Notice of the Final Oral Examination
for the Degree of Master of Applied Science

of

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BASc (University of Toronto, 2015)

“Unmanned Aerial Vehicle-based Non-destructive Testing Methods for Concrete Structures”

Department of Mechanical Engineering

Tuesday, July 3, 2018
1:00 P.M.
Engineering Office Wing
Room 430

Supervisory Committee:
Dr. Rishi Gupta, Department of Mechanical Engineering, University of Victoria (Supervisor)
Dr. Yang Shi, Department of Mechanical Engineering, UVic (Member)

External Examiner:
Dr. Alexandra Branzan Albu, Department of Electrical and Computer Engineering, UVic

Chair of Oral Examination:
Dr. Patrick O’Hara, Department of Geography, UVic

Dr. Stephen Evans, Acting Dean, Faculty of Graduate Studies
Abstract

In this work, unmanned aerial vehicle-based non-destructive testing methods for concrete structures are evaluated and developed. There exists a need for improved infrastructure inspection techniques with increased expediency. Unmanned aerial vehicles (UAVs) are highly mobile and have shown promise towards achieving this directive, but more work is required to adapt traditional NDT methods to be UAV-compatible. To this end, concrete sounding techniques were evaluated with a quantitative acoustic frequency analysis procedure on a series of concrete slabs. One such method was adapted for use with a UAV and was used to detect subsurface voids in one of the concrete samples and offer a means of depth estimation. This work was complemented with experiments concerning UAV-based visual and infrared imaging techniques already in practice for UAV-based concrete inspection. Together, findings indicate the strengths and weaknesses of the NDTs tested and suggest further improvements for UAV-based NDTs and inspection strategies moving forward. Development of a novel sensor platform for UAV-based measurement, as well as results of an actual bridge inspection using infrared and optical methods demonstrate the present capabilities of the UAV-based instrumentation.