure based Prediction
- Usage Monitoring and RUL Prediction
- Offline Data Analytics and Reporting
- Process Monitoring, Control, and Optimization
- Online PID Controller Health
- Intelligent Alarming (EEMUA 191 compliant)
- Product Quality Assessment
- Situation Awareness, Visualization, Dashboard Creation
- Digitization and DIAK Integration
- Enterprise Manufacturing Intelligence
D2K Solutions Engineering Services

• Knowledge Engineering and Requirements Derivation
  • Model-based Engineering and Requirements Traceability
  • Reliability Centered Maintenance
  • Conceptualization of Digital Thread

• Algorithm Selection and Model Analysis
  • Data Science and analytics
  • Tools for training and validation

• Innovation, Implementation, and Integration
  • Agile development process
  • SQA and transparency with stakeholders

• Verification and Validation
  • Behavior based testing
Model-based Design and Digital Thread

Leveraging the “Digital Thread” through Model-based Engineering
Flow Subsystem as a Concept
Flow Subsystem 1: Members (TK1, pp1, T1, P1, pp2, pp3, V2, pp6, pp9, T3, P3, V5, T2, P2, F1, TK2), Source: TK1, Sink: TK2.
Flow Subsystem 1: Members (TK1, pp1, T1, P1, pp2, pp4, V3, pp7, pp9, T3, P3, V5, T2, P2, F1, TK2), Source: TK1, Sink: TK2.

Note: Reasoner incorporates the concept of Flow Subsystem and dynamically determines Flow Subsystems for any application and its current configuration.

In Contrast with a data/information driven approach:
Flow subsystem selected from a pre-defined list that considers all possible combinations of valve configurations for all schematics
• generally hundreds or thousands of valves are involved, becoming a complex combinatorial problem.
• Any changes in the system (e.g. adding a valve) will require extensive work to update the combinatorial list.
• Any new system will require its own combinatorial list.
Extensible and Re-usable Class Libraries
Example of PHM Platform for generating and testing a Decision Tree:

```
Outlook | Temperature | Humidity | Wind | Play
Sunny   | Hot         | High     | Weak | No
Sunny   | Hot         | High     | Weak | Yes
Overcast| Hot         | High     | Weak | Yes
Rain    | Cold        | Normal   | Weak | Yes
Rain    | Cold        | Normal   | Strong| Yes
Overcast| Cool        | Normal   | Strong| Yes
Sunny   | Med         | High     | Weak | No
Sunny   | Med         | High     | Weak | Yes
Overcast| Med         | High     | Weak | Yes
Overcast| Hot         | High     | Weak | Yes
Rain    | Med         | High     | Strong| No
```

BUILD-BASEBALL

"122911: last execution of 3 malware Stocks task 0.0 second."

Events of Execution Controller BUILD-BASEBALL

CREATE-MATRIX-FOR-BASEBALL

TEST-DECISION-TREE

TEST-BASEBALL

"102857: last execution of one malware Stock task 0.5 second."

Events of Execution Controller TEST-BASEBALL
D2K Agile Development Process

• Overview
  • Development teams and the project stakeholders work closely to deliver incremental, iterative software and value.
  • It is understood, expected, and embraced that requirements will change based on the customer’s and market’s evolving needs.

• Accomplishments
  • Most recently, D2K delivered software systems to a NASA NextSTEP-2 Habitation partner in less than 4 months. The partner told NASA that they wished D2K had been working with them for the full 18 months of the Program.

• Significance
  • Frequent collaboration between D2K and the customer ensures that projects never drift too far off course
  • Trust is built quickly by focusing on delivering value; not just billing hours
Enterprise Manufacturing Intelligence

- Model-based Enterprise
- Apply a top-down approach based on manufacturing mission
- Consider implications for monitoring both product and process
- Integrate all data and knowledge into a comprehensive understanding of overall manufacturing process
- Strong emphasis on presentation and visualization
- Don’t replace but empower SMEs and operators