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# Smart Hospital

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By

AUTHOR'S NAME



Department of Engineering Mathematics  
UNIVERSITY OF BRISTOL

A dissertation submitted to the University of Bristol in accordance with the requirements of the degree of DOCTOR OF PHILOSOPHY in the Faculty of Engineering.

APRIL 2013

Word count: ten thousand and four



# Abstract

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# Dedication and acknowledgements

Here goes the dedication.



# Author's declaration

I declare that the work in this dissertation was carried out in accordance with the requirements of the University's Regulations and Code of Practice for Research Degree Programmes and that it has not been submitted for any other academic award. Except where indicated by specific reference in the text, the work is the candidate's own work. Work done in collaboration with, or with the assistance of, others, is indicated as such. Any views expressed in the dissertation are those of the author.

SIGNED: ..... DATE: .....





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# Chapter 1

## Introduction

Begins a chapter. Example: When the beloved cellist (Christopher Walken - outstanding) of a world-renowned string quartet receives a life-changing diagnosis, the group's future suddenly hangs in the balance: suppressed emotions, competing egos and uncontrollable passions threaten to derail years of friendship and collaboration. Featuring a brilliant ensemble cast (including Philip Seymour Hoffman, Catherine Keener and Mark Ivanir as the three other quartet members), it is a fascinating look into the world of working musicians, and an elegant homage to chamber music and the cultural world of New York. The music, of course, is ravishing (the score is the work of regular David Lynch collaborator Angelo Badalamenti): A Late Quartet hits all the right notes.

### 1.1 Motivation

Begins a section.

#### 1.1.1 Client Brief

Begins a subsection.

#### 1.1.2 General

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#### 1.1.3 Specific

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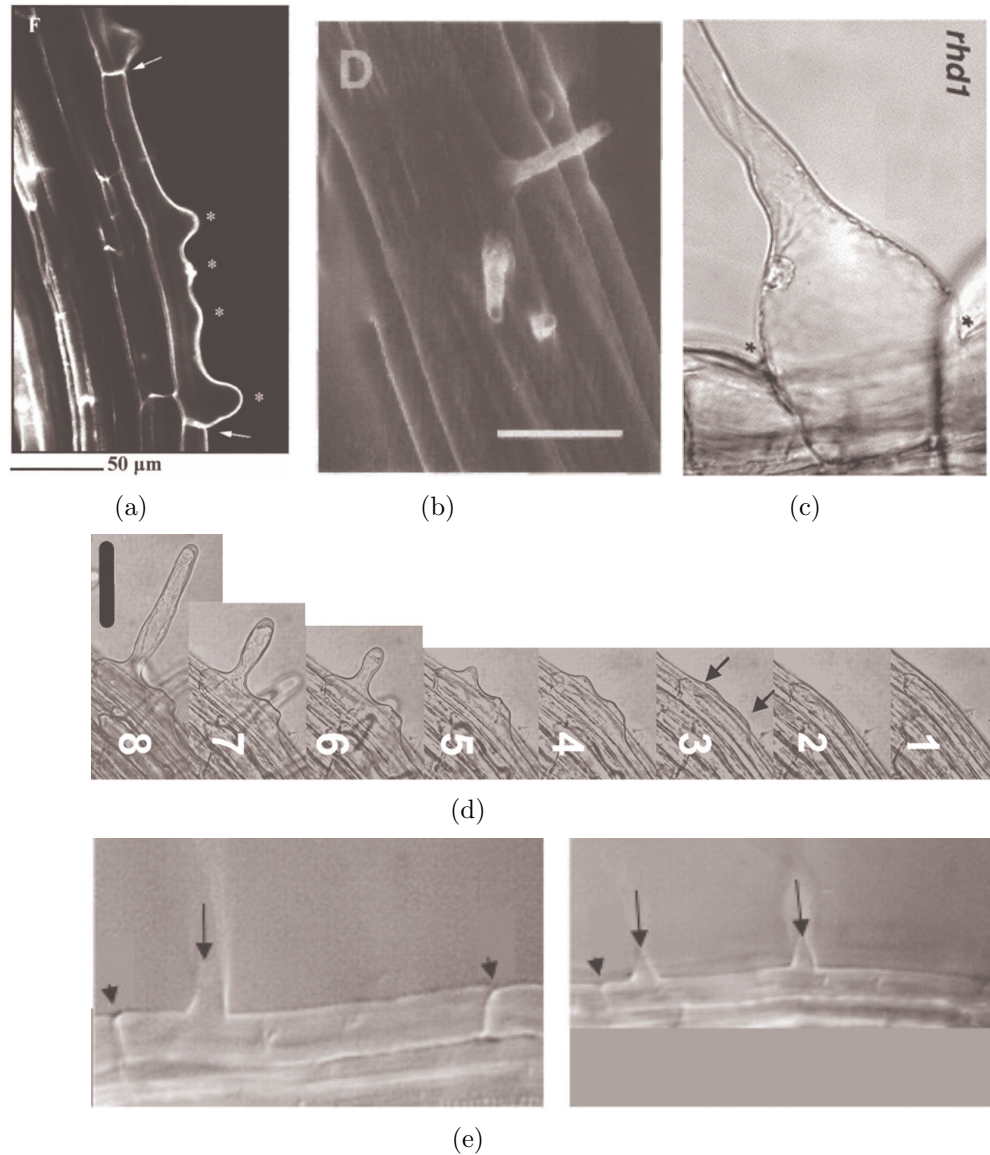


Figure 1.1: (a) A mutant RH cell. Asterisks show multiple sites of RH initiation in a single root hair cell (indicated by the arrows). Figure reproduced from [5]. (b) Hair-forming cell with three RH initiation locations. The bar represents 50  $\mu\text{m}$ . Figure reproduced from [3]. (c) Large bump in mutant *rhd1*. Figure reproduced from [1]. (d) Mutant overexpressing gene *ROP2*; from right-hand to left-hand, numbers indicate progressive snapshots at different times. RH initiation sites are indicated by the arrows. The bar represents 75  $\mu\text{m}$ . Figure reproduced from [2]. (e) Mutants affected by auxin. On the left-hand side, RH site is farther away from the apical end (left arrow cap); on the right-hand side, multiple RH locations (arrows). Figure reproduced from [4].



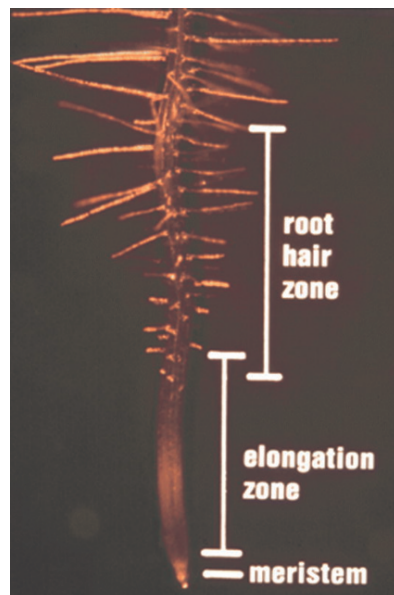


Figure 1.2: Developmental zones of an Arabidopsis root. Figure reproduced from [1].



## Chapter 2

# Background

### 2.1 Relative Work

#### 2.1.1 SDG Goal 3

#### 2.1.2 Existing Solutions

### 2.2 Requirements

The system is primarily designed as a web-based platform for general hospital staff, specifically doctors and nurses, to facilitate interaction with patients. The core aim is to enable healthcare professionals to manage patient information, conduct remote consultations, and reduce the need for patients to visit the hospital in person. While patients are also considered stakeholders of the system, the focus of the design and development process was placed on the needs of doctors and nurses. The decision was driven by the goal of reducing the administrative and operational workload for hospital staff, thereby improving efficiency within clinical workflows.



## Chapter 3

# Design and Implementations

Begins a chapter. Example: When the beloved cellist (Christopher Walken - outstanding) of a world-renowned string quartet receives a life-changing diagnosis, the group's future suddenly hangs in the balance: suppressed emotions, competing egos and uncontrollable passions threaten to derail years of friendship and collaboration. Featuring a brilliant ensemble cast (including Philip Seymour Hoffman, Catherine Keener and Mark Ivanir as the three other quartet members), it is a fascinating look into the world of working musicians, and an elegant homage to chamber music and the cultural world of New York. The music, of course, is ravishing (the score is the work of regular David Lynch collaborator Angelo Badalamenti): A Late Quartet hits all the right notes.

### 3.1 Methodology

#### 3.1.1 Work Flow

#### 3.1.2 Process

#### 3.1.3 Front-end Tools

#### 3.1.4 Back-end Tools

#### 3.1.5 Testing Tools

### 3.2 Front-end Design and Implementations

#### 3.2.1 Early Stage-Virtual Hospital Africa(VHA)

#### 3.2.2 Smart Hospital

### 3.3 Back-end Design and Implementations



## Chapter 4

# Evaluation and Testing

Begins a chapter. Example: When the beloved cellist (Christopher Walken - outstanding) of a world-renowned string quartet receives a life-changing diagnosis, the group's future suddenly hangs in the balance: suppressed emotions, competing egos and uncontrollable passions threaten to derail years of friendship and collaboration. Featuring a brilliant ensemble cast (including Philip Seymour Hoffman, Catherine Keener and Mark Ivanir as the three other quartet members), it is a fascinating look into the world of working musicians, and an elegant homage to chamber music and the cultural world of New York. The music, of course, is ravishing (the score is the work of regular David Lynch collaborator Angelo Badalamenti): A Late Quartet hits all the right notes.





## Chapter 5

## Conclusion

Begins a chapter. Example: When the beloved cellist (Christopher Walken - outstanding) of a world-renowned string quartet receives a life-changing diagnosis, the group's future suddenly hangs in the balance: suppressed emotions, competing egos and uncontrollable passions threaten to derail years of friendship and collaboration. Featuring a brilliant ensemble cast (including Philip Seymour Hoffman, Catherine Keener and Mark Ivanir as the three other quartet members), it is a fascinating look into the world of working musicians, and an elegant homage to chamber music and the cultural world of New York. The music, of course, is ravishing (the score is the work of regular David Lynch collaborator Angelo Badalamenti): *A Late Quartet* hits all the right notes.



## Chapter 6

## Reference



## Appendix A

## Appendix A

Begins an appendix



# Bibliography

- [1] C. GRIERSON AND J. SCHIEFELBEIN, *The Arabidopsis Book*, American Society of Plant Biologist, 2002.
- [2] M. JONES AND N. SMIRNOFF, *Nuclear dynamics during the simultaneous and sustained tip growth of multiple root hairs arising from a single root epidermal cell*, J. of Exp. Bot., 57 (2006), pp. 4269–4275.
- [3] J. D. MASUCCI AND J. W. SCHIEFELBEIN, *The rhd6 mutation of arabidopsis thaliana alters root-hair initiation through an auxin- and ethylene-associated process*, Plant. Physiol., 106 (1994), pp. 1335–1346.
- [4] R. PAYNE AND C. GRIERSON, *A theoretical model for rop localisation by auxin in arabidopsis root hair cells*, PLoS ONE, 4 (2009), p. e8337. doi:10.1371/journal.pone.0008337.
- [5] S. RIGAS, G. DEBROSSES, K. HARALAMPIDIS, F. VICENTE-ANGULO, K. A. FELDMAN, A. GRABOV, L. DOLAN, AND P. HATZPOULOS, *Trh1 encodes a potassium transporter required for tip growth in arabidopsis root hairs*, The Plant Cell, 13 (2001), pp. 139–151.

