

Final Project Computer Engineering

## -PICIT-

### Don't take a photograph, make it!

(Ansel Adams)

#### Problem Definition

With the introduction of digital cameras and smart phones into our lives, we are never satisfied with one single photograph. Every event on our lives is documented in a series of nearly-identical photos, which are shared on social media. Yet, there is always the one person who is dissatisfied. **We are here to satisfy everyone!**

Over the course of this project, we wish to develop an algorithm which will allow the generation of the perfect photograph, which will include each person's favorite moment.

For example, if three people are photographed in three consecutive pictures at a birthday party, each photograph will disappoint one of them. In the first picture, Amir is blinking. In the second, the birthday girl is looking away, and in the third, a balloon is blocking Keren's face. By integrating the three photographs, we aim to create the perfect picture, incorporating the best shot of each of them.



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## **Background**

In order to understand this report, the reader should have basic knowledge in image processing.

related work is Photomontage processing, Geometric image rearrangement, Pyramids, homography transform, blending, interesting points and descriptors.

## **Related Work**

<http://grail.cs.washington.edu/projects/photomontage/photomontage.pdf>

the article presented a framework that allows a user to easily and quickly create a digital photomontage. The system combines graph-cut optimization and a gradient domain image-fusion algorithm with an intuitive user interface for defining local and global objective

<http://www.cs.huji.ac.il/~peleg/papers/iccv09-shiftmap.pdf>

Shift-map editing. change the features of the image, while saving the natural look of it.

<http://webee.technion.ac.il/people/anat.levin/papers/blendingTR.pdf>

image stitching, In order to define and get the best possible stitching, the article represent several formal cost functions for the evaluation of the quality of stitching.

## **Solution**

### **Overview**

#### **First alternative:**

The first alternative for solving the problem is that when we take a picture, the camera will take multiply pictures and then choose the best one, by recognize blinking, lack of eye contact and more.

Advantages: choose in real time the picture, without involving the user.

Disadvantage: you can't merge between different images, and the algorithm doesn't know your taste, and what count a good picture for the individuals.

#### **Second alternative:**

Another alternative is using filters.

Advantages: variety of options, remove flaws like acne.

Disadvantage: you can't save the nature look and can't merge between different images.

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## Proposed Solution

In our project the user will take few pictures (about 3), then he will be able to choose the parts from each image that will be in the final image. The program merges all the pictures in a natural way and create the final outcome- the best image!

During the implementation we will use algorithms of image processing such as min-cut, pyramids blending, detected feature points, RANSAC, stitching. In this way we will get the best results for blending between images. We chose this approach because now we can create an image that look natural, the users can choose their own moments and create an integration of multiply images.

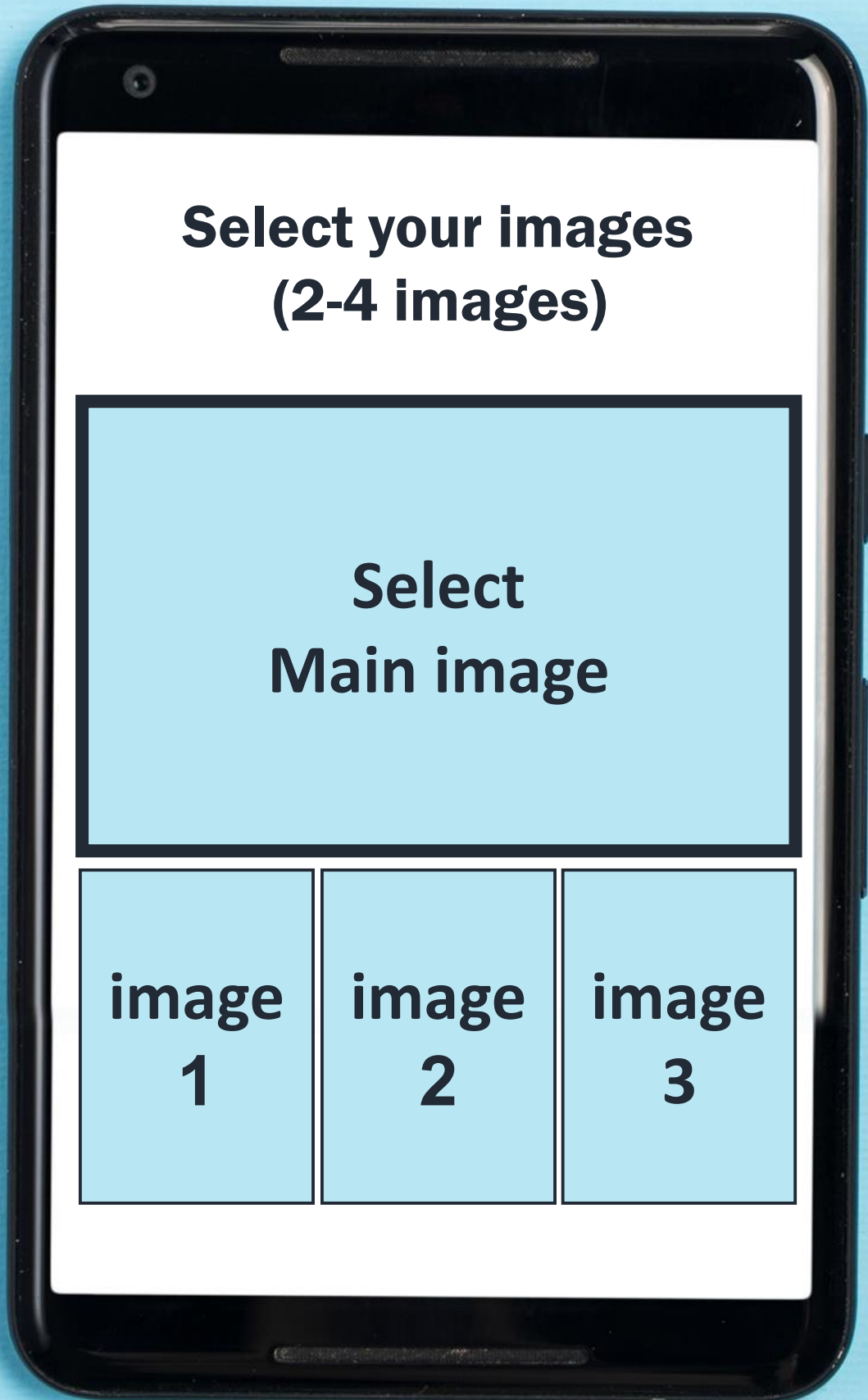
**PICIT**

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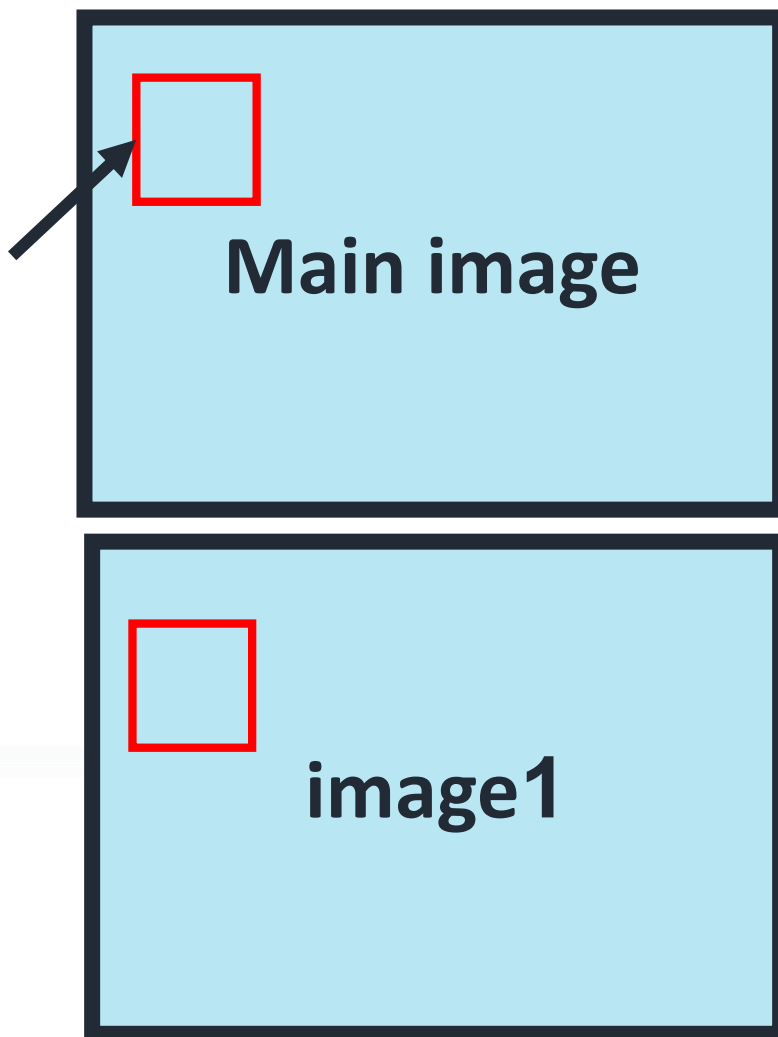
**Ansel Adams**



Connect to the gallery/camera of the user  
for adding the images

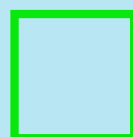
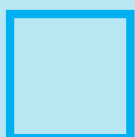
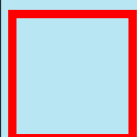


For each of the secondary images,  
Select the region that you want  
to take for the final image  
In addition, Select its location  
in the main picture





After choosing the regions, press **FIX\_ME**  
and go to the next level



**Select  
Main image**



**image1**



**image2**



**image3**

**FIX ME**



Main image



Image 1





Main image



Image 1



**FIX ME**

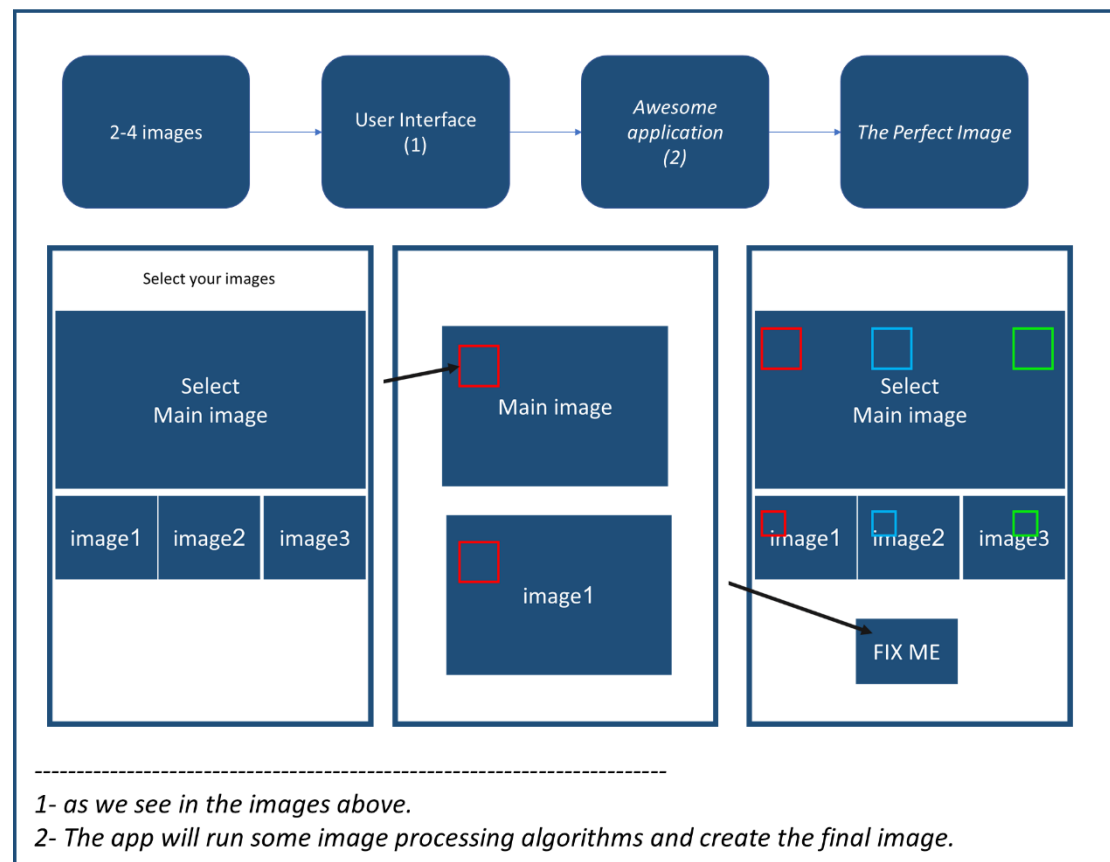




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## Key Components



## Solution Feasibility

**various technologies we plan to use in your project:**

Python libraries like:

- Numpy
- Open CV
- Matplotlib
- Scipy
- Skimage
- Image io
- Pillow

For the application:

[django](#) - a high-level Python Web framework or android studio, or Xcode

[https://developer.android.com/studio/?gclid=Cj0KCQjwh6XmBRDRARIsAKNInDHxNznQkCnb8kdPfYoPW\\_HMEu\\_hXd2BOUz93\\_Q7eC52hjQ-XzI04UAaAoGVEALw\\_wcB](https://developer.android.com/studio/?gclid=Cj0KCQjwh6XmBRDRARIsAKNInDHxNznQkCnb8kdPfYoPW_HMEu_hXd2BOUz93_Q7eC52hjQ-XzI04UAaAoGVEALw_wcB)

<https://developer.apple.com/xcode/>

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**different challenges and uncertainties in our project:**

we want that our application will be in daily use, so we need to make sure that the performance will be quick, clean and accurate.

Time:

The process of checking the parts of the images to find the best fit for the integration requires an observation on all the image's pixels, finding interesting points, processing and handling them. All this may take a long time, which will significantly impair the user experience. Our goal is to keep the use easy as we can, so we will have to invest thought in finding the fastest way that give us good performance.

Accuracy:

We want that the combination of the pictures will look natural, as this is the original picture that was taken. To do this we will have to look for the ideal way to make the blending and the integration.

After implement every step- the algorithms and the app, We will make user experience testing and improve our work accordingly.



## **Plan for Spring Semester 2019**

### **Skateboard-Bike-Car**

We are not sure that our algorithms will be fast and accurate enough, so to test this we will first check with simple algorithm and small images.

We are not sure our app will be comforting to use, so we will create a paper prototype of our app (that include the levels of the use) and test it on some of our friends.

Our plain:

1. First step, we want to get familiar with the algorithms that we will use, learn MinCut and Shift-Map.
2. Then we will implement the basic algorithms and test them on simple images on the computer.
3. Know the target- choose the platform for the app and start implement the connection between the algorithm that we run on the computer to the app platform.
4. Test the implementation on more complicated data.
5. user experience testing -Try our app on different people, get feedback and improve the app.
6. Design the application.
7. Get the complete product.

### **Preliminary Knowledge**

#### **Academic literature:**

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the article presented a framework that allows a user to easily and quickly create a digital photomontage. The system combines graph-cut optimization and a gradient domain image-fusion algorithm with an intuitive user interface for defining local and global objective

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#### **HUJI courses: (we already took those courses)**

Image processing

Algorithms

Computer vision

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### Software and Hardware Requirements

Learn how to use android studio or IOS in order to build mobile-based image processing.

### Preliminary Assignments

Read articles and choose the methods and algorithms to use in our implementation.

Overview on the material of image processing.

Then, we will Implement 2 of the algorithms that we may choose and learn from the articles- min cut and shift-map.

### Semester Schedule

During the meeting with our advisor Prof. Shmuel Peleg we decide on a schedule for this semester. Prof. Shmuel emphasize that before implement the algorithms, we need to invest time in learning them deeply.

May:

- learn the first algorithm- min cut.

June:

- implement Min-cut algorithm.
- Learn the second algorithm- Shift-Map.
- Implement the Shift-Map algorithm.