DMACE Challenge

(Digital **M**anufacturing **A**nalysis, **C**orrelation and **E**stimation**)**

Rules

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Defense Advanced Research Projects Agency
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1. Introduction

The Defense Advanced Research Projects Agency (DARPA) is conducting the DARPA Digital Manufacturing Analysis, Correlation and Estimation (DMACE) Challenge, a prize-based competition that will explore the development of models that correlate inputs for defined digital manufacturing processes to the corresponding structural characteristics of two complex digitally manufactured structures. The Challenge will also explore the utility of crowd sourcing and wide area collaboration in solving a complex structural materials problem.

The Challenge is authorized under 10 U.S.C. § 2374a, which authorizes the Secretary of Defense to award prizes in recognition of outstanding achievements in basic, advanced, and applied research, technology development, and prototype development that have the potential for application to the performance of military missions of the Department of Defense.

These rules apply to all participants in the Challenge. These rules may be changed without prior notice, and all participants should monitor the Challenge website (http://www.DMACE.net) for the latest information.

DARPA may cancel the Challenge without notice.

The DARPA Director will be the final decision authority for all matters concerning the Challenge.

Nothing in these rules, to include information on the Challenge website, may be interpreted as authorizing the incurrence of any costs or modifying the statement of work or authorizing work outside the terms and conditions of any existing agreements or contracts with DARPA.

2. Eligibility

The Challenge is open to individual participants and teams of participants of all ages. Participants under 18 years of age may be required to obtain the consent of a guardian and/or meet other applicable legal requirements as a prerequisite to accepting the Challenge prize.

Participants must have legal access to the Internet. Violation of the rules or intentional or consistent activity that undermines the spirit of the Challenge may result in disqualification. The Challenge is void wherever restricted or prohibited by law.

An individual is not eligible to register or otherwise access the Challenge website if he or she is on the Specially Designated Nationals list promulgated and amended by the Office of Foreign Assets Control of the United States Department of the Treasury.

DARPA employees and family members, as well as DARPA support contractors and their family members, are ineligible to participate in the Challenge. Similarly, Oak Ridge National Laboratory and U.S. Naval Postgraduate School employees, support contractors and the dependents thereof who are involved with the design, manufacturing, testing and analysis of DMACE Challenge content or materials are ineligible to participate in the Challenge.

Non-U.S. citizens require a taxpayer identification number (TIN) to receive the prize. A TIN is obtainable upon request from the U.S. Government. Additional information is available on the U.S. Internal Revenue Service website at www.IRS.gov.

DARPA reserves the right to disqualify a participant whose actions are deemed to violate the spirit of the competition for any reason, including but not limited to, the violation of laws or regulations in the course of participation in the Challenge.

3. Performance Guidelines

Under the Challenge, DARPA will use digital manufacturing (DM) machine processes to manufacture metallic sphere and polymer cube structures and conduct a series of structural load tests on the items. Data regarding the manufacture and testing of the items will be posted to the DMACE Challenge website (http://www.DMACE.net) for analysis by Challenge participants. Participants (individual or team) will be challenged to develop models that accurately predict test outputs to given corresponding DM machine inputs. The models that most accurately predict the final test results for both the metallic sphere and the polymer cube will win the Challenge.

For each structure, DARPA will publish data on the Challenge website regarding the input settings for a particular digital manufacturing process and the resultant output of structural testing. Input setting data may include, but is not limited to, device control parameters, material composition, and computer-aided design files. Output data may include, but is not limited to, stiffness, strength, and displacement data. Data may be provided in a variety of formats, tabular and graphical.

To evaluate the accuracy of participant models, on December 3, 2010, DARPA will post the final DM parameters changes on the Challenge website. The values of the final DM input parameters of the final test articles will be different from those used to develop the participants' models. Participants will use their models to predict the outcome of the structural load tests of the final structures. Participant predictions will be compared using the sample Mahalanobis distance. The participant with the lowest sample Mahalanobis distance will be the winner. The formulation for calculating the sample Mahalanobis distance will be disseminated on the DMACE Challenge website.

One entry may be submitted by each team or individual participant. Team entries must have a single individual as the team leader and primary point of contact as the prize recipient.

To be a valid entry, participant submissions must include the predicted result of the structural test for each component; i.e., there will be a prediction for the metallic material structure and the polymer material structure. Valid entries must include their models and a brief description of the techniques used in the development of their models. Additional information will be posted on the Challenge website during the course of the Challenge.

Data for model development will be released incrementally beginning on or about October 29, 2010, and will continue through December 1, 2010. The final parameter changes requiring

correlation estimation will be posted via the Challenge website on December 3, 2010, after which participants will have until 4:30 PM EST December 6, 2010 to submit their predictions of test results for the two final designs (one for the sphere and one for the cube) as their entry. During the week of December 6, 2010, the final samples will be tested and the winner selected.

Participants are required to register and submit their entry on the event website. Data format for entries will be in International System (SI) units in the format prescribed on the Challenge website.

Winners will be notified via email and identified on the Challenge website.

By submitting an entry, a participant authorizes his or her name to be released to the media if the participant wins the prize. DARPA does not require that participants relinquish or otherwise grant license rights to intellectual property developed or delivered under the Challenge.

DARPA does not plan to retain entries after the Challenge is completed, but will compute aggregate statistics. DARPA may contact participants to discuss the means and methods used in solving the challenge.

All correspondence regarding this event should be directed to webmaster@DMACE.net.

4. Prize

A $50,000 cash prize will be awarded to the entry with the lowest sample Mahalanobis distance. No prize for second place (runner-up) will be awarded unless DARPA cannot contact the winning participant. If DARPA is unable to contact the winning participant within 24 hours after posting the winning participant, DARPA may award the prize to the runner-up participant.

In the event of a tie, the valid entry with the earliest submission will be the winner.

DARPA will award the prize to the individual or team point of contact registered on the Challenge website.

Tax treatment of prizes will be handled in accordance with U.S. Internal Revenue Service guidelines. The winner must provide a U.S. TIN (e.g., a social security number) to receive the cash prize.