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

of

KURT FAIRFIELD

“Design and Application of a Water Powered Irrigation Robot”

Department of Mechanical Engineering

Thursday, April 9, 2020
10:00 A.M.
Remote Defence

Supervisory Committee:
Dr. Caterina Valeo, Department of Mechanical Engineering, University of Victoria (Co-Supervisor)
Dr. Daniela Constantinescu, Department of Mechanical Engineering, UVic (Co-Supervisor)

External Examiner:
Dr. Michael McGuire, Department of Electrical Engineering, UVic

Chair of Oral Examination:
Dr. Shailoo Bedi, Department of Educational Psychology & Leadership Studies, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies
Abstract

This document presents the written thesis work on the conceptual design of a novel legged irrigation robot in partial fulfillment of the course requirements of MECH 599 – MASc. Thesis in the Department of Mechanical Engineering at the University of Victoria, British Columbia, Canada.

This paper reports the findings of conceptual design and application research for a novel use of irrigation fluid power to provide mobility to a legged autonomous, tethered irrigation robot. Systems already exist to convert fluid power to rotary motion to power various irrigation systems. The conceptual designs implement a McKibben actuator to generate linear motion with water as the process fluid and a compact 3DOF spherical joint to create a modular robot leg that can be used to create a legged ambulatory robot. A six-legged robot is proposed from the conceptual design of the modular leg.

Irrigation was selected as the initial leading application, however, once deployed the devices provide a field-ready platform to facilitate a whole suite of agriculturally important activities; seeding, weed suppression, pest management, soil sensing, crop growth assessment, as well as creating a robust research platform. This work is the lead in research to provide a viable mechanism to facilitate control system and dynamic modelling ahead of full-scale prototyping and field testing.