## Online Path Planning for Multi-Robot Coverage

## Kevin Bradner

Department of Electrical Engineering and Computer Science

Case Western Reserve University

January, 2020

## **Contents**

| 1 | Introduction             |                                     |   | 1  |
|---|--------------------------|-------------------------------------|---|----|
|   | 1.1                      | Roboti                              | ic Coverage Background                  | 1  |
|   |                          | 1.1.1                               | Spanning-Tree based Coverage Algorithms | 3  |
|   |                          | 1.1.2                               | Multi-Agent Robotic Coverage            | 9  |
|   | 1.2                      | Problem Statement                   |   |    |
|   |                          | 1.2.1                               | Rules for Robot Motion                  | 14 |
|   |                          | 1.2.2                               | Environment Description                 | 16 |
|   |                          | 1.2.3                               | Field of View and Information Sharing   | 18 |
|   |                          | 1.2.4                               | Relation to Robotic Mapping             | 19 |
|   |                          | 1.2.5                               | Applications and Other Notes            | 22 |
| 2 | Simulation Development 2 |                                     |   |    |
|   | 2.1                      | Implementation of Problem Statement |   | 25 |
|   |                          | 2.1.1                               | Simulated Environment & Dynamics        | 25 |
|   |                          | 2.1.2                               | Robot and Ensemble Representation       | 27 |
|   |                          | 2.1.3                               | Environment Interface                   | 29 |
|   |                          | 2.1.4                               | Environment Generation                  | 32 |
|   |                          | 2.1.5                               | Running Simulations                     | 36 |
|   |                          | 2.1.6                               | Visualization Tools and Parsing         | 38 |
|   | 2.2                      | Extra l                             | Features                                | 43 |