Contents

1. Introduction **1-3**

1.1 Motivation.....1

1.1.1 Recognition of patterns in Spatio-temporal data.....1

1.1.2 Use of Formal Grammar within QSR for recognition.....1-2

1.2 Organization of the thesis.....2-3

2. Literature Review **1-21**

2.1 Qualitative Spatial Representation and Reasoning

2.1.1 What is Qualitative Spatial Reasoning (QSR)? 1-3

2.1.2 Qualitative Spatio-Temporal Reasoning (QSTR).....3-4

2.1.3 QSTR for Learning From Video 4-6

2.1.3.1 Hidden Markov Model & QSTR.....5-6

2.1.3.2 Formal Grammar & QSTR.....6

2.2 Image Processing 7-21

2.2.1 OpenCV 2.2 7-11

2.2.1.1 Introduction.....7

2.2.1.2 Basic Image Processing Examples using OpenCV.....7-10

2.2.1.3 Use of the library.....11

2.2.2 Object Detection 11-14

2.2.2.1 Introduction.....11

2.2.2.2 Algorithms available.....11-14

2.2.2.3 Algorithm used for background subtraction.....14

2.2.3 Object Tracking 15-19

2.2.3.1 Introduction.....15

2.2.3.2 Algorithms available.....15-17

2.2.3.3 Algorithm used for tracking.....17-19

2.2.4 Noise Reduction and Removal 20-21

2.2.4.1 Morphological Operations (Dilation and Erosion).....20-21

2.2.4.2 Connected Components 21

3. Proposed Architecture 1-8

3.1 Image Qualification 1

3.1.1 Introduction (Image MBR relations).....1

3.1.2 Description of the modules.....2-3

3.2 QR for Pattern Identification 4-8

3.2.1 Introduction 4

3.2.2 Description of the modules 5-8

4. Conclusion And Future Work 1-3

4.1 Results and Screenshots.....1-2

4.2 Conclusion & Summary of work.....3

5. References 1-2