



S2699 – Digital Data for Next Generation Measurement/Locating Tools Project POP APR 19 – MAR 21

Process Change - Under Cognizance of Industry CRD # 1062

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Issue Description / Project Objective

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Location identification can account for up to 10% of labor costs with regards to shooting studs and no paint mark-up areas. GDEB and GDBIW use current projection technologies developed years ago, which offer limited options for production due to a narrow scope of work.

Project Objective

The Digital Data project will improve the processes used to locate and install paint masking and hanger stud positions by:

- Automatic queries of the CAD model and planning databases for location and work sequencing data needed to drive the projectors
- Develop and produce a mobile optical projection device (MOP) and supporting software to receive and process CAD and product data
- Integration of paint masking data with the mobile optical projection and stud location data with the Total Station system to validate the accuracy and repeatability of the improved process





Example of Frame, Flange and Web







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- Step 1: Identify component requiring paint masking
- Step 2: Find all surrounding components
- Step 3: Automatically winnow components
- Step 4: Manually select components to be projected





- Develop shipbuilder end use software that automatically queries the CAD model and planning databases for location and work sequencing data needed to drive the projectors
 - > Projection software functionality includes (Contractor Built):
 - MANUSCRIPT imports product geometry; creates solution; creates job and cal. files
 - LOGIC ENGINE Controls comm.; database entry; operational control
 - OPERATOR CLIENT Optics cal.; Pose and Tracking alignment; executes instructions
- Design and produce a mobile optical projection (MOP) device and supporting software to receive and process CAD and related product data
 - > Adapt Delta Sigma specialized 3D Projection technology for accurate location CAD projection in shipyard environment
 - Pixel alignment/changes thru the projection arc;
 - ProjectorVision 3D translator adaptation; Lens selection
- Integration of paint masking data with the mobile optical projection and stud location data with the Total Station system to validate the accuracy and repeatability of the improved process
 - In production proof of concept for product model geometry data extraction to feed optical system accomplished







Prototype Rig

High Level Process Flow – Projection Execution

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Project Status / Issues

- Contractor Delta Sigma Corp. has developed Mobile Optical Projector (MOP) and software (SW) to the revised project schedule
 - Selected and integrated Intel 515i camera
 - Working through with Delta Sigma Comp. a number of SW development issues
 - Implementation of Initial Pose and Edge Tracking algorithms have been challenging
 - Integration of EB provided REGGIE Plug-in code for Initial Pose -commonality of SW across EB
 - Prototype Rig #1 at BIW; Integration has commenced
 - Prototype Rig #2 to EB in Feb.- Initial Integration steps have commenced
 - Remote training complete
- Prototype demonstration planning underway execute at BIW
- It is anticipated Prototype rigs will remain with the Shipyards
 - Delta Sigma Company will continue refinement of proof-of-concept rigs and SW
 - Other shipyards use cases will be identified
- Enhanced the plate marking application extracting geometric information from electrical hanger level of assemblies (LOAs) at release status.
 - Integrated with Total Station to project highly accurate stud locations
 - Now in production use







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Register Projection







Project Data and Do Markup



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Move Projector Head – Edge Tracking



Near-Term Activities

- Near-Term Milestones to be Addressed
 - > Completion of MOP Test Plan to validate functionality and SW
 - > Completion of integration steps and BIW and EB
 - Finalize Demonstration Plans
- Technical Progress to be Accomplished
 - > Complete software algorithm implementation and coding:
 - Edge Based Initial Pose
 - Edge-Based Tracking
 - REGGIE Plug-In code(EB) April Tags for Initial Pose (improvement during Implementation)
 - > Integration of paint masking locations and stud locations with MOP
 - $_{\odot}$ Complete preparation of test data to begin User Acceptance Testing
 - Near completion refining footprint extraction code
 - Schedule/choreograph end-to-end performance
 - Conduct end-to-end activities
- Risk Reduction Items to be Addressed
 - Complete all proof-of-concept level SW implementations and coding
 - $_{\odot}$ Identify work arounds/on the shop floor contingency steps where needed (in-work)
 - Finalize Demonstration Plans logistics COVID era (video demonstration, facility availability, etc.)











Backup

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MANTECH manufacturing technology program

Task 1: Data Extraction of Electrical Hanger and Tile Stud Locations (GDEB)

- Requirements analysis & detailed design for extraction
 of data from model
- Implemented analysis & labeling on the electrical hanger studs
- Implemented compatibility with Spatial Analyzer
- User testing & demo Requirements Document

Task 3: Data Creation and Management for Paint Masking (GDEB)

- Requirements analysis & detailed design for extraction of paint masking data from model
- Enhanced Mobile Computing project's Build Plan Editor successfully enhanced to support paint masking views
- Bounding box query & down-select capability to select paint masking components
- Created Paint Masking work orders with storage and viewing ability in EB's Interactive Work Instruction
- Extracted treatment tile holograms
- Able to create treatment tile work orders, incl. center cross-hairs
- Unit & user testing

Task 2: Data Creation and Management for Paint Masking (GDBIW)

- Requirements analysis & detailed design for No Paint Mark Up (NPMU) data extraction from model
- Produced graphical footprints of hotwork attachments
- Explored alternative methods for creating footprints with Applied Physical Sciences for hotwork items shown on drawings but not in the CATIA model
- Unit & user testing

Task 4: Analysis and Design of Mobile Optical Projector (GDBIW)

- Requirements analysis & definition for the MOP system
- · Concept and detail design of the MOP
- Attended Air Force ManTech presentation of Digital Flashlight in December 2019 at Wright Patterson AFB
- Leased and set up a projector for testing footprint projection at BIW and provided demo at Phase I Review

Task 5: Phase I Reporting

 Updated business cases, determined 'Go' to Phase II, Phase I Report







