Project Description – Real-time Face Visual Effects

File version	V1.0_16092025
Type:	Group project (plagiarism check applied)
Submission to canvas:	One zip file includes: • Project report, please use template (IPCV_2025_Project_Report_Tempalte.docx), **final format. pdf** • Source code (requirement see below) **Suggestion: total size of zip file better small than 30MB*
During presentation	**1. 1-min elevator pitch (max 1 minute)** **2. Live demo (max 5 mins)** **3. Q&A individual questions (4 mins)**

1 Introduction

In this project, the main idea is to apply **core computer vision and image processing techniques** to **create interactive and customized effects** in real time.

- Students will ***design and implement visual effects*** similar to those seen in TikTok or Snapchat.
- Students will ***build the system entirely*** with their own code (no pretrained models or commercial effect software, or existing commercial API to use, no photoshop, or effect house)
- Student will ***demonstrate it live***, and show how learned IPCV methods can be used to generate engaging visual effects.
- Student will also ***give an elevator pitch*** (max 1 minute) on the ideas of those visual effects they created to the general public audiences (slides can be used during the pitch).
- Student will ***submit a short technical report*** (max 2 pages)

2 Requirements

Each project must include at least the following **three compulsory tasks and one optional task.**

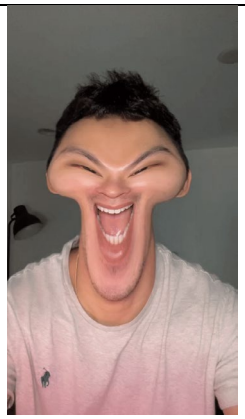
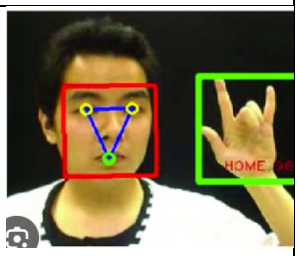
Each group has max 3 students. Each of the students should be responsible for one compulsory task. Each group will decide on their own for this task assigning.

***Working individually (i.e. one group only with one student) is allowed but cannot be used as an excuse for not delivering all three compulsory tasks. You have to implement all compulsory tasks by yourself. So, in this case, it is highly, highly… discouraged!!!**

***Working in of group only having two students is allowed but cannot be used as an excuse for not delivering all three compulsory tasks. You have to implement all compulsory tasks by two of you. So, in this case, it is highly discouraged!!!**

The one who is responsible for task 1-3 will be responsible for corresponding questions in Q&A. Their grades thus can be different to other group members.

No.	Task	Description	Examples (you should do something different)

1	**Face Warp** **(mandatory)**	Detect and warp the face area as the basis for further effects: you are free to choose those warping effects, like enlarging, twisting, shrinking, etc. The warping effect must follow the face move, not as a static warping at the fixed location on the image.	
2	**Face Augmentation** **(mandatory)**	Add virtual figures, icons, or masks (e.g., hat, beard, glasses) aligned with the detected face. The augmented effects must follow the face move, not as a static augmented at the fixed location on the image. If adding virtual glasses on the face, it must follow when face is moving.	
3	**Motion Tracking & Interaction** **(mandatory)**	Implement object/hand tracking and use it to interact dynamically with the face effects (e.g., hand gesture triggers hat movement).	
4	Additional creative features, **(optional)** **Not mandatory!!!**	e.g., background effects, multi-person tracking, or 3D depth cues are encouraged ✓ It is not mandatory. You decide whether you want to take this chance or leave it. ✓ No bonus points will be given for this part. It is just something you want to show to others. ✓ Without taking this part, you will NOT lose any point. ✓ As audiences, we, of course, appreciate something creative and nice. ✓ The team can be invited for some demos later in other events (student event, UT Robotics day), if it is very nice/if you have a time.	Anything, but not repeat previous technique and requirements (i.e., 1-3). Anything you think it is cool.

3 Checklist for deliverables of each group:

- **1-minute pitch**, which will be given during the presentation day (**Nov 5, 6 & 7**)
- **Live demo** of all compulsory tasks (recorded videos are not accepted).
- **Code repository** with clear documentation and instructions:
  - **Source code** with comments
  - **Readme.md file** to descript the file structure.
  - **The media files you used for visual effects. The original files, e.g. figures, videos, any format of files.**
  - **Everything in one zip file less than 30mb.**
- **Short report** (max 2 pages) describing the methods, implementation using the template provide. Answer the open questions. Using other format rather the template will lose this part points complete.

Remarks

- All effects must be implemented with **own code**, only using allowed libraries (e.g. scikit-image, opencv, dlib, matplotlib, numpy, etc.).
- Using self-trained/pre-trained AI models, even you train/create this model yourself, it is not encouraged. You will not lose points. But, it also doesn't mean you have higher points by definition.
- The focus is on demonstrating **understanding of IPCV concepts and apply them to real applications (i.e. visual effects) with learned IPCV technology** rather than using existing software and tools.
- Efficiency, clarity, and robustness of the demo will be valued in grading.
- Demo time is not for your to debug. It is for showing off.

4 Grading

4.1 Grading details

Grading (10 points): Total point of the project part will take 40% weighting for the final grade of this course.

Deliverables	Requirements	**Points**
1-min pitch **(1 min)**	Clear, simple, and informative to sell your final product as a team. ✓ Indicating what are the IPCV technologies you used. ✓ How those technologies could create such cool stuffs? ✓ Why they are cool to you? ✓ How to let others think it is cool as well?	**2**
Live demo (max 5 mins)	shows all compulsory demo at once. ✓ You have no chance to debug during the demo. ✓ You run out of time. What you have shown is your final deliverable. ✓ **We are NOT going to give you extra time for debugging** ✓ **Demo is demo. Debug should be done before the demo.** ✓ Prepare your code beforehand & Test it many times, on all different pc/laptops. Make sure it is robust to run.	**3**

	✓ The final grade will be given by evaluation committee. ✓ The final all three compulsory or optional effects will be evaluated as a whole product. Thus, you will get one unified point for all effects together.	
Q&A for each student with the evaluation committee **(approx. 4 mins)**	The answer will be assessed based on the level of understanding and reasoning behind the problems/questions. ✓ Each student will be responsible for one visual effect only. ✓ people from the same group will get different grade on this part. ✓ You will do the answer individually. Not a team work. ✓ Questions can only be answered by the students who is working on a certain task.	**3**
Short report & Code repository	✓ Short and clear report. ✓ Must use the template. ✓ The code is executable with clear comments and readme file.	**2**

4.2 Grading example:

explanation of grading in one example: group_test has three student members (s1, s2, s3).

The shared point for the group test are, shown as example points below:

1. *Pitch (1) point*
2. *Demo (3) points*
3. *Report (1) points*

Total shared point = 1+3+1 = 5 points

The individual point for each member of group_test is Q&A for (s1, s2, s3) separately.

e.g., s1 gets 3 points out of 3 points

s2 gets 2 points out of 3 points

s3 gets only 1 point out of 3 points

Final grades for s1, s2, s3

s1 = (1+3+1)+3=8

s2 = (1+3+1)+2 =7

s3 = (1+3+1)+1 = 6

4.3 Grading guidelines:

Group project	Fair	Average	Good	Excellent
Fulfilling the project requirements →Demo	(a) Fulfilling the assignment partial requirements with less than averaged performance. Live demo with lagging Effect are not consistent	(b) Fulfilling the assignment main requirement with an normal performance and performing effects are normally stable and without	As in b), but the performance of the requirement is with high accuracy and efficiency. Almost no lagging Smooth tracking Smooth frames	(d) As in c), but all requirements are performed with very good accuracy and efficiency. The effects created are also creative

	Certain frame without effects or even mis-match, losing frame lagging	failure frame being frequently appeared Lagging is less. Mismatching is acceptable, but not perfect		
Proper implementation of the selected algorithms ➔ Demo, source code	(a) Functioning implementation	(b) As in (a) and including commented implementation of main commands for the understanding of the reader	(c) As in (b) and well-structured code with proper commenting and sectioning of functions.	(d) As in (c) and considering the implementation processing time
Oral discussion: Proper understanding of the used algorithms ➔ Q&A	(a) Understanding the function of the main used algorithms	(b) understanding the function and basic concept of the main used algorithms	(c) As in b), but with also knowing other functions that are not used and giving reasons of selecting this approach	(d) As in c), but with knowing the mathematical background of the main functions used