

SOFTWARE ENGINEERING

PROJECT:

IMAGE PROCESSING (GENDER RECOGNITION AND AGE PREDICTION)

Face++ = new face recognition ();

Female

Age 31

Smile 85%

SOFTWARE DOCUMENTATION

Course instructor: *Sir Ahmed Mohsin*

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Preface

In the development process – esp. Software development (using engineering principles) – documentation helps to keep track of all necessary aspects of an application and it also improves the quality of software product. Hence, the importance of documenting any software project is immense.

The following content in this document contains the “Process document” and the “Product document” of the project at different levels of iterations. These iterations are basically the milestones, that lead up to a final release version of the software.

There are numerous applications of this project, that aims to provide a product that will predict the age group and gender of a person through image processing. An example is “statistical analysis”, that can either be used for research enhancement purposes or simply to record survey data.

Requirements

User Requirements

- i.** The software must provide means to spot human faces, either through the eye of a live running camera, or from an already existing photo.
[NOTE: It is not necessary for the software to have both features.]
- ii.** The software must be able to identify the gender of the human face(s) spotted.
- iii.** The software must be able to predict the closest approximate age group of the gender-identified human face.
- iv.** The software must be implemented in Python programming language.
- v.** The software shall be permitted to be coded using OpenCV, matplotlib and NumPy libraries for image recognition.
- vi.** The software should use deep learning.

System Requirements

- ***Functional requirements (FR's)***
[for iteration # 1]

FR 1.01 (a)	The system shall proceed to detect faces of humans through a live running camera, or on an already existing picture, whichever single choice the user makes (on starting the application).
FR 1.01 (a-1)	The system shall open a window, that will prompt the user to select one 'checkbox' for the options: (a) >> Detect face(s) from a live camera (b) >> Detect face(s) from an existing picture
FR 1.01 (a-2)	The user shall click on the 'click-box' named "Next" to proceed.
FR 1.01 (a-3)	The system shall open a new window of a live running camera footage, provided the user selects the checkbox of 'Detect face(s) from a live camera'.
FR 1.01 (a-4)	The system shall open file explorer to let the user choose the picture to be processed, provided the user selects the checkbox of 'Detect face(s) from an existing picture'.

FR 1.01 (b)	The software shall identify human faces, by highlighting the detected face by a rectangular boundary.
FR 1.01 (b-1)	The software shall count the number of faces detected and display total number of detected faces as output in a new window within a minute of processing the current image/video frame.
FR 1.01 (b-2)	The software shall terminate, when the user clicks on the 'FINISH' click-button on the output window displaying people count.

▪ ***Non-functional requirements (NFR's)***

NFR 1.01	The software must be coded in Python programming
NFR 1.01 (α3 & α4)	The software shall use matplotlib library in python to highlight the detected face(s)

Use Case

Descriptive use cases

Case 1:

Use case: detectFace

Primary Actor: User

Pre-condition: The user has already selected an option from the given window (either a live running camera, or an existing picture to detect faces)

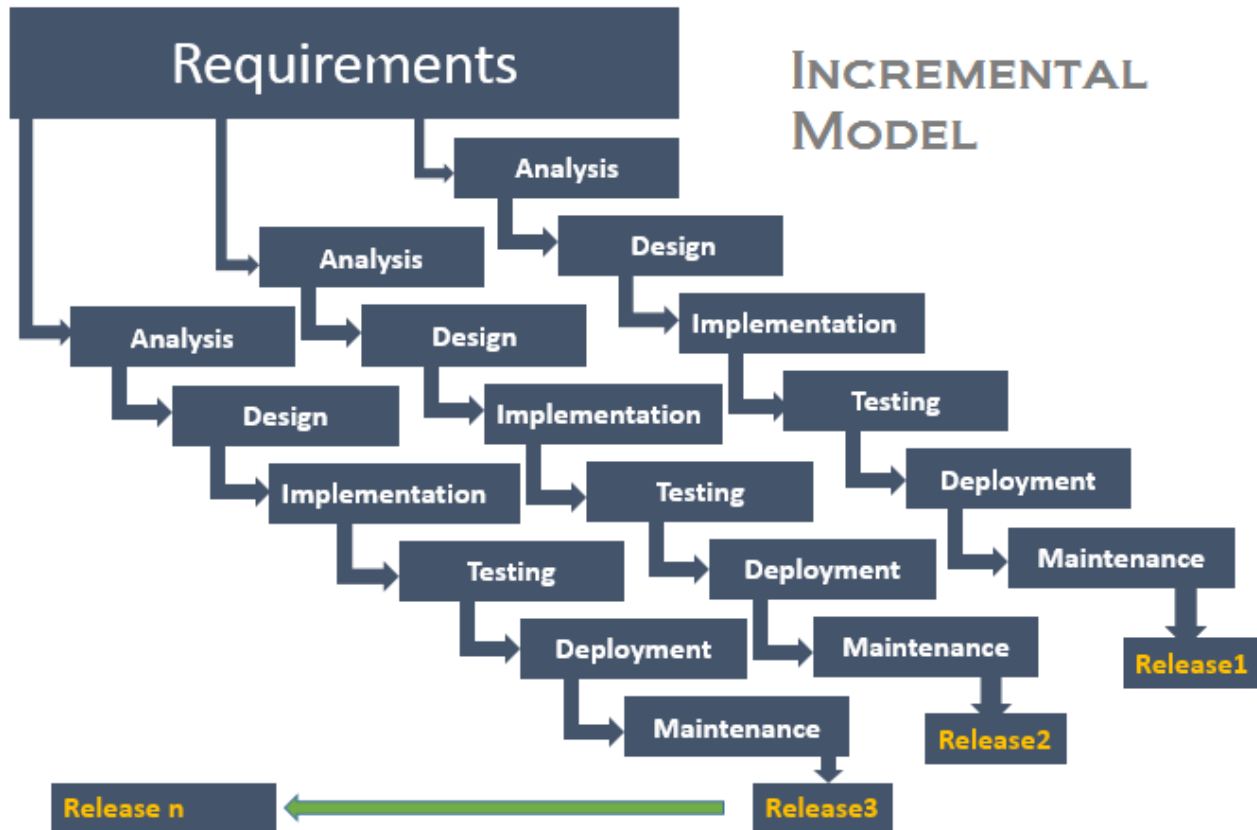
Success Guarantee (post-condition): Faces successfully detected; count for number of successful faces returned.

Work Flow:

1. The user starts the application
2. The application opens a new window, listing two options for user to select one of the option:
 - *Detect faces from live camera feed
 - *Detect faces from an existing picture

Initial Project Requirements Analysis

The project's SDLC is based on the following model:



This model gives an overview of how things are to be carried out. Each successive release aims to increase functionality of the software product. It is more appropriate to consider each iteration as a milestone, towards the ultimate goal of the software product.

- ❖ The first release of the product aims to produce a software capable of detecting a human face.
- ❖ The second release of the product aims to produce a software capable of predicting gender of the detected human face.
- ❖ The third release of the product aims to produce a software capable of predicting age of the gender-identified human face.

Development Iteration (no. 1) planning + documentation

Project Title: Image Processing (Gender Recognition and Age Prediction) via Deep Learning. [Plan for first iteration]	
Start Date: 10/9/2017	End Date: 7/11/2017
Project Manager: Muhammad Omer Affan	
Users: AUMC Faculty members and niche audience	
Stakeholders and Expectations: Team: Have ready access to individuals with the authority to make decisions regarding software requirements. Be given specific and detailed feedback on product increments. Professor Ahmed Mohsin: Have a cool app to show other students as an example of good work at project end. AUMC Faculty: Can find the number of faces in a picture. Help to keep track of number of students.	
Purpose (Problem or opportunity addressed by the project): Teachers will be able to identify the number of students in a particular picture. This can help in keeping count for attendance.	
Goals and Objectives: The overall goal of this first release is to provide an app that will identify faces of humans in a picture/video. The faces in the picture shall be outlined/highlighted by a square box indicating the identified faces by the app.	
Schedule Information (Major milestones and deliverables): 10/9/2017 – Gather requirements 12/9/2017 – Install stated requirements as per project proposal 13/9/2017 – Learn basic Python programming 20/10/2017 – Requirements Implementation Complete 21/10/2017 – Coding 3/11/2017 – Testing 7/11/2017 – Release + Documentation	

Project Priorities and degrees of freedom: This is at the discretion of the team leader based on approaching deadlines. Roles are changeable based on workloads of individual team members. Roles are expected to shift throughout the project as needs arise.

Approach: Iterative and incremental is planned. Feedback will be used from one iteration to the next. The first iteration will focus on one of the basic functionalities of the app. Subsequent iterations will build upon that and incorporate more features as time allows.

Constraints: Tight deadlines due to limited time span for project development. Development delayed due to incomplete knowledge of the programming language – Python programming language basics to be learned first in order to proceed with the software's development.

Assumptions: Functionality of each release shall be as close to expected result as possible.

Success Criteria: The project will be considered a success if

- (1) Each release is acknowledged by the course instructor [Sir Ahmed Mohsin]
- (2) Documentation maintained for release.

Risks and obstacles to success:

1. Usage of an unfamiliar programming language might cause the product to not be as good as expected.
2. Learning, comparing and implementing the right algorithms and right libraries.
3. Unexpected hardware limitations.
4. Unexpected delays due to team member's unexpected emergencies.

Signatures

Project Manager

Team member# 1

Team member# 2

Team member# 3

General Terms & Conditions

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**# INCOMPLETE PROJECT DOCUMENTATION FOR
ITERATIONS 2 AND 3 ARE STILL YET TO BE
DONE!**

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Glossary

SDLC: Software development and Life Cycle

User-Requirements: Requirements that contains both FRs and NFRs.

FRs: Functional Requirements

NFRs: *Non-Functional Requirements*

Constraints: limitations