SOFTWARE ENGINEERING PROJECT

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TOPIC :

HAND - TRACKING FEATURES USING PYTHON

TABLE OF CONTENTS

SUB - TOPIC	PAGE NO
1 . NAME OF GROUP MEMBERS	1
2. TOPIC OF PROJECT	2
3. TABLE OF CONTENTS	3
4. PROBLEM STATEMENT & ABSTRACT	4
5. FUNCTIONAL REQUIREMENTS	5
6. NON FUNCTIONAL REQUIREMENTS	6
7. EXTERNAL INTERFACE REQUIREMENTS	7
8. GOAL OF IMPLEMENTATION	8
9. DATA FLOW DIAGRAM LEVEL 0 and 1	9
10. DATA FLOW DIAGRAM LEVEL 2	10
11. UML - USE CASE DIAGRAM	12
12. UML - ACTIVITY DIAGRAM	13
13. UML - SEQUENCE DIAGRAM	14
14. ENTITY RELATIONSHIP (ER) DIAGRAM	15
15. TEST CASES	16
16. CONCLUSION	17

Problem Statement:

Making Hand tracking features for Windows using Python Programming language .

ABSTRACT

- Our project introduces an Application using Computer Vision for Hand tracking recognition. With these Hand tracking features we can perform multiple operations without touching the device or the screen of the computer which saves a lot of time. One of these tasks include turning off the laptop through a specific hand gesture , which is recognized by the program through the camera and then the necessary action is performed . There are multiple more instructions which can be performed by the program , which is a way to reduce the time consumed for manually doing these activities and increasing productivity of our daily lives . Software development life cycle (SDLC) is critical and remains the most significant part of software development in Software engineering. There exists several SDLCs, each designed for specific needs to accommodate available resources and skills; they are compatible with certain programming languages and tool-kits, and are of immense benefits to the software engineers. Iterative Model is quite acceptable by the programmers .We are using the Iterative Waterfall Life Cycle Model for our project. This life cycle model is easy to understand and implementation can be started with a small set of requirements and we can enhance the previous version after every iteration until we can get our fully working model with no errors. In this life cycle model, error management is also easy. Using an Iterative life cycle model for short term projects is highly preferred and it is the most commonly and widely used life cycle model .

FUNCTIONAL REQUIREMENTS

- The camera used will be able to capture user images from the video sequences.
- The software will be able to produce multiple frames and display the image in the RGB colour space.
- The software will be able to display the converted RGB image in a new window and convert it into grey image.
- The software will be able to detect the contours of the detected skin regions.
- The software, which act as an intermediate in passing these, processed image in order to control the media player.
- The user should have at least a basic knowledge of windows and web browsers, such as install software like OpenCV, Python etc. and executing a program, and the ability to follow on screen instructions.
- The user will not need any technical expertise in order to use this program.

NON FUNCTIONAL REQUIREMENTS

- **Usability**: The user is facilitated with the control section for the entire process in which they can arrange the position of hand at the centre of ROI under consideration, the variation of palm position and respective command generation etc. can be effectively facilitated by mean of user interface. The implementation and calibration of camera and its resolution can also be done as per quality and preciseness requirement. The frame size, flow rate and its command variation with respect to threshold developed and colour component of hand colour, can be easily calibrated by means of certain defined thresholds.

- **Security and support**: Application will be permissible to be used only in secure network so there is less feasibility of insecurity over the functionality of the application. On the other hand, the system functions in a real time application scenario, therefore the camera, colour and platform compatibility is must in this case. IN case of command transfer using certain connected devices or wireless communication, the proper port assignment would also be a predominant factor to be consider.

- **Maintainability**: The installation and operation manual of the project will be provided to the user.

- **Extensibility**: The project work is also open for any future modification and hence the work could be define as the one of the extensible work.

EXTERNAL INTERFACE REQUIREMENTS

- **User Interface**: The external or operating user is an individual who is interested to introduce a novel Algorithm for shape based hand gesture recognition in real time application scenario. The user interface would be like axis presenting real time movement of human hand and its relative position with respect to defined centroid or morphological thresholds.

- **Restoration with Text Removal Software Interface**: The Operating Systems can be any version of Windows, Linux, UNIX or Mac.

- **Hardware Interface**: In the execution of this project, the hardware interface used is a normal 32/64 bit operating system supported along with better integration with network interface card for better communication with other workstations.
  For better and precise outcome, a high definition camera with calibrated functioning with defined RGB or YBR colour format is must. Since the proposed system functions in real time application, therefore the camera quality and its colour accuracy would be important.
  In the proposed system, the background also plays a vital role, therefore the background segmentation or calibration with well-defined frame rate or resolution would be must.
  Such cautions would ensure optimal recognition and tracing of hand gesture.

GOAL OF IMPLEMENTATION

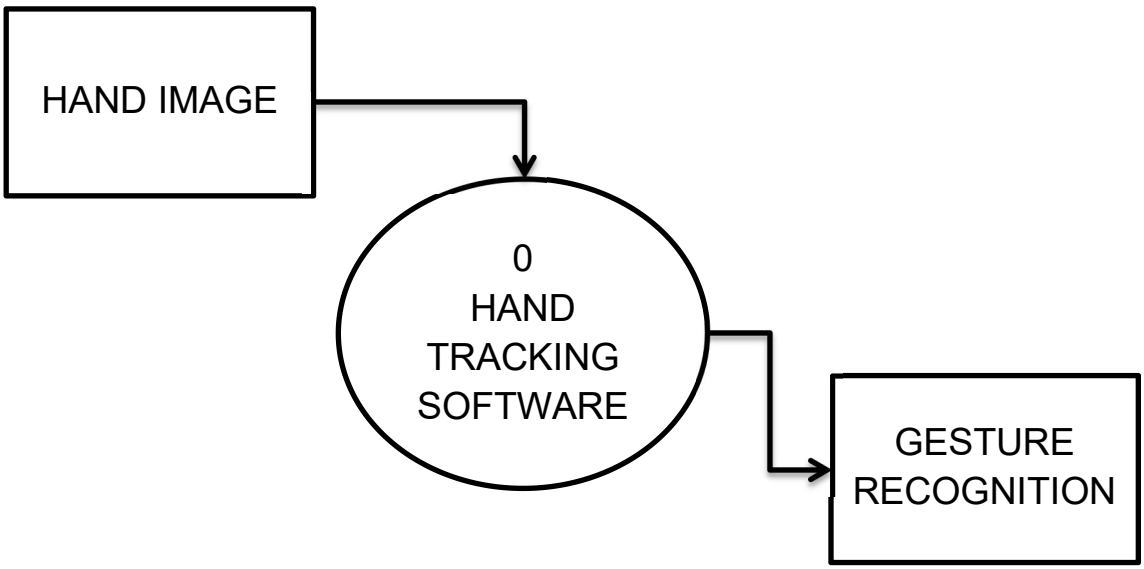
- Our project introduces an Application using Computer Vision for Hand tracking recognition. With these Hand tracking features we can perform multiple operations without touching the device or the screen of the computer which saves a lot of time.

- One of these tasks include turning off the laptop through a specific hand gesture , which is recognized by the program through the camera and then the necessary action is performed .

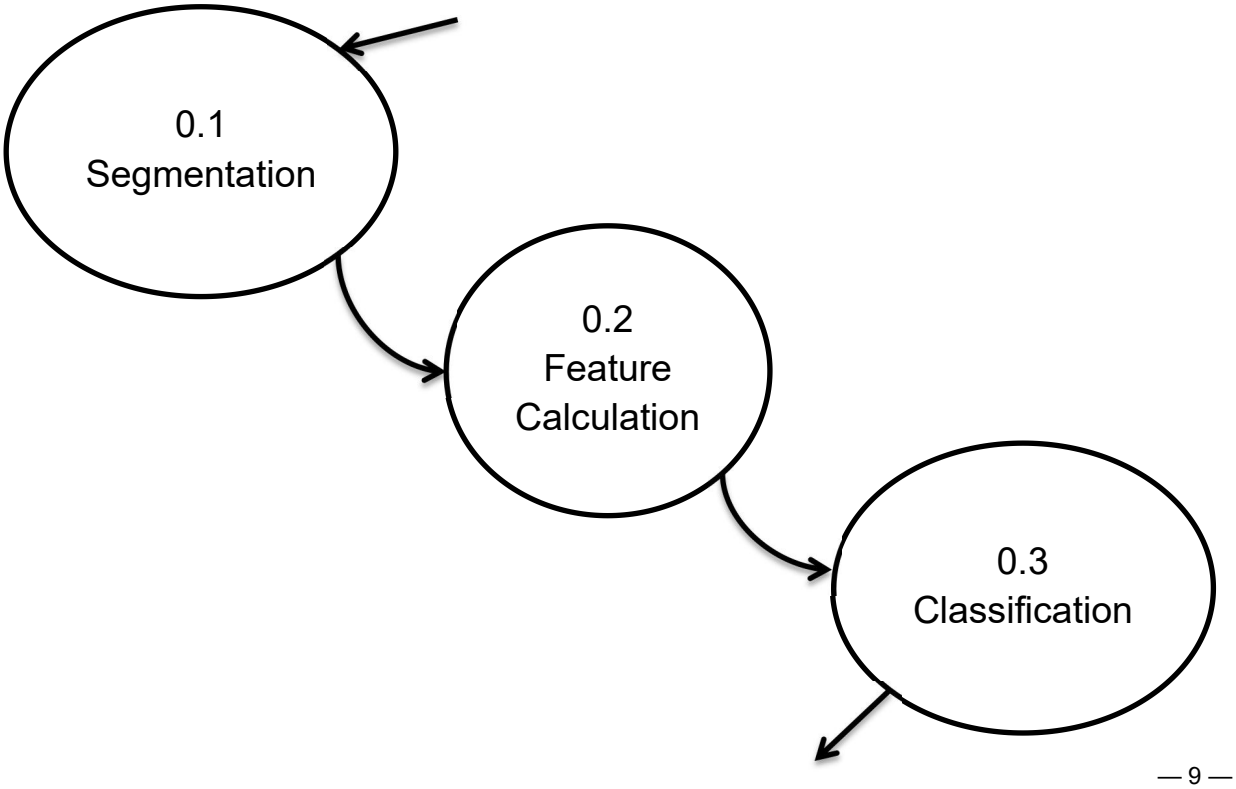
- There are multiple more instructions which can be performed by the program , which is a way to reduce the time consumed for manually doing these activities and increasing productivity of our daily lives .

DATA FLOW DIAGRAM

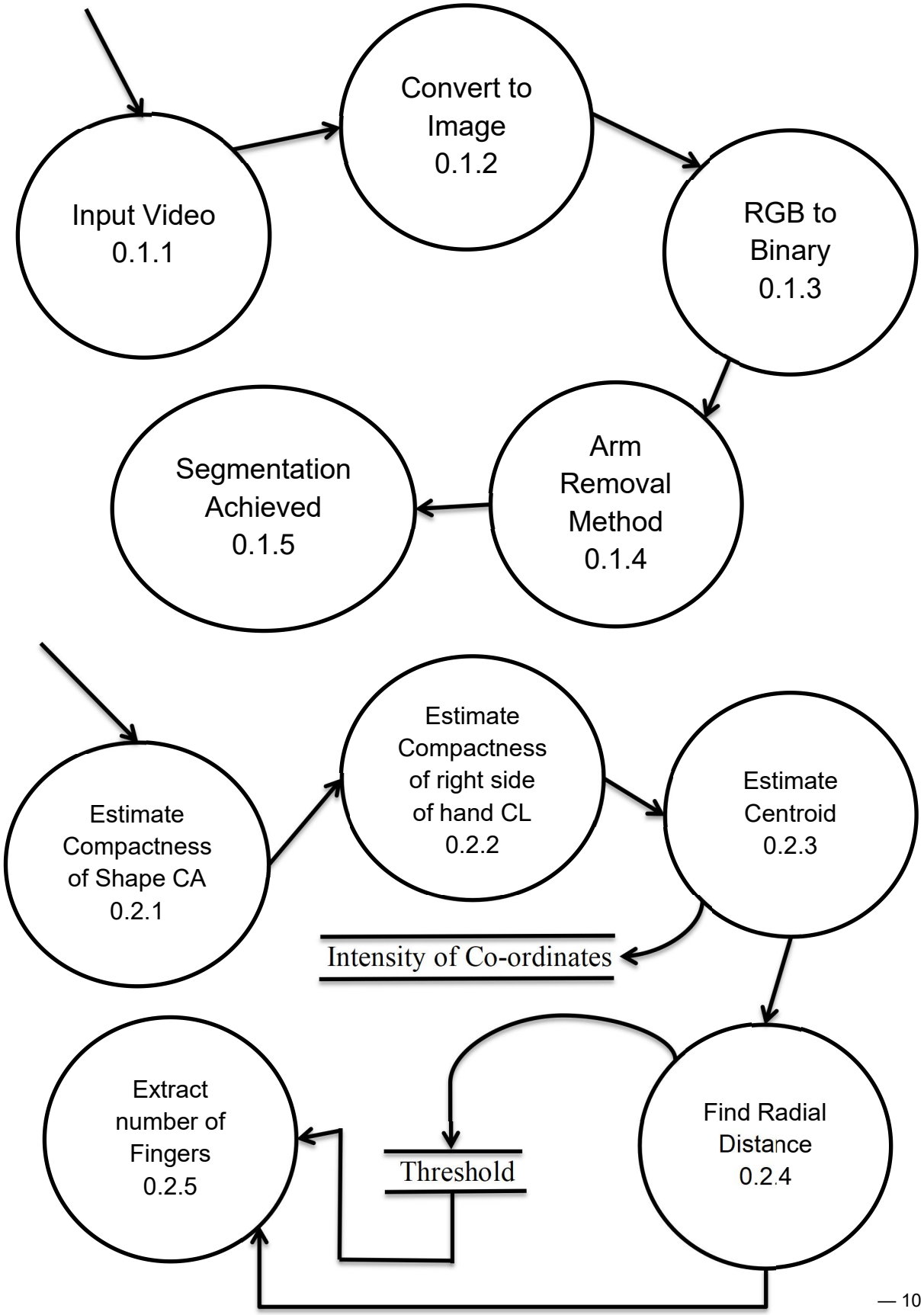
LEVEL 0 DFD



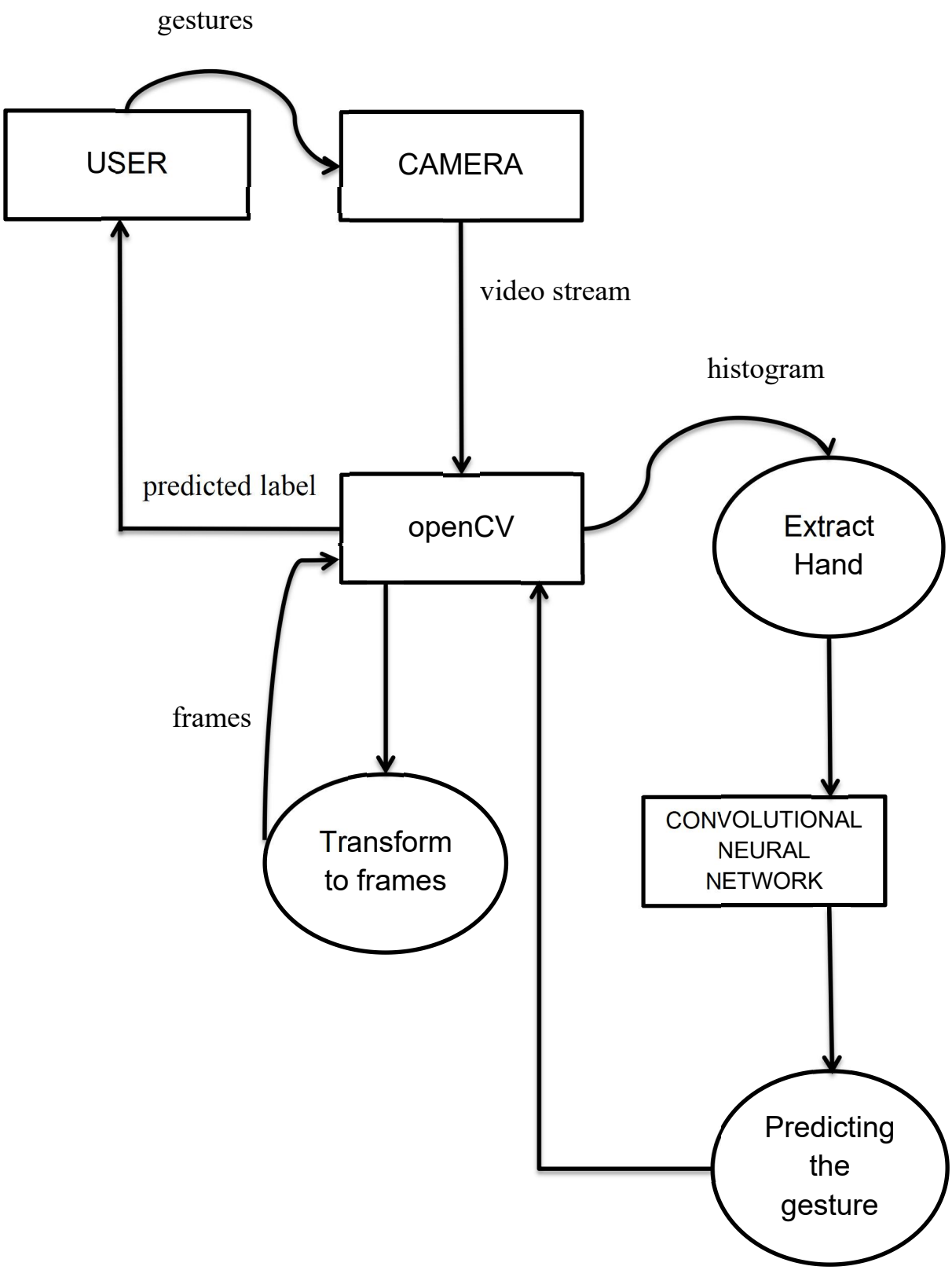
LEVEL 1 DFD



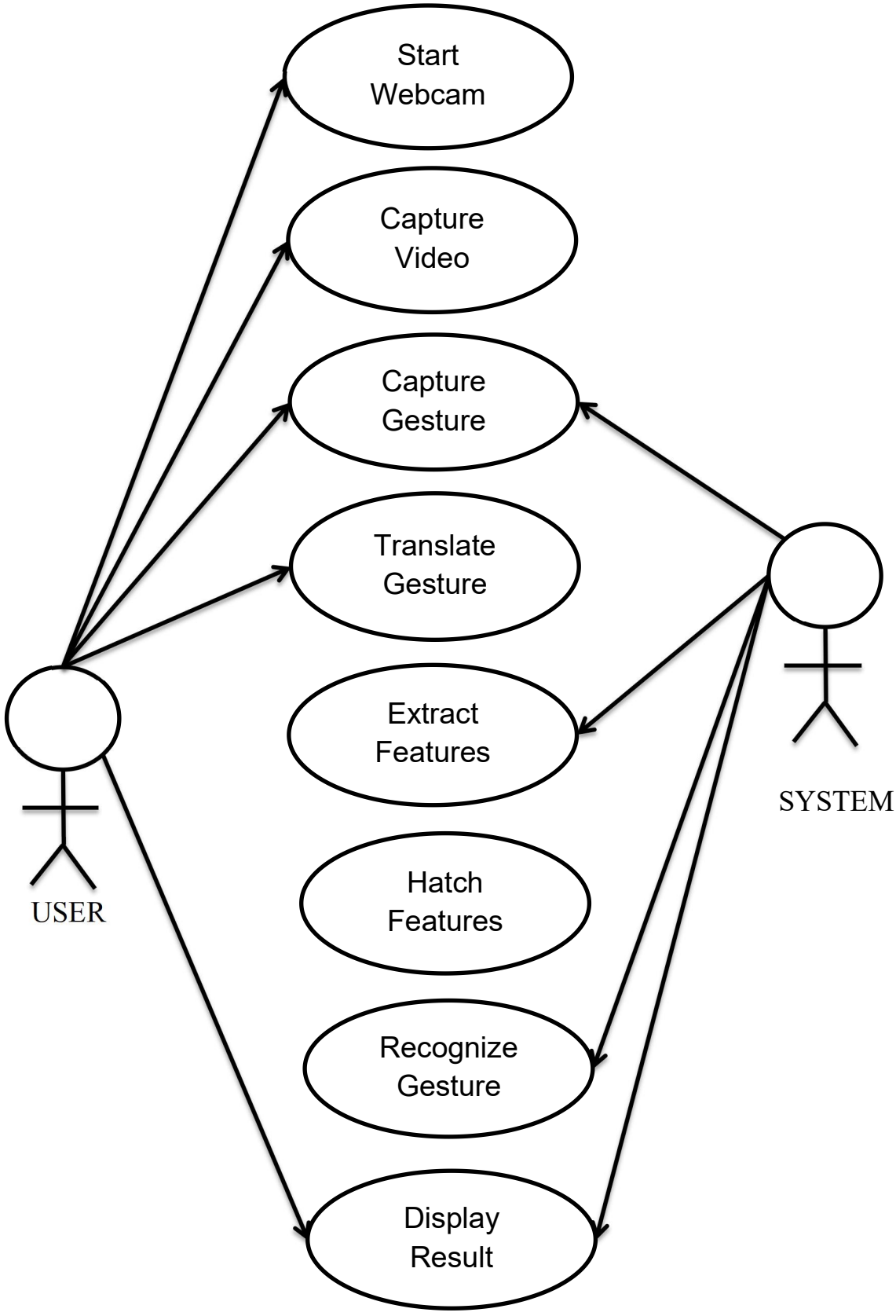
LEVEL 2 DFD


Input Video
0.1.1
Convert to
Image
0.1.2
RGB to
Binary
0.1.3
Arm
Removal
Method
0.1.4
Segmentation
Achieved
0.1.5
Estimate
Compactness
of Shape CA
0.2.1
Estimate
Compactness
of right side
of hand CL
0.2.2
Estimate
Centroid
0.2.3
Intensity of Co-ordinates
Find Radial
Distance
0.2.4
Threshold
Extract
number of
Fingers
0.2.5

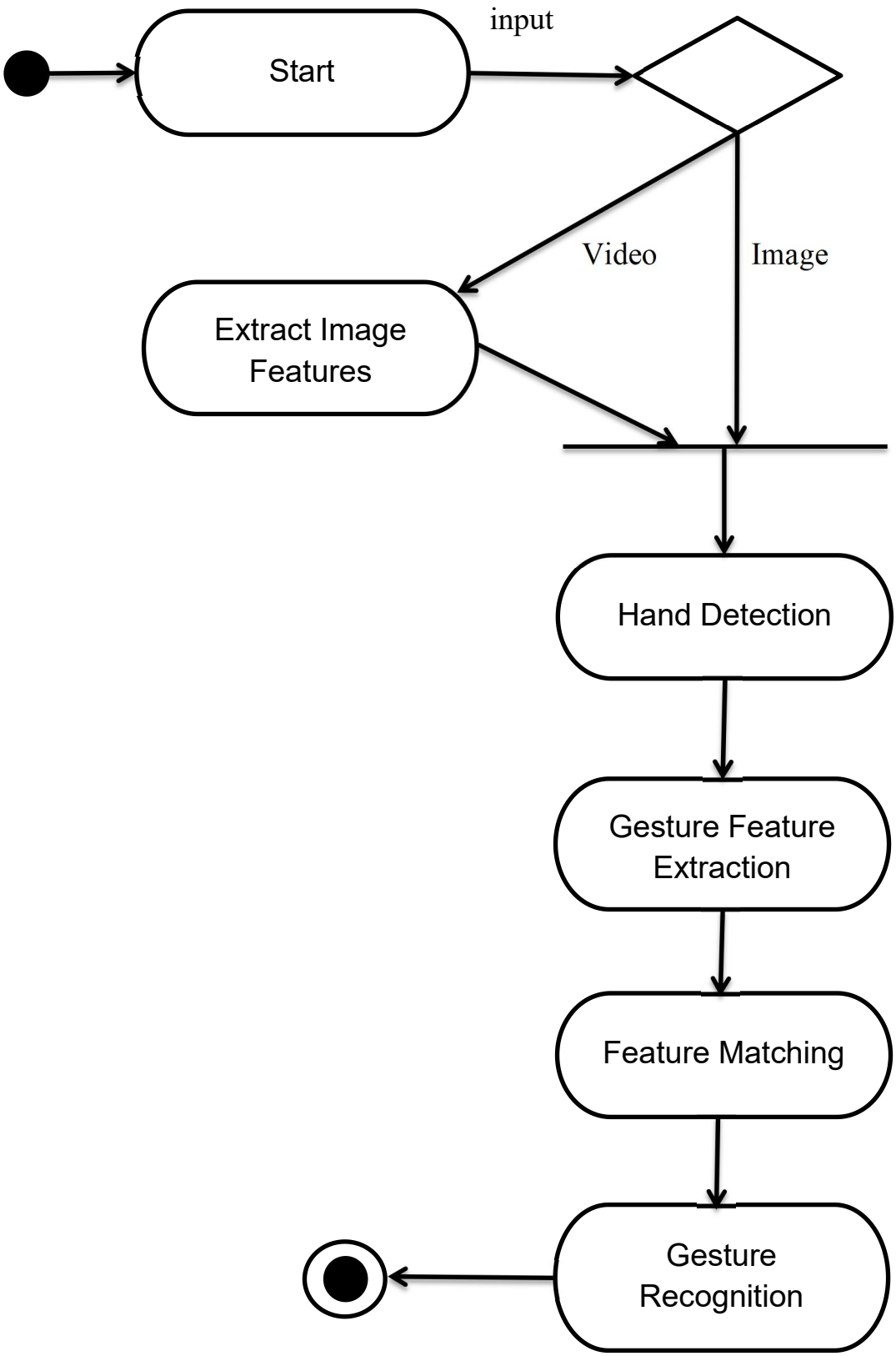
DATA FLOW DIAGRAM



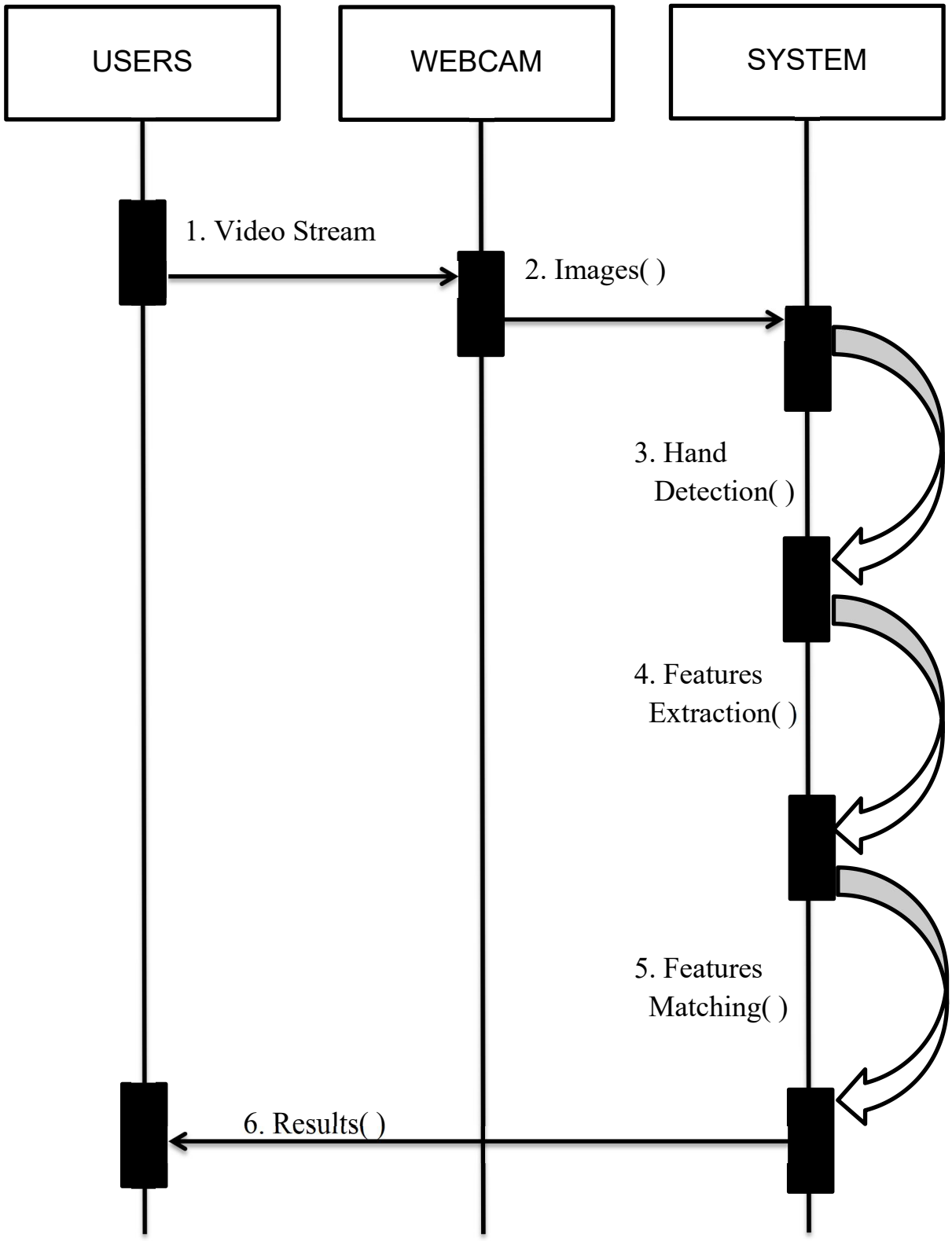
USE CASE DIAGRAM



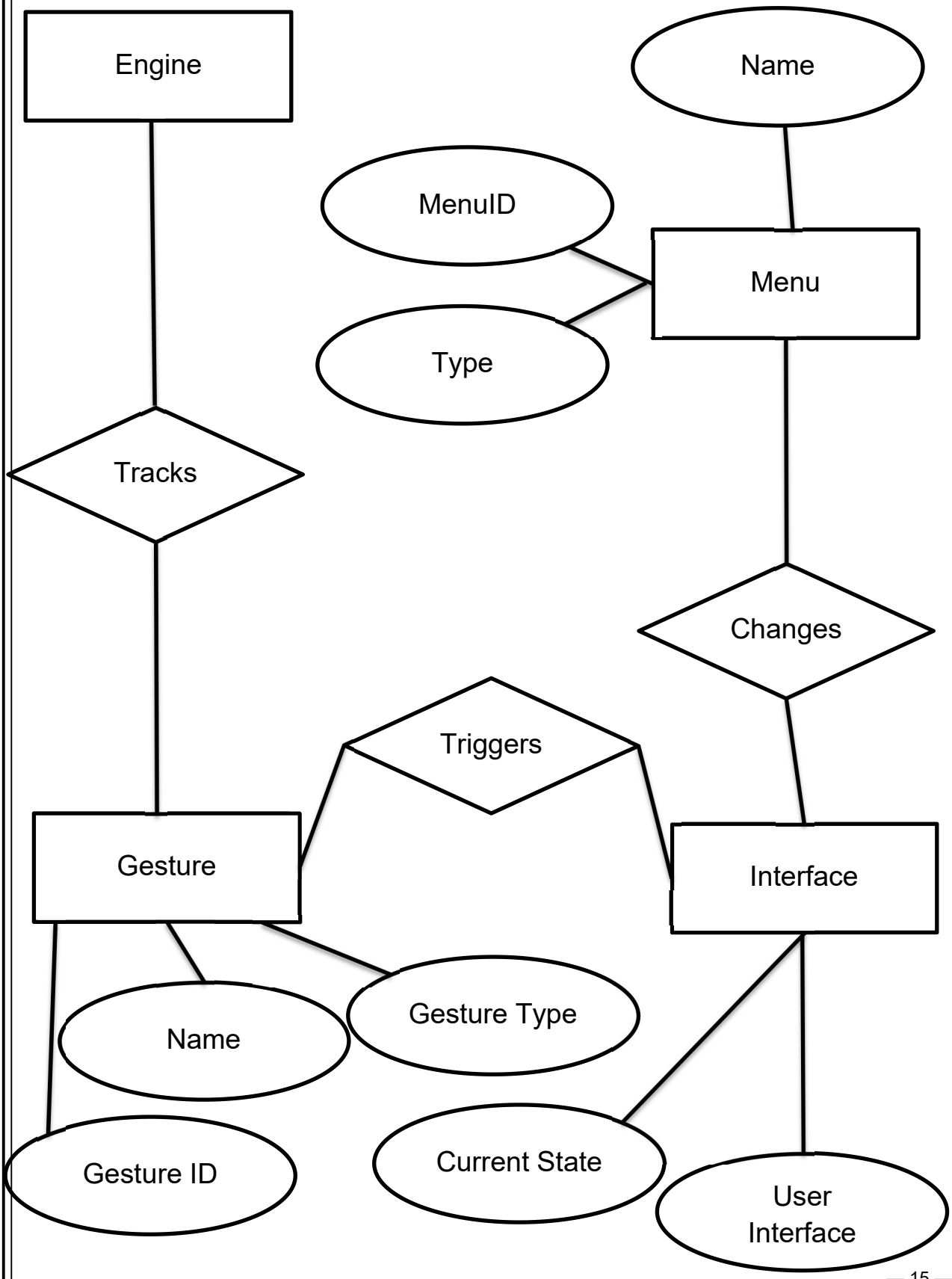
ACTIVITY DIAGRAM



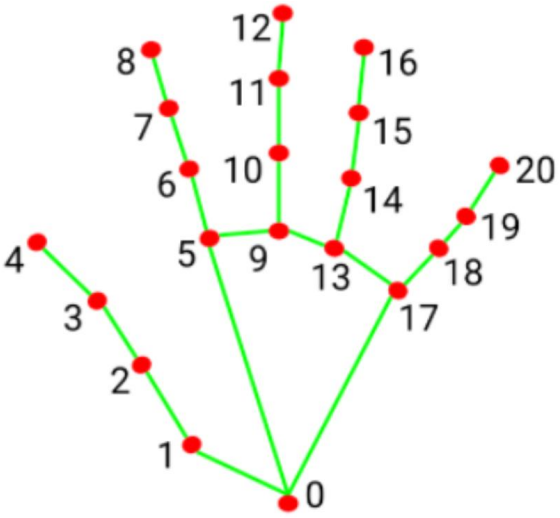
SEQUENCE DIAGRAM



ENTITY RELATIONSHIP (ER) DIAGRAM



TEST CASES



0. WRIST
1. THUMB_CMC
2. THUMB_MCP
3. THUMB_IP
4. THUMB_TIP
5. INDEX_FINGER_MCP
6. INDEX_FINGER_PIP
7. INDEX_FINGER_DIP
8. INDEX_FINGER_TIP
9. MIDDLE_FINGER_MCP
10. MIDDLE_FINGER_PIP
11. MIDDLE_FINGER_DIP
12. MIDDLE_FINGER_TIP
13. RING_FINGER_MCP
14. RING_FINGER_PIP
15. RING_FINGER_DIP
16. RING_FINGER_TIP
17. PINKY_MCP
18. PINKY_PIP
19. PINKY_DIP
20. PINKY_TIP

CONCLUSION

- This document represents a report of the detailed understanding for development of the software “Hand Tracking Features using Python” .

- It covers the basics of the software like Abstract , SRS Document , DFD Diagrams , UML Diagrams and also the ER Diagram .

- After the user interface is visually illustrated, the goal of the final product is clearer and more apparent. The works that are done so far provides a point of view on the design process, so the schedule is added to the document in order to show the timetable for the future fork to be done.

- Preparing this report was an important milestone in our schedule, since it will provide a common understanding of the expected outcomes of the application, components of the system, and the responsibilities of team members.

- With the help of this document, programming part of the project can be started in near future. No confusion will be faced if strict observance of the document is pursued while programming part.

THANK

YOU