

OMIC R&D TECHNOLOGY BOARD

CONCEPTUAL ABSTRACT



TITLE: Robot Vision for Defect Classification [Phase 2 of R7]

RELATED ROAD-MAPPING DESIGNATION ID#: R28

SUPPORTIVE INDUSTRY: Cobot Team, Boeing

PROJECT TYPE: General Project

PROBLEM STATEMENT (What Are We Trying to Solve?): Up to now, vision systems have been successful at part measurement, defect size measurement on a relatively homogeneous surface, edge burr conditions, and surface finish. However, the vision systems need to evolve to where they can inform the user on the type or classification of the defect. These classifications would include descriptors such as: wear, porosity, inclusions, burr, and debris. Like the measurement capability, the vision system should be able to make these classifications on dry as well as oily surfaces.

PROJECT DESCRIPTION: The work will leverage the developed robotic vision system (R7) for detecting and identifying the type of defects on the machined, composite, or 3D printed surfaces. Prior results from R7 project have demonstrated the feasibility of detecting the cavity, crack, and bump from dry or oily surfaces based on the 3D point-cloud data. The algorithm developed in R7 further enables the successful detection on milled rough surfaces. The work in Phase II will integrate machine learning models into the robotic vision system to classify the type of defects by referring to the features extractable from the point-cloud data. The outcome of this work will provide a fully automatic means to check different types of surfaces, identify the defects that are critical for the manufacturer, and reason the source factors lead to the defects. The final product should be a self-contained, user-friendly apparatus that can be utilized at OMIC for lab work & demonstrations.

Identify Related OMIC R&D Resources: Proposing researchers should use their best judgment in deciding on the optimal resources for the research. To further aid in this decision, the OMIC staff has taken the initiative to best identify on-site resources (machines, equipment, and staff) that may relate to the scope of this research. Please recognize that researchers are not limited to these resources.

- Machines and equipment at OMIC can be reviewed at:
<https://www.omic.us/explore/facility>
- OMIC Staff or SMEs

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PROJECT DELIVERABLES:

- Final report
- Final presentation
- Developed apparatus

SPECIAL NOTE: It should be recognized that this Conceptual Abstract is written based on comments collected during OMIC R&D Road-mapping workshop and based on industries need for applied research. However, researchers as SMEs, are encouraged to lend specific technical feedback to further refine the Project Description and or Project Outcomes. The proposing researcher may do so either directly to OMIC R&D, or in the submitting proposal.

UTILIZATION OF OMIC RESOURCES: Researchers are encouraged to utilize the capital and personnel resources available on the OMIC R&D campus in their proposals. Use of OMIC time and machines should be included in the Proposal funding request. If use of OMIC resources are not identified in a proposal and are requested during, the project sponsor will be responsible for requesting a costed project amendment from the Tech Board.

PROJECT UPDATE EXPECTATIONS: Researchers are required to have monthly update discussion with OMIC R&D to provide a summary update on project status. This is done by way of a user-friendly format known as the OMIC 6-Block update. Typically, these meetings are scheduled on the first Wednesday and Thursday of each month. Secondly, depending on the scope of the project, OMIC R&D's industry Tech Board representatives are often interested in periodic project updates, and even in project participation. Researchers are required to communicate with supportive industry and facilitate communications as required.

PROJECT DURATION: It is OMIC R&D's strong preference that duration of a General Project aligns with the academic calendar cycle (July 2023 to June 2024). It is preferred that the project be completed by June 2024. Researchers are encouraged to factor in variables such as contracting, student hiring (if needed), procurement, holidays, and travel. It has been OMIC R&D's experience that a projects useful working duration is typically 9 to 10 months. Researchers are also encouraged to lend feedback, and to adjust the scope of work to best fit this preferred timeframe. Additionally, it is reasonable to even recommend phasing breakdowns to the project. In some unique circumstances, if the project is to take significantly longer than the duration of the academic year, this reasoning should be explicitly explained in the proposal.

CONTACTS AT OMIC R&D:

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