

NORTH-WEST UNIVERSITY

HONOURS THESIS

---

# A cellular automata approach to model informal settlement growth

---

*Author:*

Affaan MUHAMMAD

*Supervisor:*

Prof. Hennie KRUGER

*A thesis submitted in fulfilment of the requirements  
for the degree of Bachelor of Science Honours  
in the*

School of Computer Science and Information Systems

April 14, 2021

# Declaration of Authorship

I, Affaan MUHAMMAD, declare that this thesis titled, “A cellular automata approach to model informal settlement growth” and the work presented in it are my own. I confirm that:

- This work was done wholly or mainly while in candidature for a research degree at this University.
- Where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated.
- Where I have consulted the published work of others, this is always clearly attributed.
- Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work.
- I have acknowledged all main sources of help.
- Where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself.

Signed:

---

Date:

---

*“a quote will come here.”*

Person quoting

NORTH-WEST UNIVERSITY

# *Abstract*

Faculty of Natural and Agricultural Sciences  
School of Computer Science and Information Systems

Bachelor of Science Honours

**A cellular automata approach to model informal settlement growth**

by Affaan MUHAMMAD

Abstract will come here in the future.

# *Acknowledgements*

Acknowledgements will come here in the future.

# Contents

<b>Declaration of Authorship</b>	<b>iii</b>
<b>Abstract</b>	<b>vii</b>
<b>1 Introduction</b>	<b>1</b>
1.1 Project description . . . . .	1
1.2 Problem description and background . . . . .	1
1.3 Aims and objectives . . . . .	1
1.3.1 Aims . . . . .	1
1.3.2 Objectives . . . . .	1
1.4 Procedures and methods . . . . .	2
1.4.1 Paradigms . . . . .	2
1.4.2 Software Development Life Cycle and Philosophies . .	2
1.4.3 Collaboration . . . . .	2
1.5 Project management . . . . .	3
1.6 Development platform, resources, and environments . . . . .	3
1.7 Ethical and legal implications . . . . .	3
1.8 Provisional chapter division . . . . .	3
<b>A Test 1</b>	<b>5</b>
A.1 Hello world? . . . . .	5
<b>Bibliography</b>	<b>7</b>

# List of Figures

# List of Tables



# List of Abbreviations

<b>CA</b>	<b>Cellular Automata</b>
<b>WHO</b>	<b>World Health Organisation</b>
<b>UN</b>	<b>United Nations</b>
<b>StatsSA</b>	<b>Statistics South Africa</b>

# Chapter 1

## Introduction

### 1.1 Project description

A cellular automata technique, specifically John Conway's 'Game of Life' will be employed to model informal settlement growth in South Africa.

### 1.2 Problem description and background

Discuss Informal settlement framework(what, where, when, how of informal settlements)

Discuss UN-Habitat MDGs' reports with regards to informal settlements

Discuss socio-economic factors of informal settlements

Discuss Cellular Automata

Discuss Conway's game of life

### 1.3 Aims and objectives

#### 1.3.1 Aims

- Create a sound statistical model
- Apply model to Conway's Game of Life to predict growth

#### 1.3.2 Objectives

- Conduct the relevant literature reviews
- Get access to relevant maps needed regarding informal settlements
- If above step fails, create own maps

- Create an application that allows map interactions
- Create a statistical model to provide an initial state
- Apply initial state to map
- Iterate and monitor growth output

## **1.4 Procedures and methods**

### **1.4.1 Paradigms**

Discuss all paradigms

Discuss their pros and cons

Discuss the one which will be chosen

### **1.4.2 Software Development Life Cycle and Philosophies**

Discuss:

- Waterfall
- Agile
- Scrum
- DAD
- XP
- Kanban
- Lean
- RUP
- Top-down & Bottom-up approach

Choose the one that will be used

### **1.4.3 Collaboration**

Discuss if comparative review will be done with other group member

## **1.5 Project management**

Gantt chart here

Scope (for research or artefact?),

limitation and risk analysis (for research or artefact?)

My Responsibilities here

## **1.6 Development platform, resources, and environments**

Operating system?

Programming language?

IDE?

## **1.7 Ethical and legal implications**

Data access implications?

## **1.8 Provisional chapter division**

Will be taken from examples given.

# Appendix A

## Test 1

### A.1 Hello world?

Test one two three

# Bibliography

- [1] "Covid-19 Pandemic and the Challenges of Informal Settlements in South Africa and Beyond: Theoretical Insights and Practical Interventions." In: *Journal of Public Administration* 55.3 (2020), pp. 283 –293. ISSN: 0036-0767. URL: <https://nwulib.nwu.ac.za/login?url=https://search.ebscohost.com/login.aspx?direct=true&db=edssas&AN=edssas.ejc.jpada.v55.n3.a4&site=eds-live>.