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# RPPR Final Report

## as of 14-Mar-2022

Agency Code: 21XD

Proposal Number: 75738CSRIP

Agreement Number: W911NF-20-1-0134

### INVESTIGATOR(S):

**Name:** Lin Ma  
**Email:** lm4wb@virginia.edu  
**Phone Number:** 4349243072  
**Principal:** Y

Organization: **University of Virginia**

Address: The Rector and Visitors of the University of Virginia, Charlottesville, VA 229014195

Country: USA

DUNS Number: 065391526

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**Report Date:** 31-Jan-2022

Date Received: 11-Mar-2022

**Final Report** for Period Beginning 24-Apr-2020 and Ending 31-Oct-2021

**Title:** High Speed Laser and Camera for in Situ 4D Visualization

**Begin Performance Period:** 24-Apr-2020

**End Performance Period:** 31-Oct-2021

**Report Term:** 0-Other

Submitted By: Lin Ma

Email: lm4wb@virginia.edu

Phone: (434) 924-3072

**Distribution Statement:** 1-Approved for public release; distribution is unlimited.

### STEM Degrees:

### STEM Participants:

**Major Goals:** This proposal requests funds for the purchase of a high speed camera and a high-speed laser system for the research of four dimensional (4D) in situ visualization. The requested equipment will be used in an ongoing research project funded by the US Army Research Office (Contract number: W911NF1820192, Project Title: In situ 4D visualization, duration: 2018-2021). The focus of the research is to enable in situ visualization of 4D (all three spatial dimensions plus time) datasets and higher dimensional datasets through collaborative efforts among the University of Virginia (Charlottesville, VA), TARDC (Warren MI), and APG (Aberdeen Proving Ground, MD). Visualization of multidimensional datasets based on post-processing is relatively mature. However, in many applications, it is of great interest and benefit to Army to be able to visualize high dimensional datasets in situ, and furthermore to guide the subsequent post-processing based on the in situ visualization. The project proposes several research topics that can potentially enable such in situ aspect and also proposes an experimental demonstration.

**Accomplishments:** The requested equipment has been purchased, delivered, and successfully tested and installed in the PI's lab at the University of Virginia. There were some delays caused by the COVID pandemic on both our end and the vendors' end to process the orders. Despite the short duration we have had with these equipment, they are already helping with both our educational and research missions. In particular, the equipment has helped the research of a PhD student (Chris Windle). The student has been maintaining excellent academic progress and successfully conducted both laboratory and field measurements described below. He has successfully passed his PhD qualification exam is preparing for his proposal defense and final defense.

**Training Opportunities:** The goal of this equipment proposal is to support the PI's research project funded by the US Army Research Office (Contract number: W911NF1820192, Project Title: In situ 4D visualization, duration: 2018-2021). And since this ARO project started in August 2018, the PI has recruited a new PhD student (Chris Windle), and has trained the student on the basics of four dimensional technologies, including the algorithms to perform 4D reconstructions, and also the experimental skills to obtain 4D measurements. The student has been maintaining excellent academic progress and successfully conducted both laboratory and field measurements described below. He has successfully passed his PhD qualification exam is preparing for his proposal defense and final defense.

**Results Dissemination:** Nothing to Report

**Honors and Awards:** Nothing to Report

**RPPR Final Report**  
as of 14-Mar-2022

**Protocol Activity Status:**

**Technology Transfer:** Nothing to Report

**PARTICIPANTS:**

**Participant Type:** PD/PI

**Participant:** Lin Ma

**Person Months Worked:** 1.00

Project Contribution:

National Academy Member: N

**Funding Support:**

**Partners**

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I certify that the information in the report is complete and accurate:

Signature: Lin Ma

Signature Date: 3/11/22 3:24PM

Here I am using this uploaded attachment to clarify the reporting of participants.

This is an equipment proposal and there is no personnel salary budgeted in it or charged on it. However, the system requires me to put in participants and also requires me to pick a person-month for each participant between 1 to 15 months. So I picked "1 month" for myself as the PI.

But again, in fact, no personnel salary was charged on this grant.