Department of the Navy SBIR/STTR Transition Program

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Topic # N221-069
Training and E-Learning for Maintenance-tasks using a Modern Platform for Operational-efficiencies (TEMM-PO)
Qualtech Systems, Inc.

WHO

SYSCOM: ONR

Sponsoring Program: NAVAIR

Transition Target: Marine Corps Engineer School (MCES), Marine Corps Combat Service Support Schools (MCCSSS)

TPOC: Peter Squire
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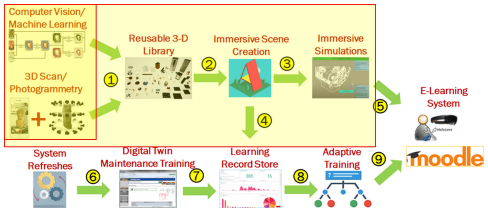
Other Transition Opportunities: Marine Corps Communication-Electronics School (MCCES)
3rd Battalion, 5th Marines (V35)



Qualtech Systems, Inc. (2023)

Notes: 1. Leverage source material such 3D scans and 2D photos to generate 3D models. For 3D scans, we will apply common open-source Photogrammetry techniques to synthesize the 3D object. For 2D pictures we will use Computer Vision ML techniques to extract 3D objects from the images. The resulting 3D objects are cataloged in a reusable library that can be used for generating immersive content.
2. Reuse the 3D objects from the library to build immersive experiences using the A-frame framework and the underlying immersive authoring engine, a web-based AR/VR Designer
3. AR/VR Designer enables authoring of AR/VR scenes for maintenance training without the need for 3D programming and graphics design skills. The AR/VR Designer also supports authoring of component identification tests in an immersive setting and scores students on them.
4. The AR/VR Designer captures student performance metrics for immersive exercises. These recorded actions are transformed into eXperience API (xAPI) learner records and logged into a Learning Record Store (LRS). LRSs such as Veracity have built-in dashboards and analytics to display learning metrics.
5. The immersive content will be deployed in a Learning Management System (LMS) platform such as Moodle. The embedded AR/VR scenes in the digital twin will be used as immersive training content.

WHAT

Operational Need and Improvement: Out-of-date tradition classroom-based training techniques such as student handouts / presentations are unable to keep up with system operations, resulting in limited capability to deliver and sustain improved readiness of Naval platforms. Furthermore, more complex battlefield systems are being fielded, bringing challenges in maintaining them. Hence, there is a need to keep training up to date via immersive maintenance training. However, the main challenge faced by schoolhouses while creating immersive content is lack of ready 3D models in the schoolhouses. This necessitates a content creation pipeline that can generate 3D models from common means such as available 2D pictures, or by taking 3D-scans using common cellphone cameras.

Specifications Required:
- Convert 2D pictures to 3D models or take 3D-scans using cellphone cameras
- Semi-automated web-based 3D object manipulation
- Immersive authoring features that animate legacy 2D content
- Automated batch conversion and cataloging of 3D content
- cmi5/xAPI tracking for immersive content hosting and learning metrics

Technology Developed: A framework that extracts images, pictures, media, references, etc. from legacy course material, and converts them to 3D models and other artifacts usable in an immersive scene to facilitate an immersive content generation. Supports various device modalities and points of delivery for personalized lifelong learning.

Warfighter Value:
- Reduces the technician's reliance on paper procedures
- Aids in building and sustaining the necessary knowledge, skills and abilities (KSAs) in maintenance technicians
- AR-driven maintenance performed in the field becomes an integral part of system "life-cycle"
- Results in less technicians performing a wide variety of maintenance tasks, saving time and reducing task errors

WHEN

Contract Number: N68335-23-C-0294 **Ending on:** Jul 21, 2025

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Marine Corps 3D scanning App	Low	Marine Corps instructors are able to create 3D objects that they can utilize to source immersive training content.	6	3rd QTR FY24
AI/ML and vision -based 2D to 3D conversion pipeline	Medium	Marine Corps instructors will be able to convert 2D images found in schoolhouse presentation to 3D objects.	6	4th QTR FY24
Deployment of the 3D model sourcing pipeline at MCES and MCCSSS schoolhouses	Medium	Marine Corps instructors will be able to modernize their legacy courses by rapidly creating the 3D building blocks for their immersive curricula.	7	2nd QTR FY25

HOW

Projected Business Model:
- The initial development costs of the 3D Content Generation addon modules will be covered by SBIR funds. There will not be any additional manufacturing cost incurred.
- Once development is complete, seek commercialization partners in consultation with the Navy TPOC, specifically, partnerships with technology primes
- Utilize sales and marketing channels such as seminars/webinars, trade shows, customer forums, press releases and social channels

Company Objectives:
- Immersive 3D Object conversion pipeline
- Apply Photogrammetry to capture 3D objects
- Immersive scene authoring enhancements
- Usability and scalability assessment and Improvements
- Technology transition to Marine Corps use-case
- Technology commercialization with non-DoD industry

Potential Commercial Applications:
- Military AR (MAR): Creating an agile warfighter through effective training
- Manufacturing: Bridge the skill gap by providing expert remote assistance and support in operations
- Maintenance, Repair and Overhaul (MRO): Attaining efficiency by accelerating the maintenance and repair activities
- Energy and Utilities: Improve first-time fix rates for critical equipment and increase technician safety

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