IMPERIAL COLLEGE LONDON

DEPARTMENT OF COMPUTING

An intelligent digital interface for sharing diagnostic medical imaging with patients

— FINAL REPORT —

by
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Abstract

”The abstract is a very brief summary of the report’s contents. It should be about half page long. Somebody unfamiliar with your project should have a good idea of what it is about having read the abstract alone and will know whether it will be of interest to them.”

Acknowledgements

”It is usual to thank those individuals who have provided particularly useful assistance, technical or otherwise, during your project. Your supervisor will obviously be pleased to be acknowledged as they will have invested quite a lot of time overseeing your progress.”

Person to thank:

- Dr Fernando Bello
- Will Cox
- Co-workers at Chelsea and westminster hospital
- Developper community over the internet and around me

I would like to express my deep gratitude to Professor Dr Fernando Bello

Contents

1 Introduction

”This is one of the most important components of the report. It should begin with a clear statement of what the project is about so that the nature and scope of the project can be understood by the reader. It should summarise everything you set out to achieve, provide a clear summary of the project’s background and relevance to other work, and give pointers to the remaining sections of the report that contain the bulk of the technical material.”

2 Project Overview

2.1 Supervisors

My direct supervisor is Dr Fernando Bello, he is a computer scientist and engineer working at the intersection of medicine, education and technology. He is a Reader in Surgical Computing and Simulation Science at Imperial College London, where he co-directs the Centre for Engagement and Simulation Science, leading a multi-disciplinary research group aiming at building suitable models and simulations of clinical processes, including clinical examination, clinical diagnosis, interventional procedures and care pathways. Dr Bello proposed my project as entitled ”An intelligent digital interface for sharing diagnostic medical imaging with patients”.

I am also working with William Cox, which is currently working on a PhD project investigating the extraction of novel benefit from diagnostic radiological images through sharing images with patients.

Dr Bello and Mr Cox will be together supporting my project and providing me informations, feed-back and support for its realization.

2.2 Project Goal

The aim of this project is to create a graphical user interface (GUI) that allows MRI, CT-scan, X-Ray patients to access their datas, with different levels of benefits. Data acquisition through this interface should be valuable for patients.
Following the first meeting with my tutors I have been able to define main criteria of success concerning the creation of the interface:

- Patient should be able to understand provided images
- Patient could explore the data in different ways/ different images orientation
- Patient should have the possibility to ask questions to doctors/ specific assigned people

I have used those basis criteria to create further specifications to meet my supervisors needs.

Some tools are already existing but essentially for dorctors; my tutors are expecting me to create something similar to the existing available interfaces but in a version that is understandable/usable for a non clinical person. The idea is to look at existing interface designs and consider how they could be changed in order to make them user friendly for the specified user group more accessible/intuitive.

3 Background Work

3.1 Project field apprehension:

Towards the first meeting with my supervisors, Will have emailed me several documents in order to get myself familiar with the context of which my project is part of. Those documents included:

- William PhD late stage review report discussing the benefit of creating a patient oriented interface
- A Litterature review document called ”Patient Health Record Systems Scope and Functionalities” [4]
- A Litterature review document called ”Patient Portal Preferences: Perspectives on Imaging Information” [5]
- A research article entitled ”Imaging informatics for consumer health: towards a radiology patient portal”

3.2 Project frame and specifications definition:

Before starting coding the interface, it is important to define the specifications in the most precise way with my tutors in order to be sure that the future produced work will fit their needs.
Specification should be done considering:

- Interface oriented specification:
  - Content
  - Functionalities
  - Design
- Data Providing:
  - What can be provided?
  - How to provide it?

3.3 DICOM Data familiarization

Imaging datas are provided in a specific format called DICOM - Digital Imaging and Communication in Medicine. This is a standard format for storing and transmitting informatic data related to medical images. This has been widely adpoted by most hospitals in order to standardise data transmission between different radiology tools, such as scanners servers, workstation, printers, network hardware and PACS - Picture Archiving and Communication System and different stakeholders.
DICOM data readers exist in open-source over the internet, my first work conerning those data is to explore existing readers and pick one that could suits my project.

3.4 Choose accurate implementation method:

I have been given the freedom to choose the langage and tools that I will use to create the interface. Multiple GUI tools are provided on the Internet, along with tutorials and advices to create interfaces. Before starting to implement the interface it is important to choose the tool that will best fit my needs. Exploring the Internet, the idea is to make a short comparison between the current most famous tools and choose the one that I feel the most confortable with.

4 The DICOM File Format

4.1 Definition

DICOM file format is a special software integrated standard format dedicated to ease data communication within different facilities in the Medical Imaging Field. This standard has been defined by the American College of Radiology (ACR) and the National Electrical Manifactural Association (NEMA) in 1983. DICOM format defines data dictionnary, data structure, file format and comes with a TCP/IP protocole to facilitate data transfer among a lot of other features. Before this standard was created it was difficult for different facilities to exchange imaging and imformation, now this format is widely use for all medical imaging areas such as CT (Computed Tomography), MRI (Magnetic Reasonance Imaging), X-Rays, Ultrasounds, etc.

4.2 Understanding file content

?
DICOM provide ... **?** super cool

5 Evaluation

6 Conclusion and future work

7 Appendix

7.1 Appendix 1 - General Interface Specification

7.2 Appendix 2 - Imaging Specification