

Project Initiation Document

A Face Authentication System

Author: Thomas Bedford

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The current status of this document is: Draft

Primary Supervisor	Hong Wei	
Secondary supervisor	James Ferryman	
Supervisor's check: For each item below the supervisor should circle ✓ if it is satisfactory for this stage of the project; if it is not satisfactory then the supervisor should circle ✗ and add a suitable comment to indicate the deficiency. The supervisor should then sign below to confirm the ✓, ✗ and comments.		
CHECKLIST		Comments, concerns and recommendations
Background	✓ ✗	✓
Problem statement	✓ ✗	✓
Technical Products	✓ ✗	✓
Crosscheck	✓ ✗	✓
Purchases	✓ ✗	✓
Health & Safety	✓ ✗	✓
Social, Legal & Ethical	✓ ✗	✓
References	✓ ✗	✓
Project Plan	✓ ✗	✓
Supervisor's Signature	<i>Hong Wei</i>	Date: 8/10/2015
Submission rules: The PID, with this form completed and signed by the supervisor, must be handed in to the student information centre (G47) AND submitted online on Blackboard by Friday 9 th October 2015. If the deadline is not met, the student will face a penalty of 5 marks being deducted from their overall module mark. It is expected that students will address any comments noted by their supervisor on this form in due course.		

1 Introduction

This document initialises the project originally mandated in [1]. It clarifies *what* is expected and *how* it is to be done. As in any project initiation there may be uncertainties and they are identified where possible using the term TBD – to be determined.

The background motivating this project is summarised below in §2. A concise statement of the objectives of this project is presented in §3. How these objectives are expected to be satisfied is summarised with a headline list of *products*¹ listed in §4.

The project is undertaken under the auspices of the final year project module SE3IP11-15-6A and this mandates that the examination products listed in §11 are delivered as well as the technical products listed in §4.

An assurance that the intended technical products are likely to be adequate is given in §5 where the objectives and technical products are crosschecked. §12 provides an outline plan and shows the plausibility that delivering the products (both technical and examination) is feasible.

The purchases expected in the plan are listed in §6. Mandatory safety, social, legal and ethical concerns are addressed in §7 and §8 respectively. All references referred to in this document are listed in §10.

2 Background

Technological advances striving to replicate human processes has resulted in biometric analysis being a focused area of research over the past twenty years. Biometric analysis of fingerprints, palm, eyes and faces have been a concentrated area of research. Humans perform face recognition on a daily basis effortlessly. Face recognition is one of the most non-intrusive methods of biometric analysis which makes it one of the most relevant applications.

With so many applications such as video surveillance, human computer interaction and law enforcement biometric analysis is a focused area of research. The main issues regarding computing face recognition is the subject's posture, age and lighting which restricts the usage of such systems to a controlled environment. With technological advances in hardware we draw closer to more efficient and reliable face authentication systems.

¹ A *product* in this context is something completed by the activity of the project. This is terminology of PRINCE2 project management. Some other PM regimes refer to *deliverables*.

3 Problem Statement

The proposed project has been analysed to extract any assumption §3.3 that can be made about the project. The constraints of which this project will be completed in have been considered in §3.2.

On the basis of the soundness of the following assumptions, §3.3, it is deemed worthwhile to satisfy these objectives, §3.1, by delivering technical products subject to these constraints, §3.2, on how they may be developed and/or delivered.

3.1 Objectives

- 1) Develop a graphical user interface to capture and display images.
- 2) Capture images from a camera device and save images as graphic files.
- 3) Implement Face detection algorithms on camera feed.
- 4) Implement Face recognition algorithms on the camera feed.
- 5) Integrate face data base into face authentication system.
- 6) Display recognition results displaying rejection and acceptance rates.

3.2 Constraints

- 1) The system will have to be in a controlled environment i.e good illumination.
- 2) Hardware such as camera resolution will dictate the quality of analysis results.
- 3) Faces captured for recognition should be of a neutral gesture and posture.
- 4) Faces captured for recognition will be frontal facing or within 20 degree angle.
- 5) Project deadlines and delivery date.

3.3 Assumptions

- 1) Experiments will be carried out in a suitable environment i.e good lighting conditions, no foreign objects between the subject and camera.
- 2) Images of faces stored in database will be frontal facing. Images captured for authentication will be frontal facing.
- 3) System subjects will not be wearing obstructive facial items i.e. sunglasses, burka, head scarf.
- 4) Participants using the system will be aware of the handling of sensitive data

4 Technical Products

Product 1: Graphical User Interface

The graphical user interface will provide a method of interaction from the user to the system.

The user interface will display a camera feed and stored images for comparison. It will provide mechanisms for the user to customise and interact with the authentication system.

No risks are involved in the completion of this product.

Product 2: Capturing and storing images as graphical files.

This product will enable a camera feed to be displayed through the GUI. It will allow the user to capture and store an image as a graphical file.

Successful implementation of the camera feed into the GUI and the ability to capture and save graphical images with satisfy this products completion.

Exceeding memory limits of storage, hardware failures and violation of privacy are the risk factors of the completion of this product.

Product 3: Computing Face Detection

The detection software will locate and track the face of a user. It will compute and draw a rectangle encompassing the contour features of the face.

For this products completion the face detection software will correctly be able to locate and track a human user's face. It will be able to illustrate through the camera feed the area of image that is being detected visible for the user.

Hardware failures and loss of code are key risks to the completion of the product.

Product 4: Computing Face Recognition

The face recognition software will be able to compare the user's captured image with a previously stored image of the user.

The system should be able to successfully compare and recognise similarities of biometrical features within two images of a user's face.

Risk to the products completion include a weak understanding of supporting libraries such as image processing libraries and bad time management.

Product 5: Integrate Face Database into system

The integration of an online database that stores images and details of users faces into the system.

The product must deliver the following tasks: Setup connections to an online database through the face authentication system. Some aspects of this products completion are TBD.

Key Risk to its completions are connection issues with the online database and the completion of the previous products.

Product 6: Display recognition results displaying rejection and acceptance rates.

The product will display acceptance and rejection rates and recognition results to the user interface.

Displaying the acceptance, rejection and recognition results will satisfy the completion of this product.

Risks to this products completion are bad design of code restricting the developer from extracting such figures and late delivery of previous products.

The products listed in this section outline the deliverables that will satisfy the project objectives. The system must deliver products 1, 2, 3 minimal. The project should incorporate 1, 2, 3, 4 and 6. Ideally the system could incorporate product 5.

5 Crosscheck of approach

	Product 1	Product 2	Product 3	Product 4	Product 5	Product 6
Objective 1	X					
Objective 2		X				
Objective 3			X			
Objective 4				X		
Objective 5					X	
Objective 6						X

The products in which this project have been broken down into §4 satisfy the objectives proposed §3.1. Each product provides a detailed solution to the tasks of each of the objectives stated in this document. Each product is associated with its own individual objective.

The time plan illustrated in the tables of §10.3 details the time allocated for each technical and examination product. The technical deliverables are scheduled to finish 2 weeks before the deadline of the final report examination product. This for extra testing, documentation and project conclusions. The deliverable products §4 have been designated adequate proportions of time §10.3 in which they can be completed and delivered in.

6 Health and Safety

- 1) Computing for extensive amounts of time without regular breaks and unsupported seating position can cause eye strain, neck and back injuries and muscle strains.
- 2) Using the software system in an inadequate environment i.e. outdoors when raining, a wet room.

- 3) Using the camera in a cluttered area with objects on the floor (trip hazard). The area in which the camera will be used needs to be cleared from any trip hazards as the user will focusing on the interface.

7 Legal and Ethical

When using the face authentication system subjects need to be aware that the system will be handling there biometrics. Likewise participants need to be aware they are being monitored as uniformed used would be intrusive and a violation of privacy. Permission needs to be granted by the user before carrying out any analysis.

An individual's biometrics is a unique set of data that needs to be handle extremely sensitively and securely. You can get a new bank card with ease but it's much harder to replace your face.

The face authentication system proposed in this project should not be used within critical systems unless results can be guaranteed. There is no place for ambiguity in critical systems. For example the use of a recognition system that cannot guarantee reliable results in a critical system may falsely identify someone for a crime they did not commit. This can be damaging to a person reputation and the repercussions can be severe.

8 Examination Products

The mandated examination products are as follows. Risks identified that may obstruct their completion are listed in [2] with cross-reference to this section.

EX1. Name: PID

- **Short Description:** The document that initiates this project and guides it thereafter.
- **Acceptance Criteria:** The PID must be written as a Microsoft Word or PDF document in compliance with the format and content instructions indicated in this document (the PID Master). All sections should be complete to a reasonable depth and quality, consistent with the stage of the project, that satisfies the technical judgement of the project supervisor and, if appropriate, the Company Partner. The sign offs on the cover page will be completed.

EX2. Name: Autumn Term Week 6 Logbook Check

- **Short Description:** A formal check of project progress based on the logbook.
- **Acceptance Criteria:** The Student Information Centre staff, and Project Co-Ordinator if necessary, must be convinced the project progress has been sufficient to date and that this progress has been adequately recorded in the logbook. The logbook must include a sign-off sheet that indicates that the logbook has been assessed by the supervisor on a weekly basis.

EX3. Name: Project Progress Review

- **Short Description:** A formal check of project progress based on a checklist form.
- **Acceptance Criteria:** The 'Project Progress Review Individual Form' must be completed by the student and supervisor and signed and submitted by the appropriate deadline.

EX4. Name: Spring Term Week 6 Demonstration

- **Short Description:** A formal presentation of the executable technical products of the project to the project supervisor and internal moderator.
- **Acceptance Criteria:** During Week 6 of Spring Term, the student must demonstrate their project to their supervisor and internal moderator. The demonstration should show that the project's technical products are on track to be completed by the end of the project.

EX5. Name: Poster

- **Short Description:** A poster summarising a significant aspect of your work.
- **Acceptance Criteria:** A poster is constructed based on the template (TBD). It will be of a quality typical of an academic conference poster presentation. The content will introduce and explain some aspect, claim of other facet of the project that the student deems most interesting and which is agreed by the supervisor.

EX6. Name: SCARP Abstract

- **Short Description:** An abstract in a form typical of an academic conference.
- **Acceptance Criteria:** The abstract is written according to the academic template (TBD). It will summarise the project with a focus on its achievements with respect to the objectives and technical products and what was learned.

EX7. Name: SCARP Paper

- **Short Description:** A short paper in a form typical of an academic conference.
- **Acceptance Criteria:** The paper is written according to the academic template (TBD). It will describe the project with a focus on its achievements with respect to the objectives and technical products and what was learned.

EX8. Name: Final Report

- **Short Description:** The academic write up of the work achieved by the project in addressing the technical problem.
- **Acceptance Criteria:** The report shall be formatted according to provided rules (TBD). It shall have content assessable according to the criteria (TBD). It will include sections such as Introduction, Literature Survey, Problem Analysis, Solution Analysis, Implementation, Evaluation (detail TBD).

EX9. Name: Demonstration to Internal Examiners

- **Short Description:** A formal presentation of the executable technical products of the project.
- **Acceptance Criteria:** The working demonstration must be convincing to the examiners in terms of: showing a significant satisfaction of the objectives through the operation of the

developed technical products; showing that the work is substantially the product of the student's efforts.

EX10. Name: SCARP Presentation

- **Short Description:** A 10 minute presentation of your work in a conference setting.
- **Acceptance Criteria:** The paper is presented in a clear, coherent manner in the allotted time and plausible answers are given to such questions that are possible in the conference schedule (typically two or three questions).

EX11. Name: Project Archive

- **Short Description:** A CD containing all project documents.
- **Acceptance Criteria:** The CD must contain all the files and folders specified in the guidelines (TBD).

9 References

- [1] A Face Authentication system, A-FACE, SE3IP11-15-6A: Individual Project (2015/16)/Course Documents/SE3IP11 List of Staff Proposed Projects 2015-16 v2.pdf, available from (https://www.bb.reading.ac.uk/webapps/blackboard/content/listContent.jsp?course_id=_113324_1&content_id=_2570572_1&mode=reset).
- [2] RA1 Risk Assessment forms, SE3IP11-15-6A: Individual Project (2015/16)/Course Documents/RISK_ASSESSMENT_FORM_RA2.docx, available from (https://www.bb.reading.ac.uk/webapps/blackboard/content/listContent.jsp?course_id=_113324_1&content_id=_2570572_1&mode=reset).
- [3] Wikipedia, Face Recognition System, available from (https://en.wikipedia.org/wiki/Facial_recognition_system), visited on [01/10/2015].
- [4] Nova Next, The limits of face recognition, available from (<http://www.pbs.org/wgbh/nova/next/tech/the-limits-of-facial-recognition/>), visited on [28/09/2015].
- [5] PFC-IonMarques.pdf, available from (www.ehu.eus/ccwintco/uploads/e/eb/PFC-IonMarques.pdf), visited on [03/10/2015]
- [6] Face Rec Algorithms, available from (<http://www.face-rec.org/algorithms/>), visited on [31/09/2015].

10 Project Plan

10.1 Technical Products

Table 10-1 Technical Products

Product Delivered	Task ID	Task Description	Effort (weeks)
1	TP1.1	Specify, Design	1
	TP1.2	Implement and test	2
	TP1.3		
2	TP2.1	Display camera feed in GUI	1
	TP2.2	Capture and save images as graphical files	2
	TP2.3		
	TP3.1	Install and setup libraries and tools	1
	TP3.2	Compute face detection	2
	TP3.3		
3	TP3.4	Run and test face detection on stored images and camera feed	2
	TP3.5		
	TP4.1	Install and setup libraries and tools	
	TP4.2	Compute face recognition	2
	TP4.3		
	TP4.4	Run and test face recognition on stored images and camera feed	2
4	TP4.5		
	TP4.6		
	TP5.1	Setup and configure connections to database	2
	TP5.2	Test sets of data from online database in the authentication system	3
	TP5.3		
	TP5.4		
5	TP5.4		
	TP5.4		
	TP6.1	Extract and display acceptance and rejection rates and recognition statistics	2
6	TP6.2		

10.2 Examination Products

Table 10-2 Examination Products

Product Delivered	Task ID	Task Description	Effort (weeks)	Who
1	EX1.1	Research and complete PID	2	
	EX1.2			Hong Wei
2	EX2.1	Write up log book and project progress review	3	
	EX2.2			
	EX3.1	Complete progress report checklist	3	Hong Wei
	EX3.2			

3	EX3.3					
	EX4.1		Project review demonstration of system progress	3		Hong Wei
4	EX4.2					Hong Wei
	EX5.1		Design and create poster	1		Hong Wei
5	EX6.1		Write up scarp extract	1		Hong Wei
6	EX7.1		Write up scarp paper	1		Hong Wei
7	EX8.1		Write up final report	2		
	EX8.2					
8	EX9.1		Preparation for final demo to examiners	1		Hong Wei
9	EX10.1		Preparation for scarp presentation	1		
10	EX11.1		Archive project	1		
11	EX11.2					Hong Wei

10.3 Time Plan for the proposed Project work

Table 10-3 Time Plan Technical Products

START DATE: <28/09/2015>

Product / Product phase		Product 1: Graphical User Interface	Product 2: Capturing and storing images	Product 3: Computing Face Detection	Product 4: Computing Face Recognition	Product 5: Integrate Face Database	Product 6: Display recognition results
	Pre-Term						
		1-2					
		3-4					
		5-6					
		7-8					
		9-10					
		11					
	Break						
		1-2					
		3-4					
		5-6					
		7-8					
		9-10					
		11					
SUMMER TERM (exams)	Break						

10.3.2

Table 10-4 Time Plan Examination Products

START DATE: <28/09/2015>

[illegible]

