

2012

Textual Content Based Video Indexing & Retrieval (TCBVIR)



Contents

1. INTRODUCTION:..... 4

1. INTRODUCTION:

TCBVIR is the labeling of an object in video based on its textual content which helps us in classifying the item and helps the user in its search.

It also helps in the later retrieval of the information as once the tags have been given its easy to identify videos having certain characteristics. Currently the bulk of video classification and segmentation is being done manually by users or operators. The classification of the videos is based on their titles and tags already allotted to them by the users and these tags may not reflect the content of the video completely and there may be certain events in the video for which no tags are present. Internet search engines search for the videos by incorporating their title, description and tags only. So for efficient and meaningful search these tags must truly reflect the video content and must be comprehensive.

This problem can be solved using an automated Textual Content Based Video Indexing system. This system can classify and index the videos based on the text appearing in the videos. This text appears in many forms, such as the ticker text in news and cricket videos, information in music videos etc. The system detects the text appearing in the video frame, separate individual letters from the text areas in the frames, and use OCR (Optical Character Recognition) for the recognition of the character. This character can be saved in a database. The database can be searched for the video containing a specific word. The database can then return the video title and the time/frame no. that contains the word.

SOFTWARE DESIGN DOCUMENT AND PROGRESS REPORT

TEXTUAL CONTENT BASED VIDEO INDEXING

&

RETRIEVAL

PC ASMAT JAMAL
NC SARDAR MUHAMMAD ASADULLAH KHAN
NC SYED ALTAN HAIDER

SUPERVISOR
LEC RABIA KHAN

SOFTWARE DESIGN DOCUMENT

Contents

- 1 INTRODUCTION 9
 - 1.1 DESIGN OBJECTIVES..... 9
 - 1.2 ABOUT THE PROJECT 9
- 2 ARCHITECTURE..... 9
 - 2.1 ARCHITECTURAL PATTERN FOR THE PROJECT 9
 - 2.2 OVERVIEW OF THE SYSTEM ARCHITECTURE 10
- 3 USE CASE DIAGRAM 11
- 4 CLASS DIAGRAM..... 12
- 5 ENTITY RELATIONSHIP DIAGRAM..... 14
- 6 Sequence Diagrams..... 15
 - 6.1 Delete user 15
 - 6.2 Delete Video..... 16
 - 6.3 Login User 17
 - 6.4 Sign Up 18
 - 6.5 Update Profile 19
 - 6.6 Upload Video..... 20
 - 6.7 Search Video 21
- 7 ACTIVITY DIAGRAMS 22

Activity Diagram shows maximum scenarios of workflow of components of our system. It shows the flow control between different components. 22

 - 7.1 DELETE VIDEO..... 22
 - 7.2 LOGIN 23
 - 7.3 SIGNUP 24
 - 7.4 UPDATE PROFILE 25
- 8 DATA FLOW DIAGRAMS 26
 - 8.1 UPLOAD VIDEO 26
 - 8.2 SEARCH VIDEO 27
- 9 PRESENTATION MODEL..... 28
 - 9.1 ADMINISTRATOR UI..... 28
 - 9.2 REGISTERED USER 30

9.3	UNREGISTERED USER	31
10	NAVIGATIONAL MODEL.....	32
10.1	USER.....	32
10.2	REGISTERED USER	33
10.3	ADMINISTRATOR	34
11.	DEPLOYMENT VIEW	35

INTRODUCTION

DESIGN OBJECTIVES

This design document captures all our functional requirements and shows their interaction with each other. The low level design also shows as to how we have been implementing; how we are going to implement all these requirements. This low level design presently does not address any non-functional requirements that our system has.

ABOUT THE PROJECT

The product to be built is a WEB-BASED VIDEO INDEXING AND RETRIEVAL ON THE BASIS OF ITS TEXTUAL CONTENT. As clear from the name, the main objectives of this project is to build a system that process a video file, detecting , extracting and then identifying the text, and then storing the video in an internet database on the basis of the text present, retrieved, in the video file. The video processing will be done when a user uploads a file in the database and then the video is stored in the database on the basis of the text retrieved from the video and the users will be able to view the video part that has the text, starting from the text appearance till the appearance ends. The user can also view the whole video.

ARCHITECTURE

The software architecture of a program or computing system is the structure or structures of the system, which comprise software components, the externally visible properties of those components, and the relationships among them.

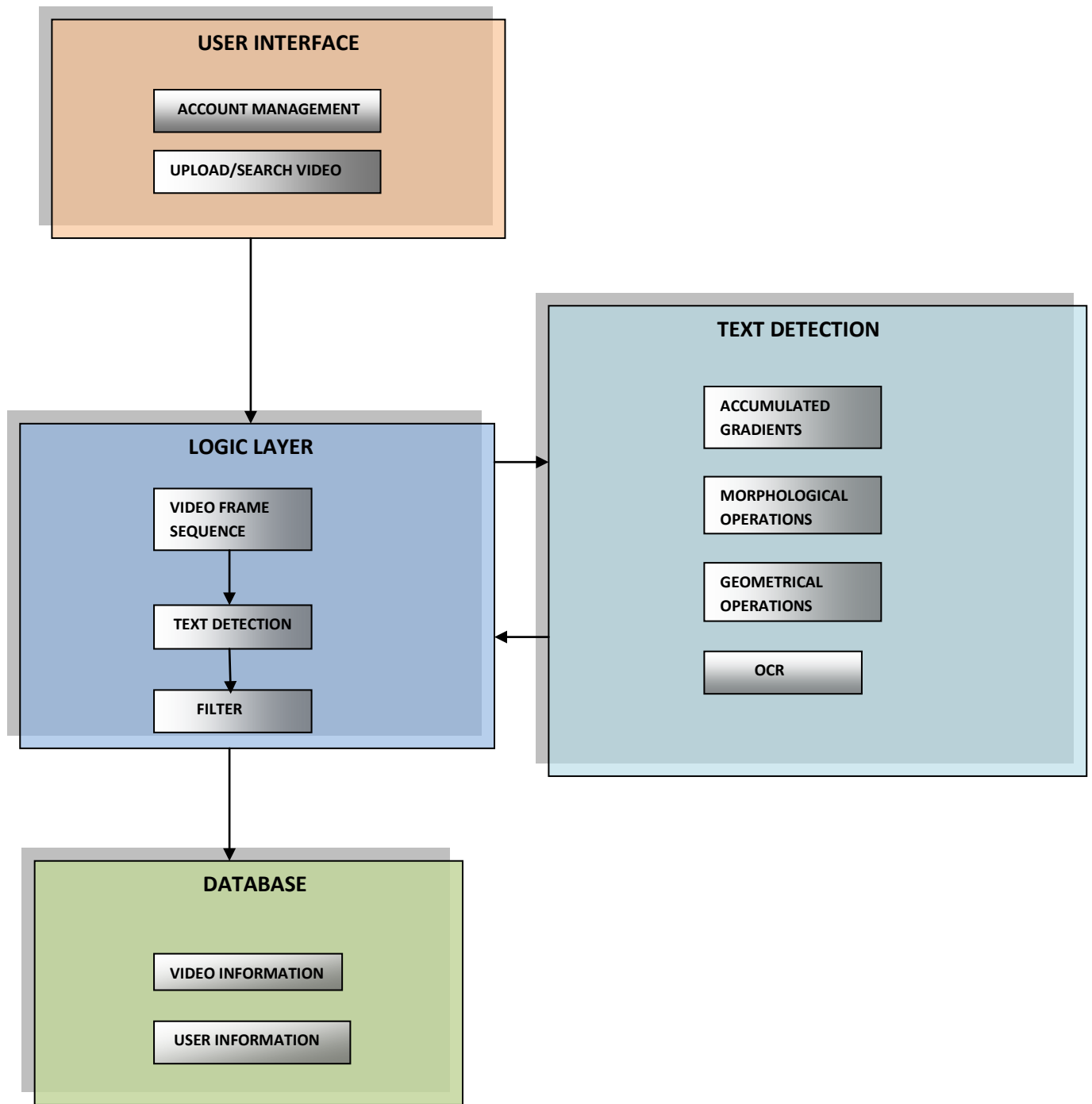
ARCHITECTURAL PATTERN FOR THE PROJECT

TO REALIZE THE OVERALL FUNCTIONALITY OF THE PROJECT, WE USED 3-TIER ARCHITECTURE. THE ARCHITECTURE TYPE, DIVIDES THE OVERALL FUNCTIONALITY INTO THREE MAIN SECTIONS.

- i) **THE PRESENTATION(UI)**
- ii) **THE BUSINESS LOGIC LAYER (FOR ALL THE LOGIC RELATED TASKS)**

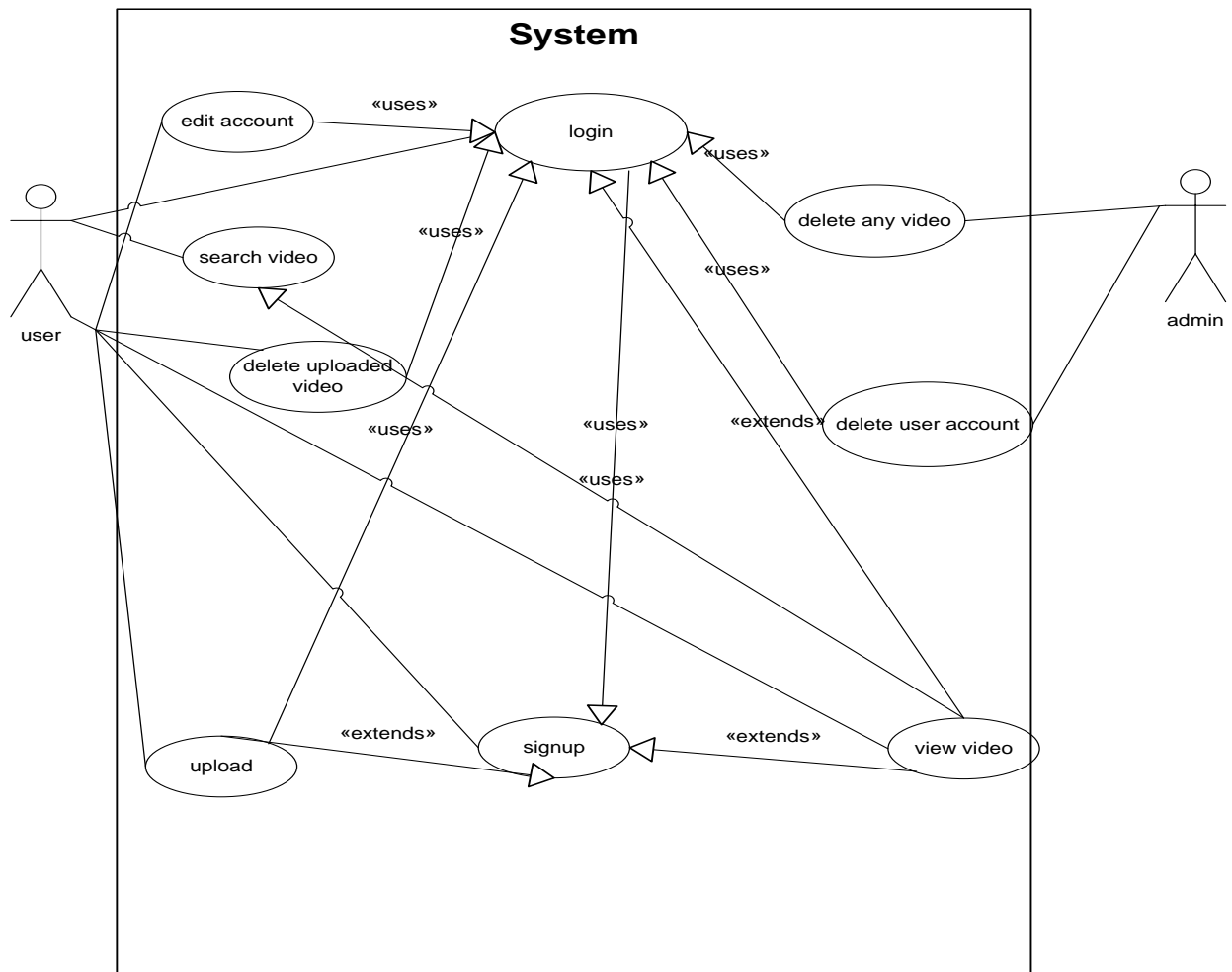
iii) THE DATABASE.

OVERVIEW OF THE SYSTEM ARCHITECTURE



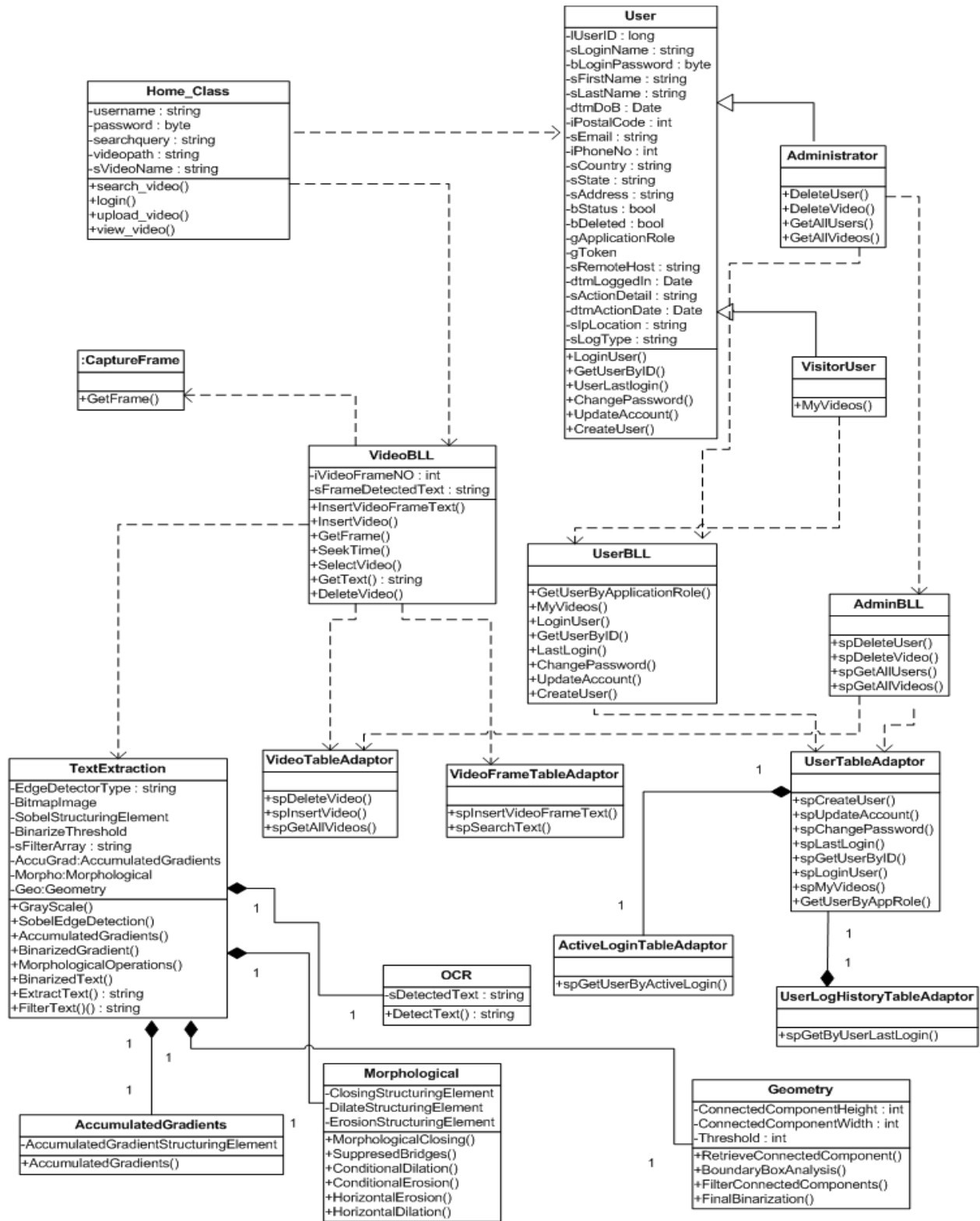
USE CASE DIAGRAM

Below is the use case diagram for our project.



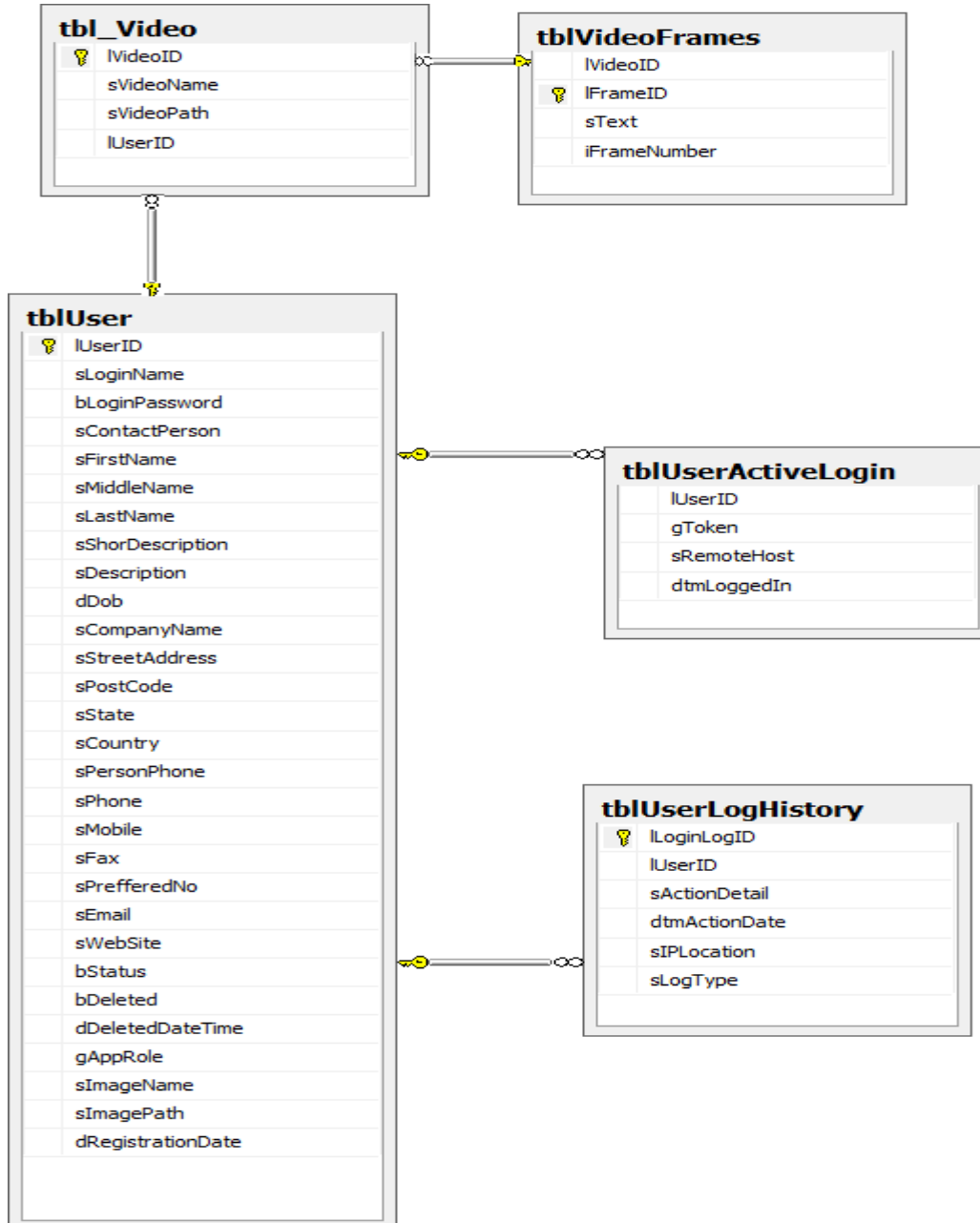
CLASS DIAGRAM

This diagram clearly shows all the system objects to be used in our system



ENTITY RELATIONSHIP DIAGRAM

Below is the ERD for our project.



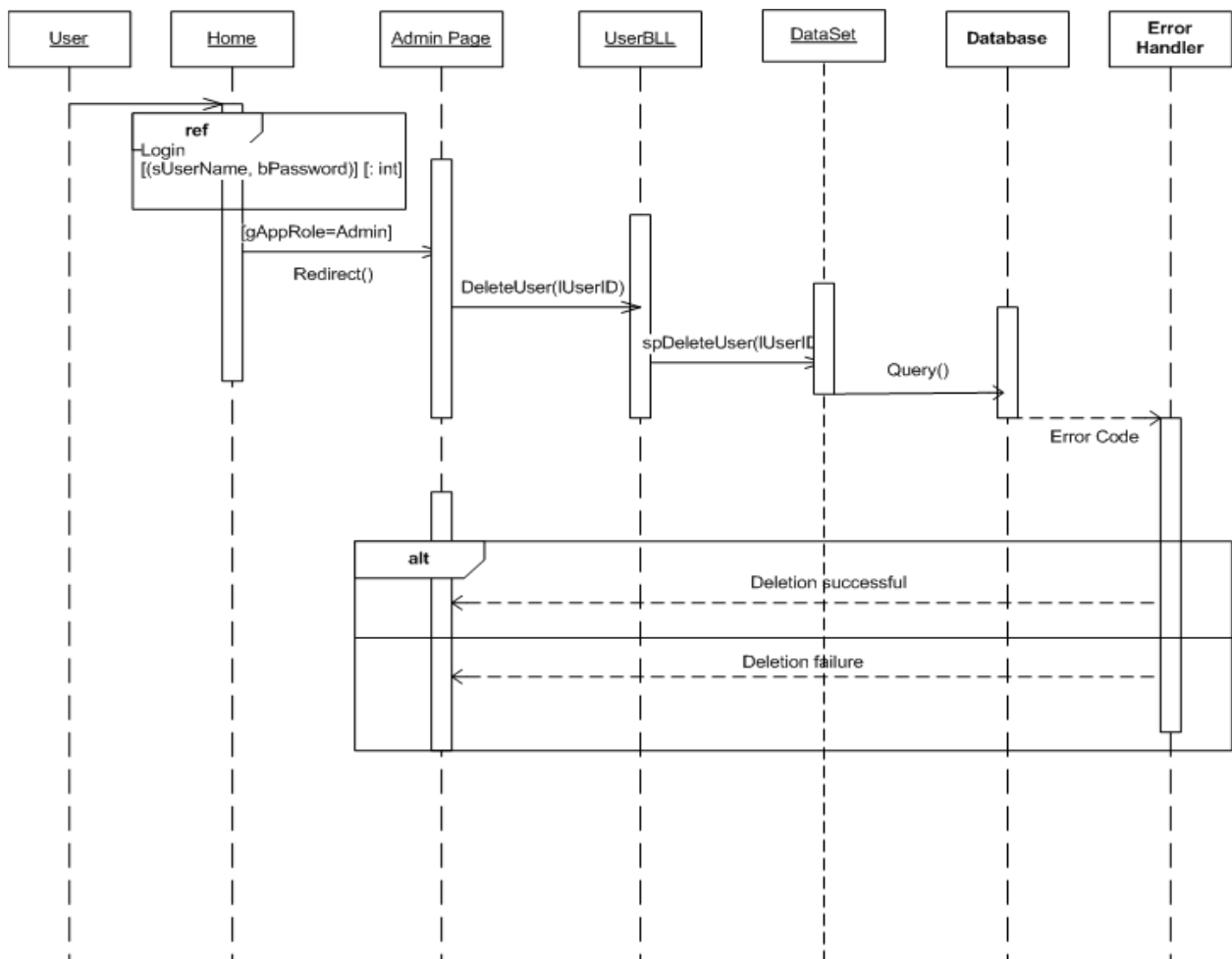
Sequence Diagrams

These sequence diagrams (dynamic model) show how the system responds to various events.

The purpose of this section is to model how the system responds to various events, i.e., model the system's behavior. We do this using sequence diagrams.

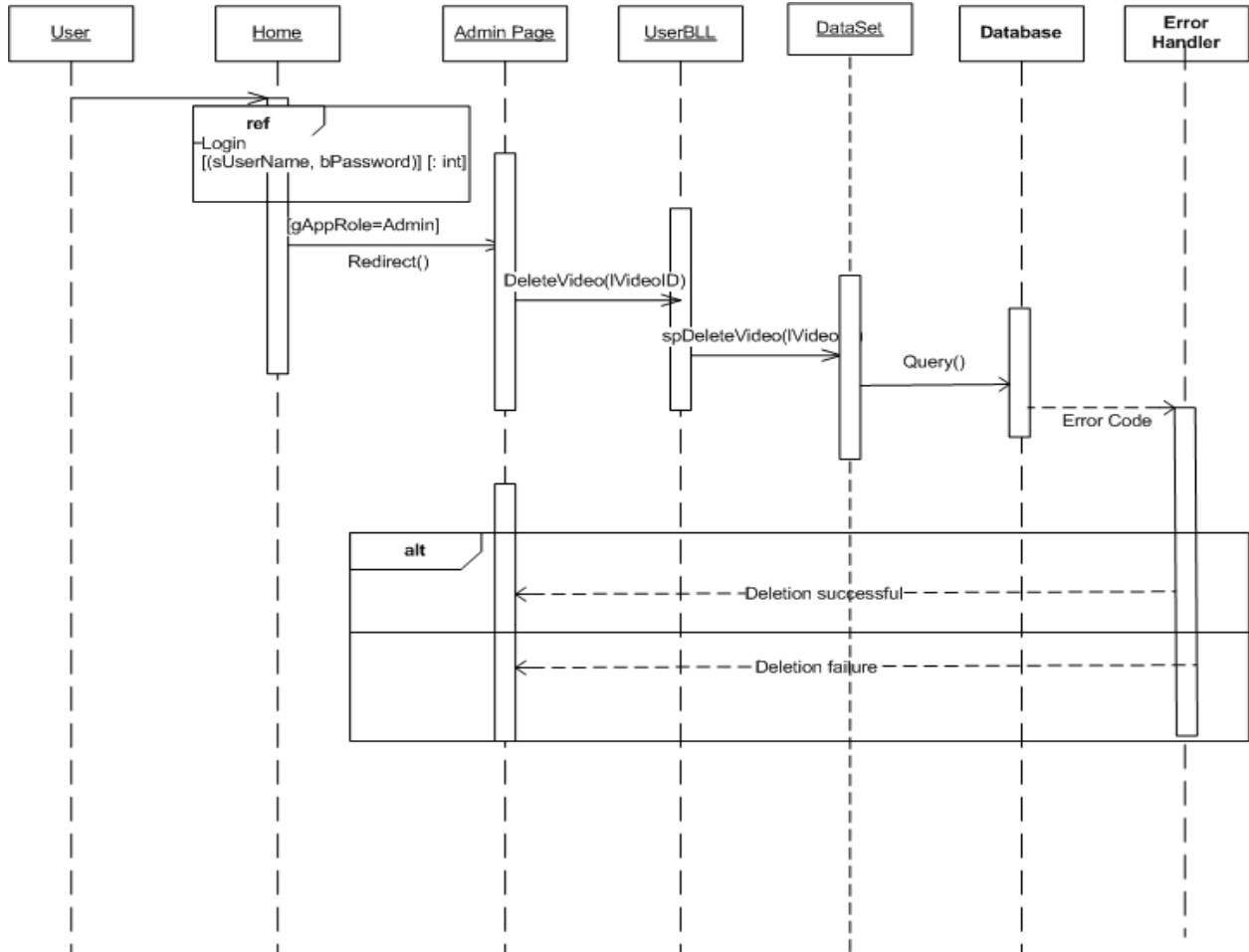
Delete user

This scenario describes the events that take place when a user is deleted.



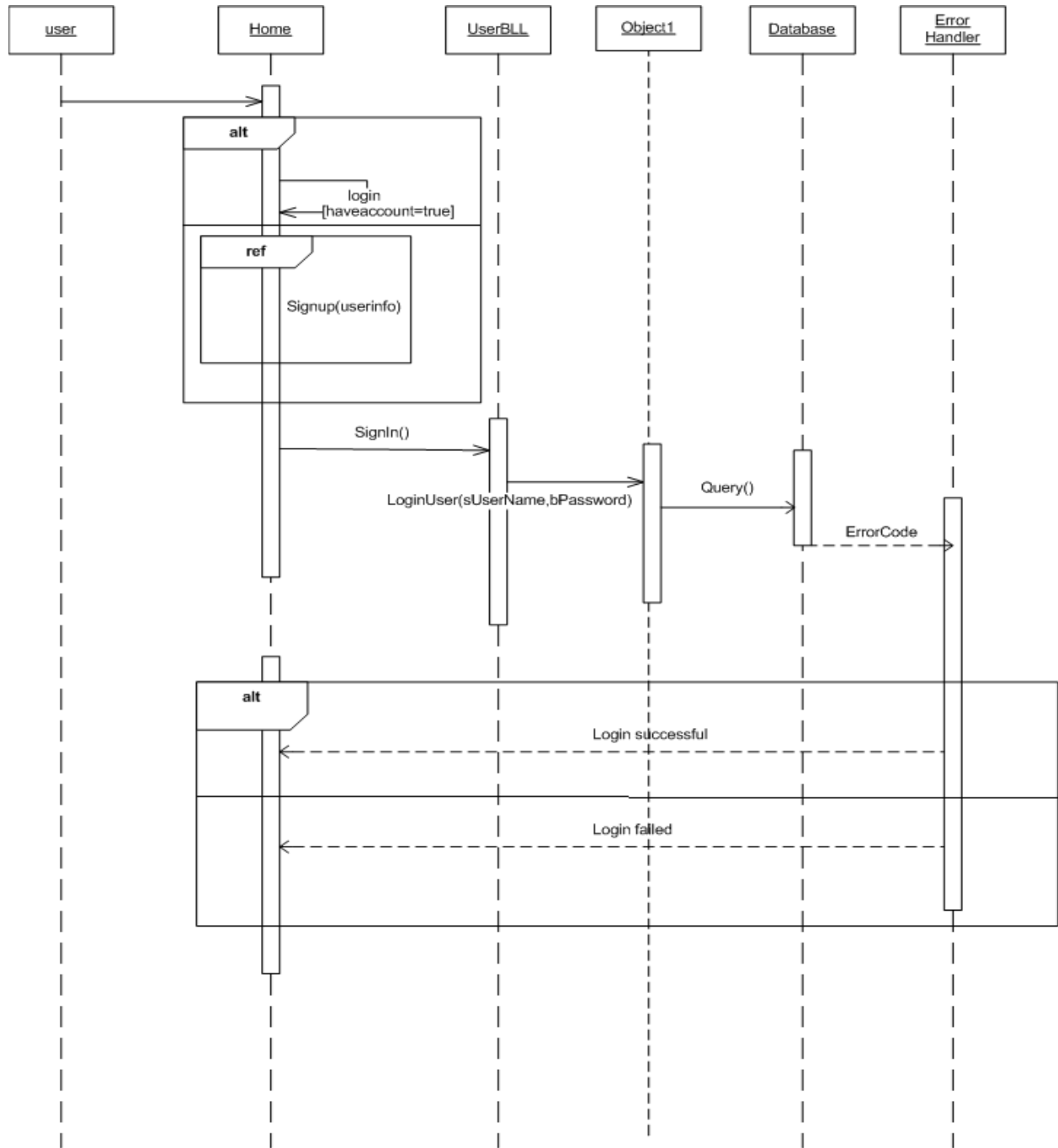
Delete Video

This scenario describes the sequence of events that take place when an administrator deletes a user uploaded video.



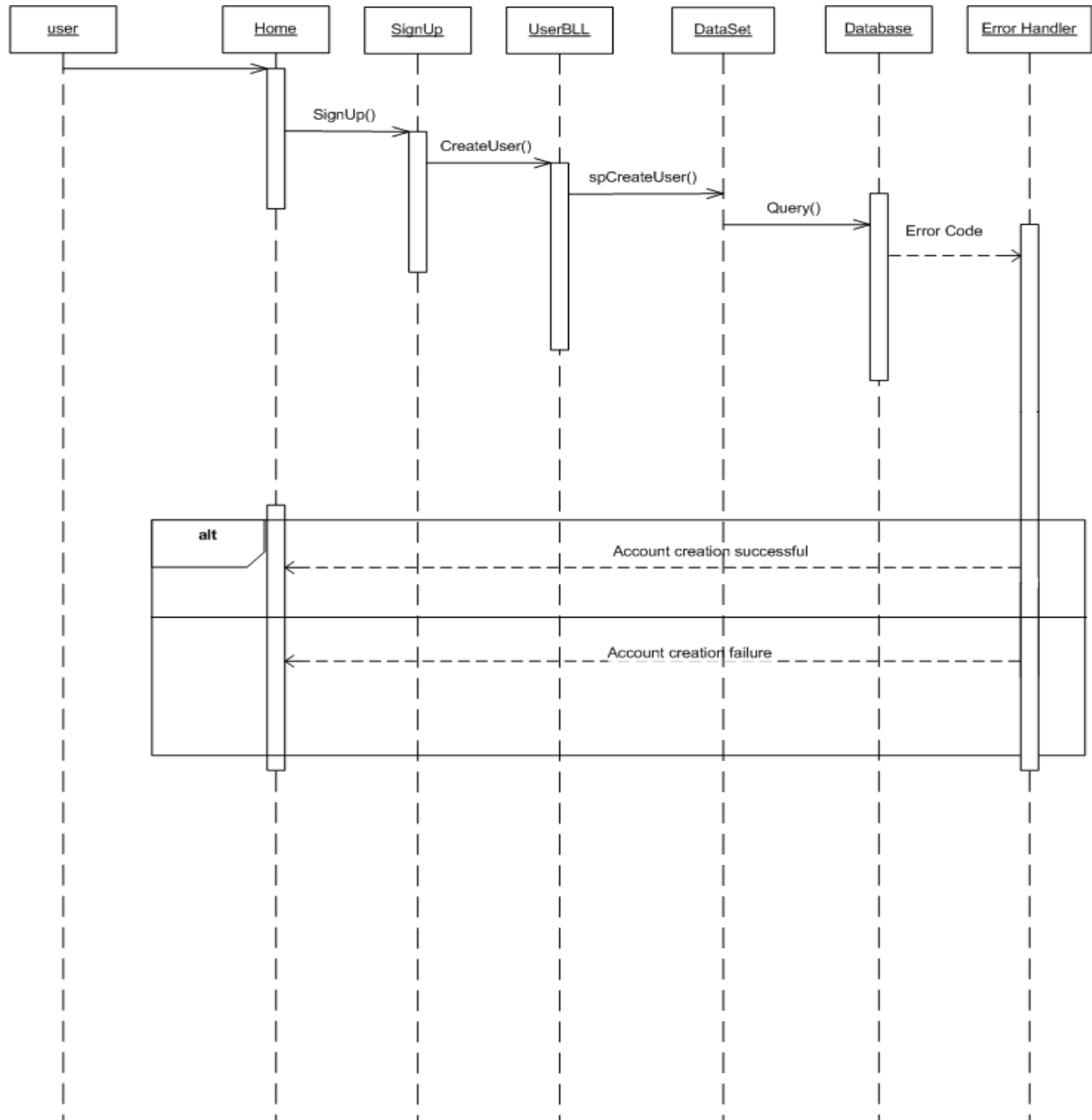
Login User

This scenario describes the sequence of events that take place when a user decides to log into the system.



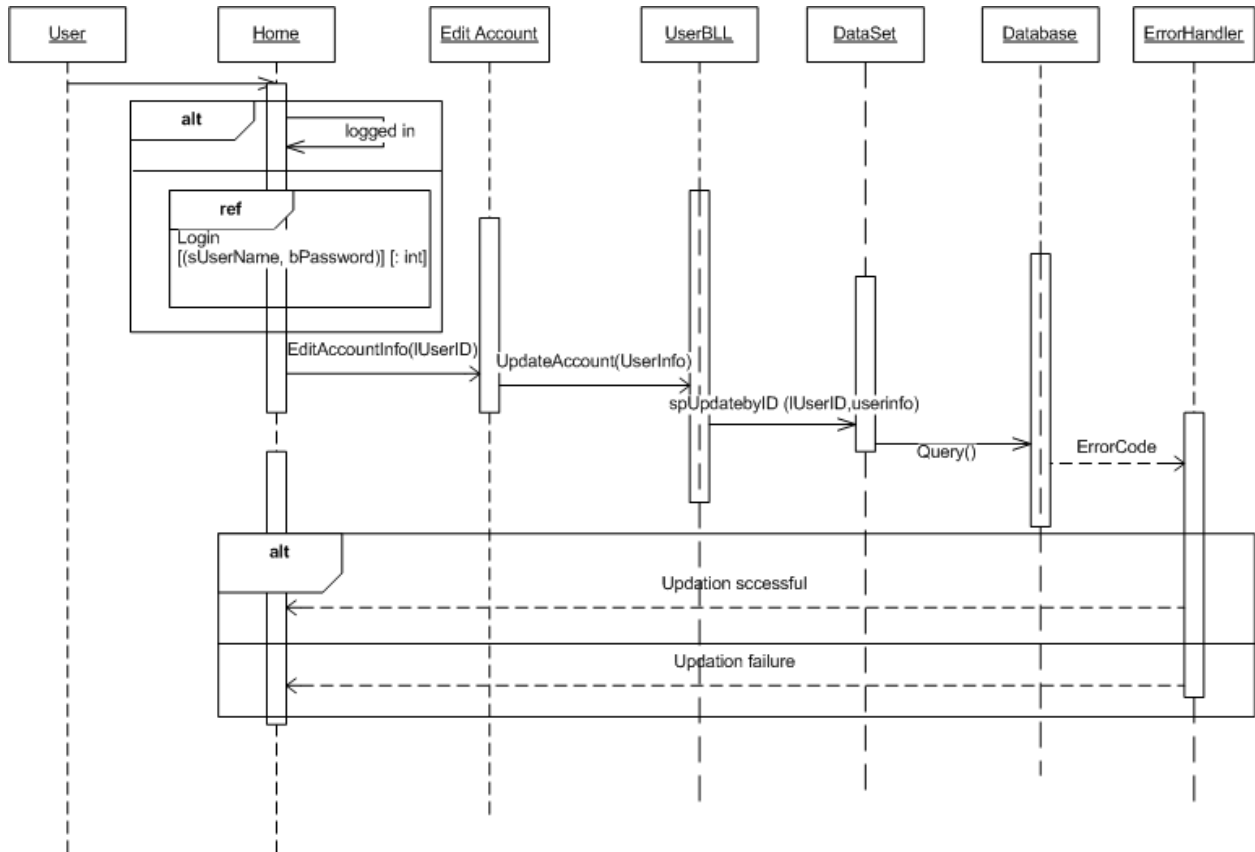
Sign Up

This scenario describes the sequence of events that take place when an unregistered user decides to Sign Up to create an account.



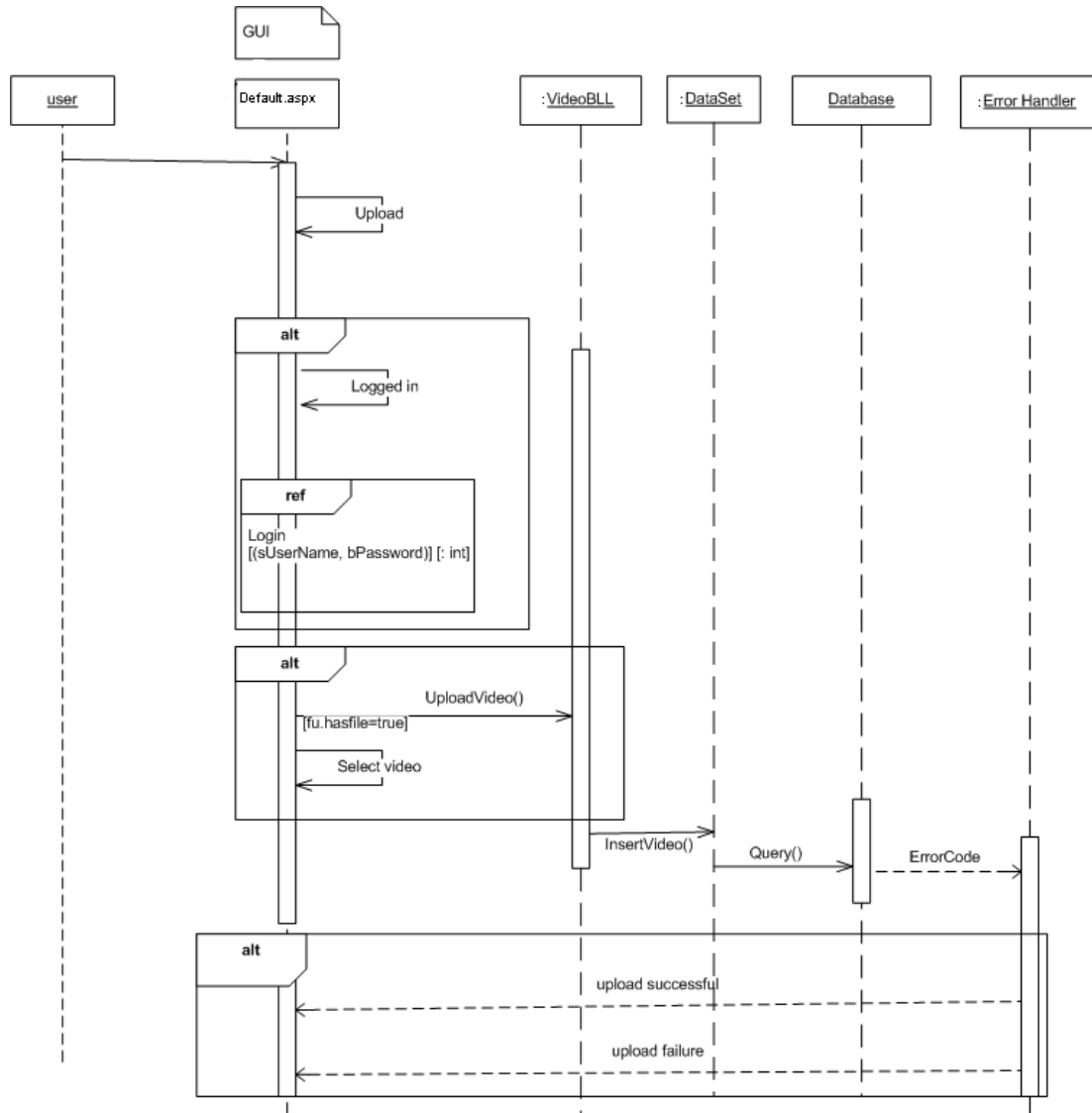
Update Profile

This scenario describes the sequence of events that take place when a user decides to update his/her profile.



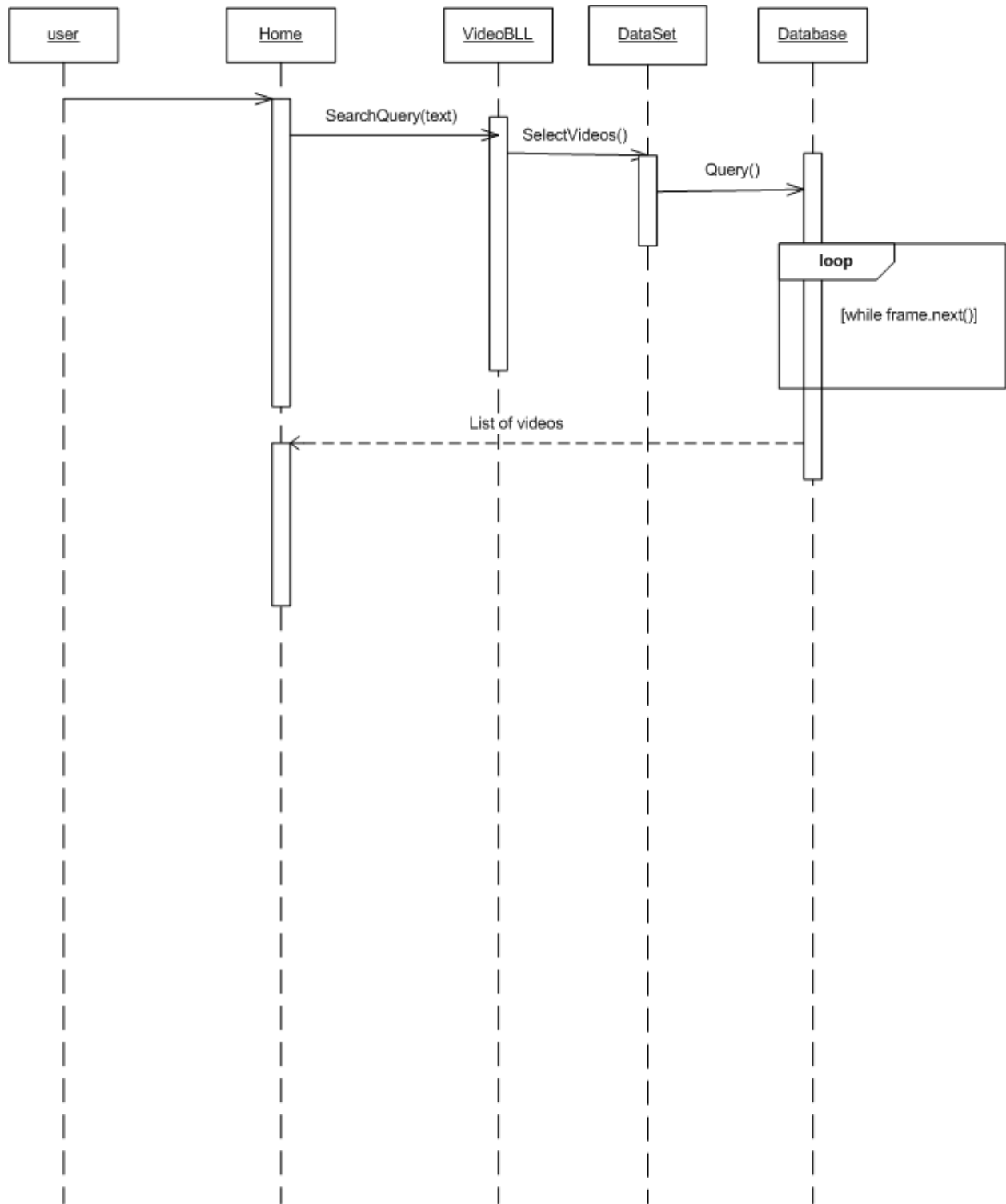
Upload Video

This scenario describes the sequence of events that take place when a user decides to upload a video.



Search Video

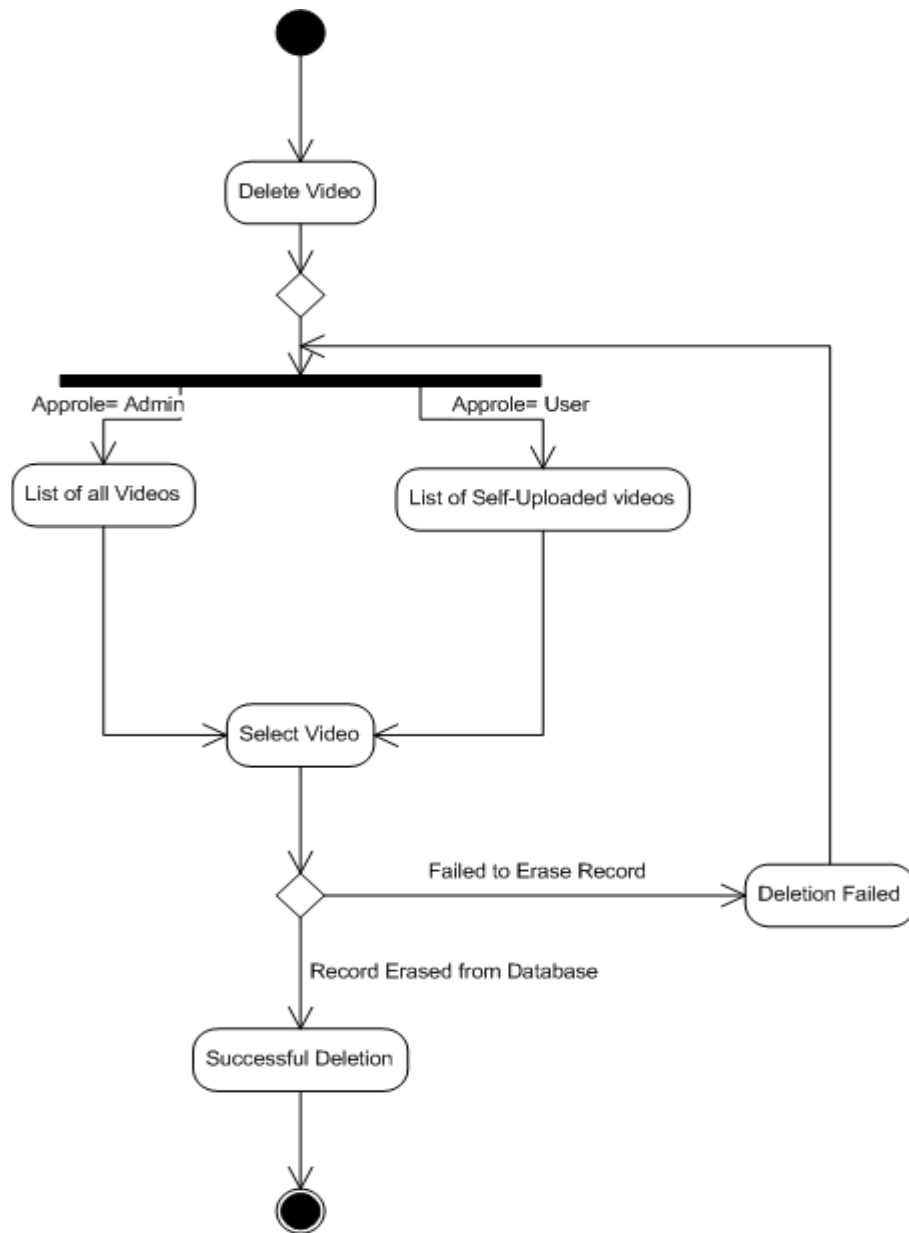
This scenario describes the sequence of events that take place when a user decides to search for a video.



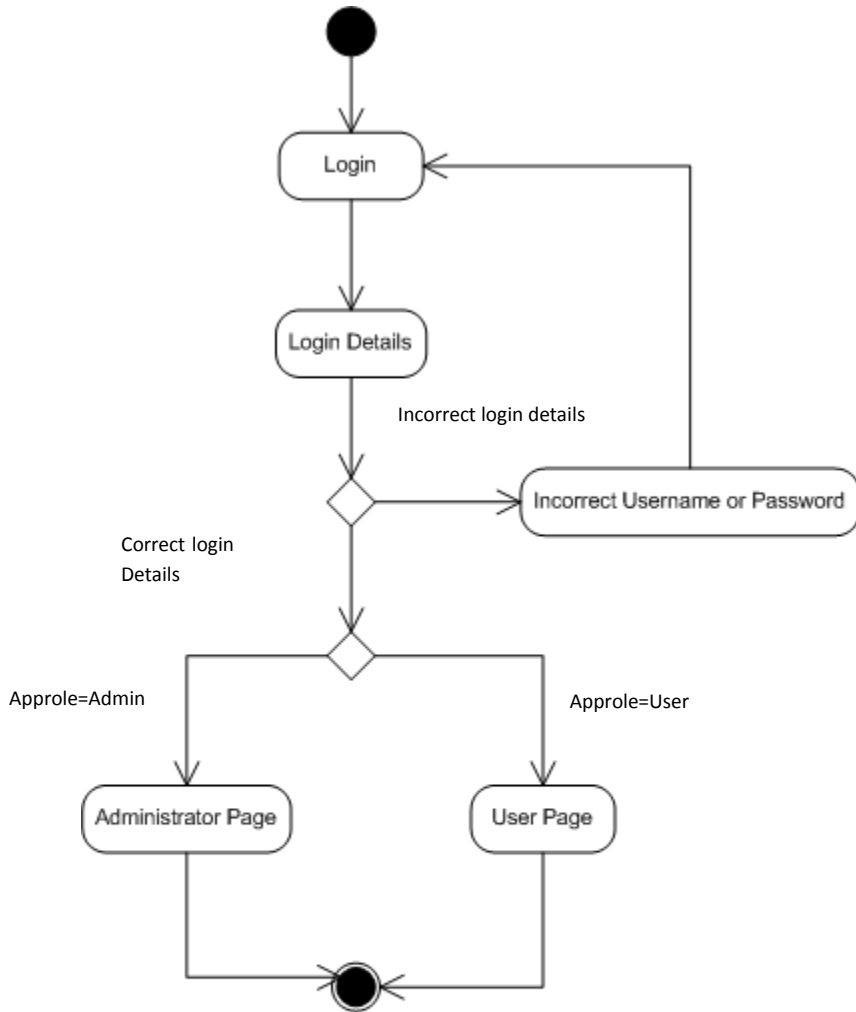
ACTIVITY DIAGRAMS

Activity Diagram shows maximum scenarios of workflow of components of our system. It shows the flow control between different components.

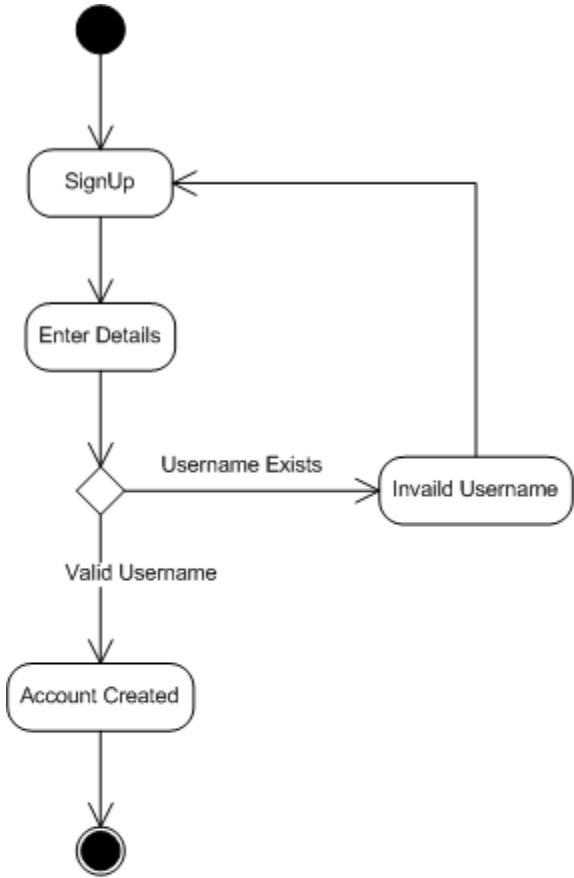
DELETE VIDEO



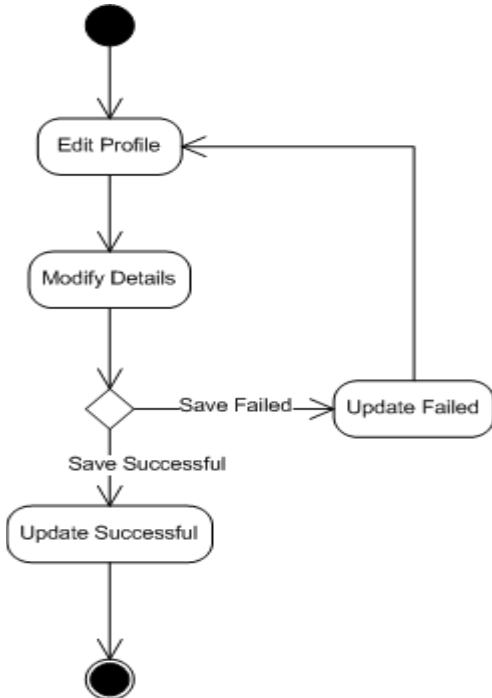
LOGIN



SIGNUP



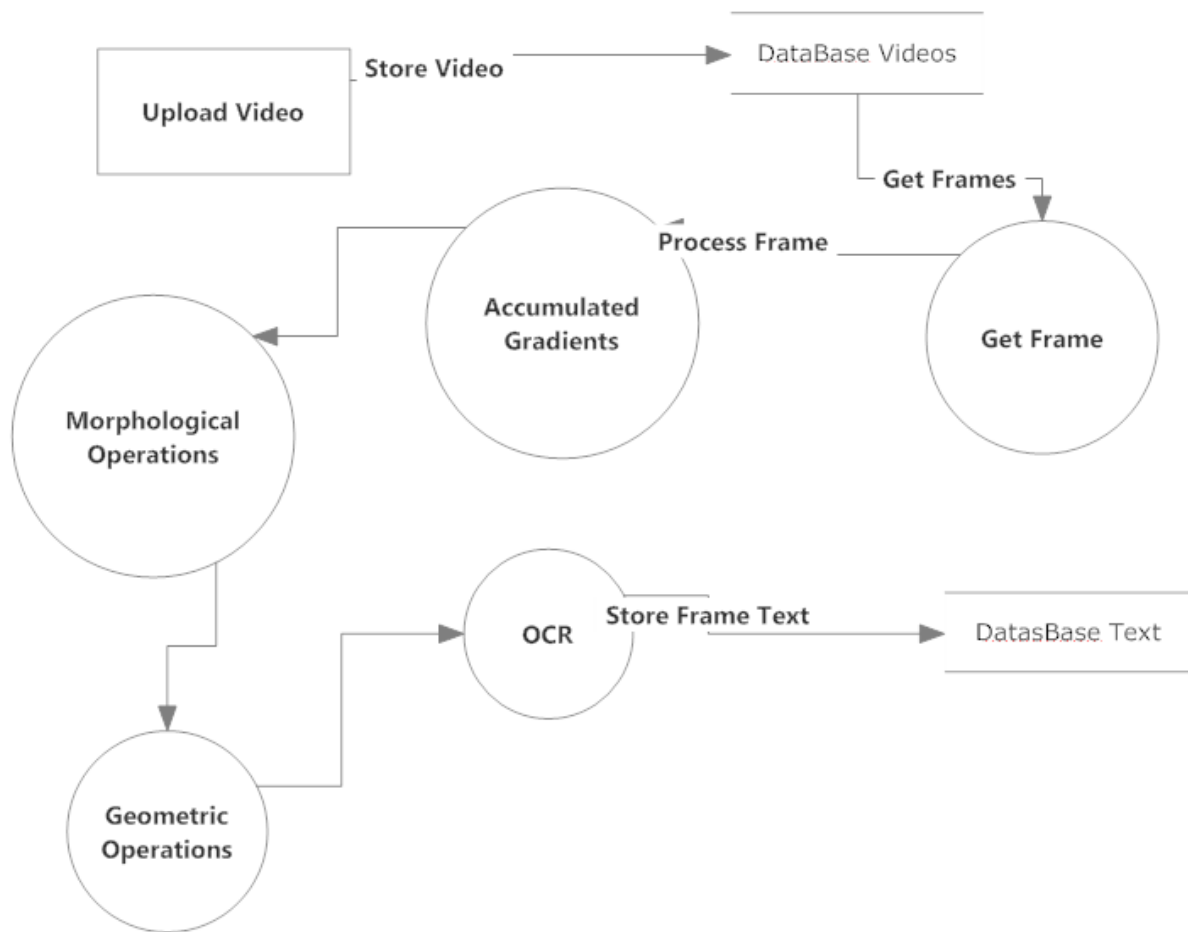
UPDATE PROFILE



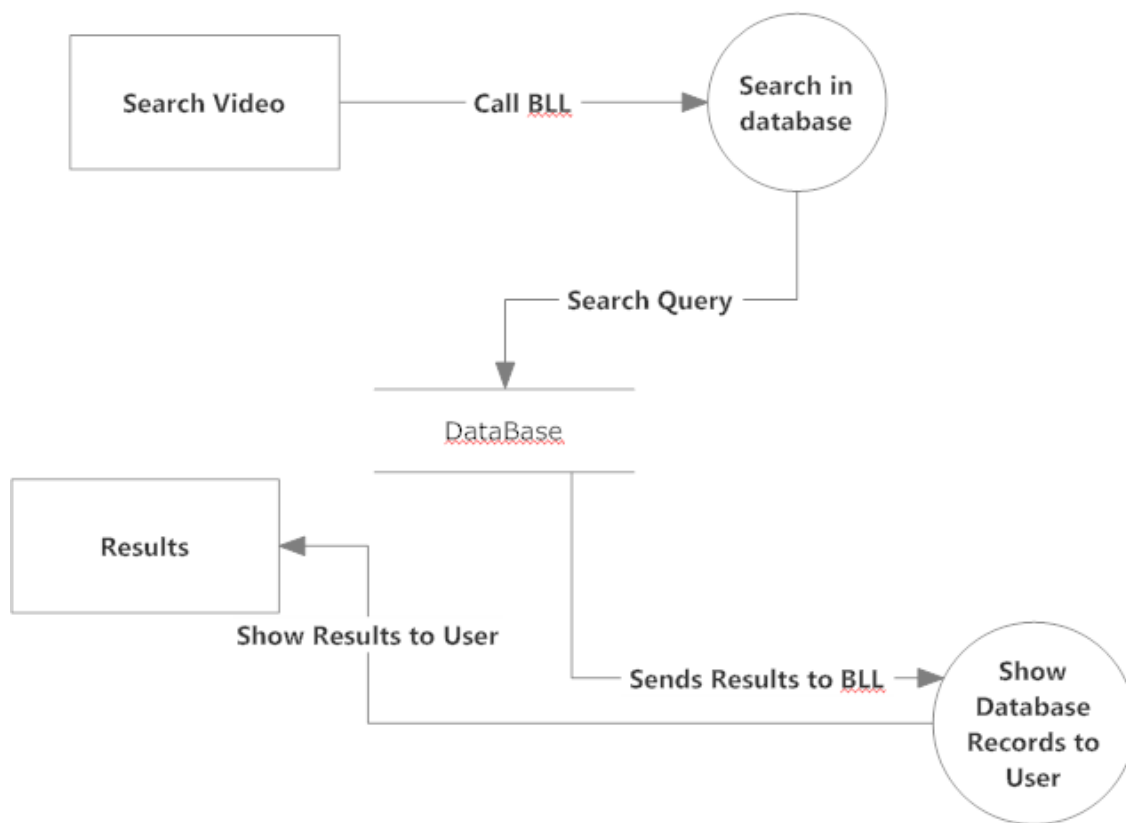
DATA FLOW DIAGRAMS

A data flow diagram is a logical model of the flow of data through a system that shows how the system's boundaries, processes, and data entities are logically related.

UPLOAD VIDEO



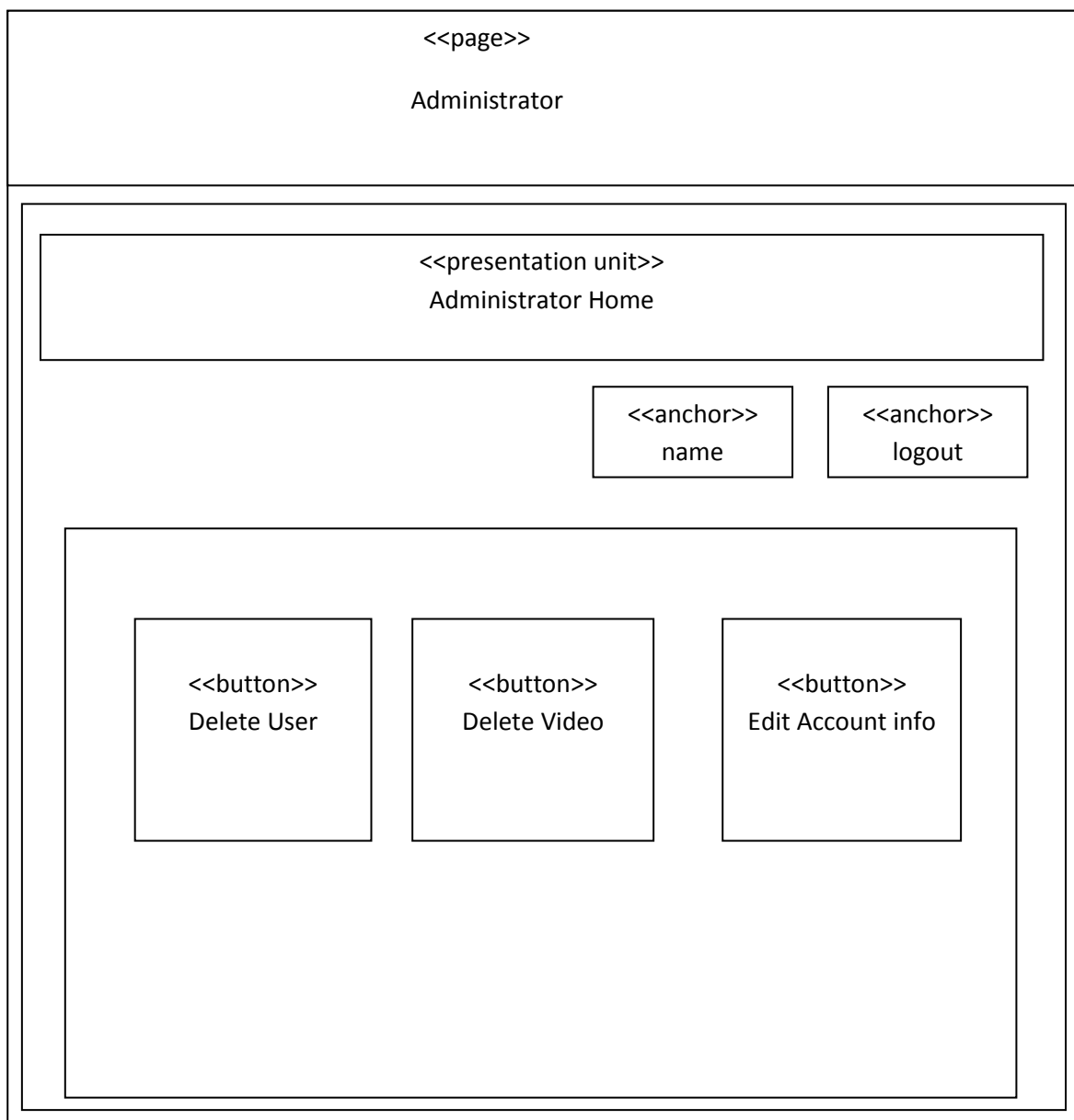
SEARCH VIDEO



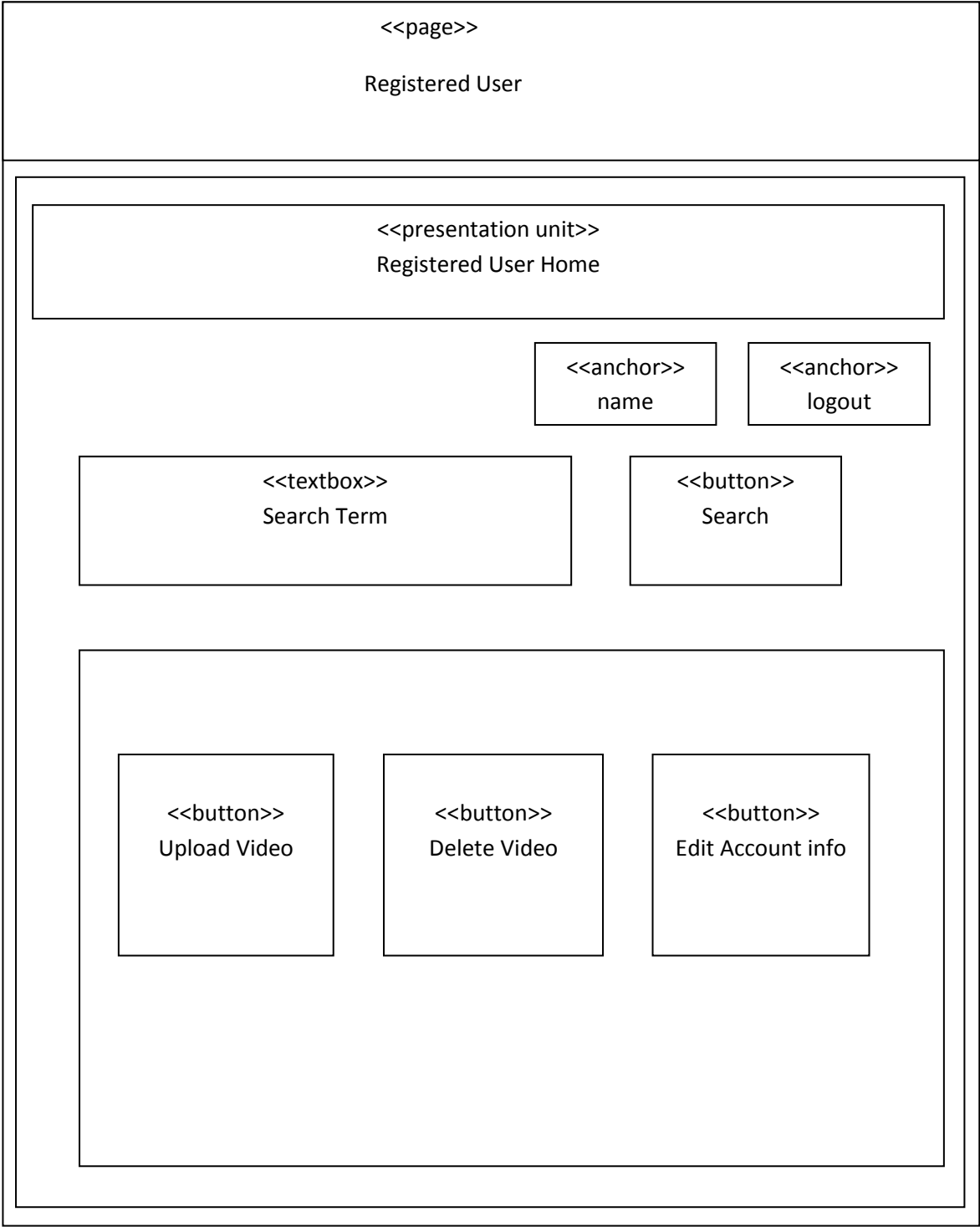
PRESENTATION MODEL

The Presentation Model shows the blueprint for the intended User Interface. It basically shows how the UI will look like to the respective User.

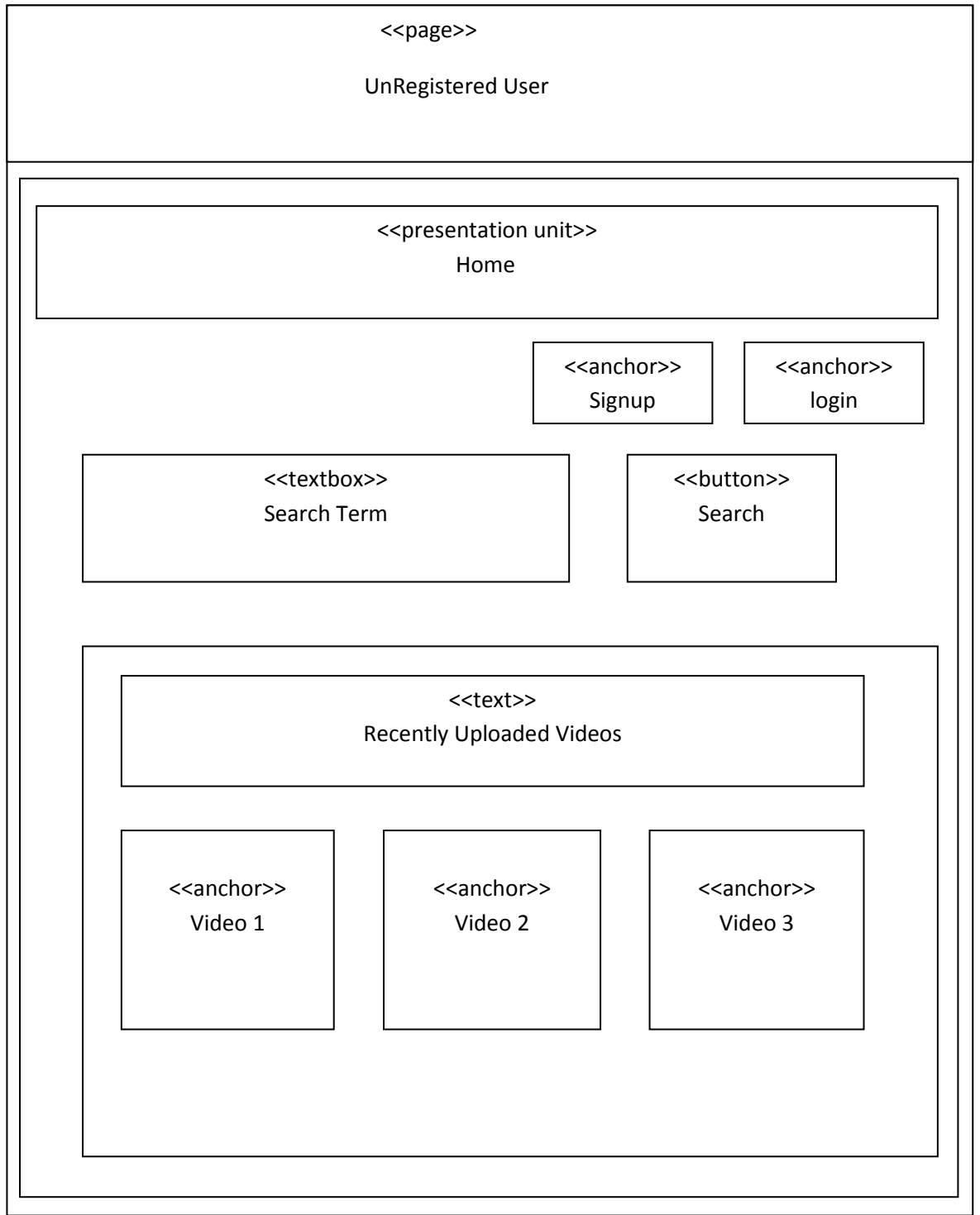
ADMINISTRATOR UI



REGISTERED USER



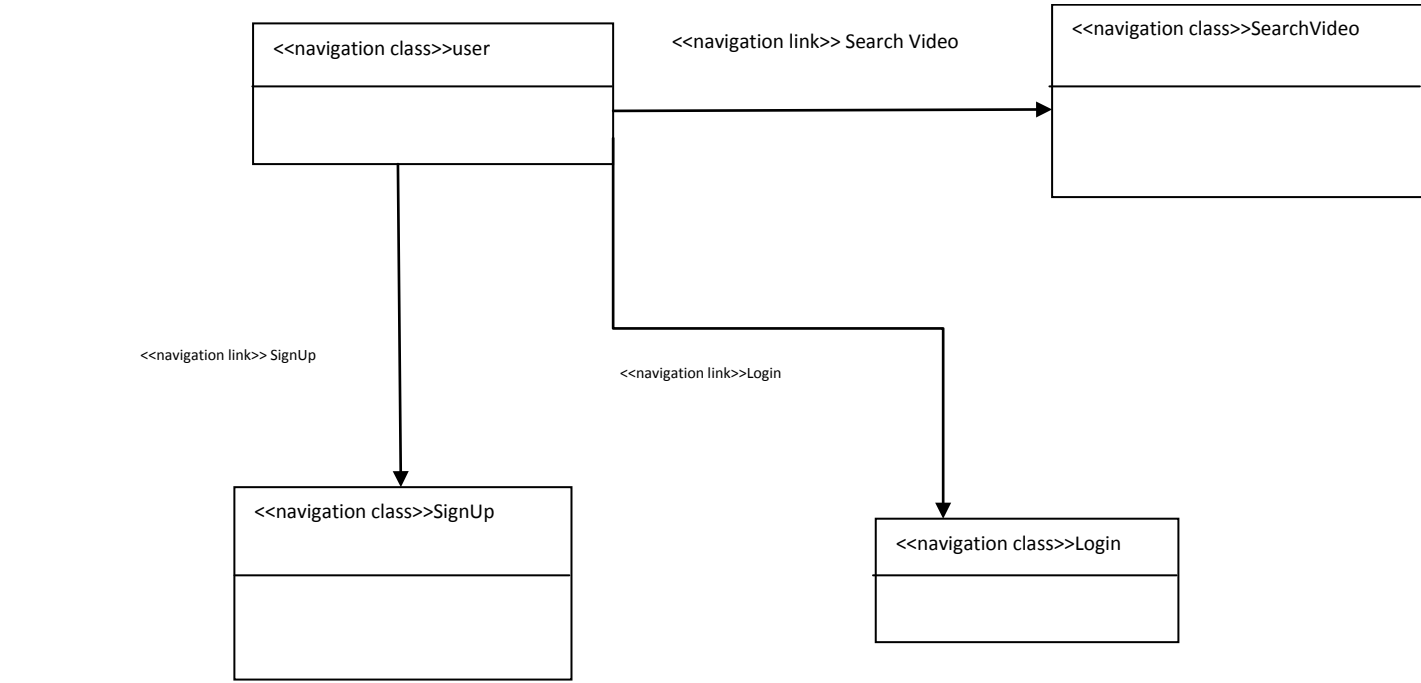
UNREGISTERED USER



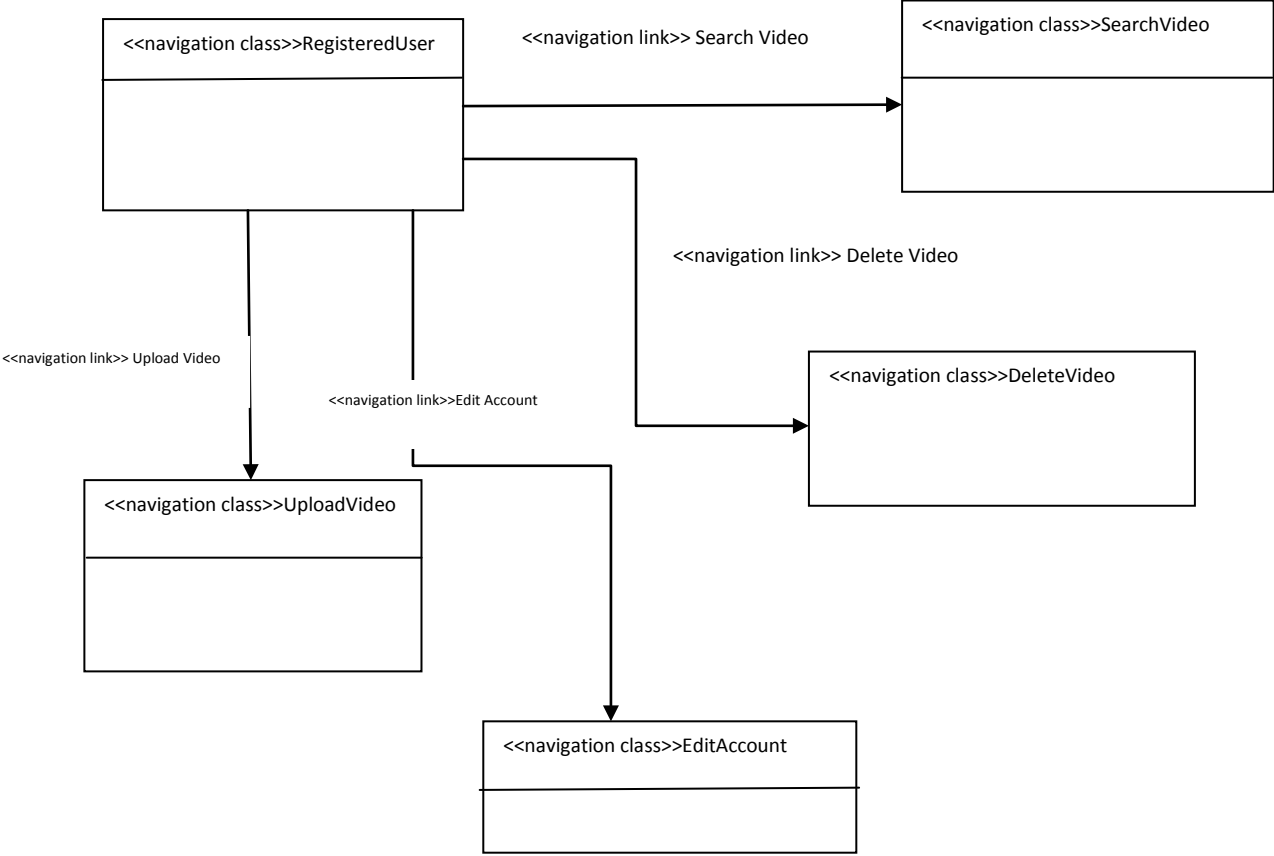
NAVIGATIONAL MODEL

THE NAVIGATIONAL MODEL DESCRIBES THE NAVIGATION BETWEEN PAGES.

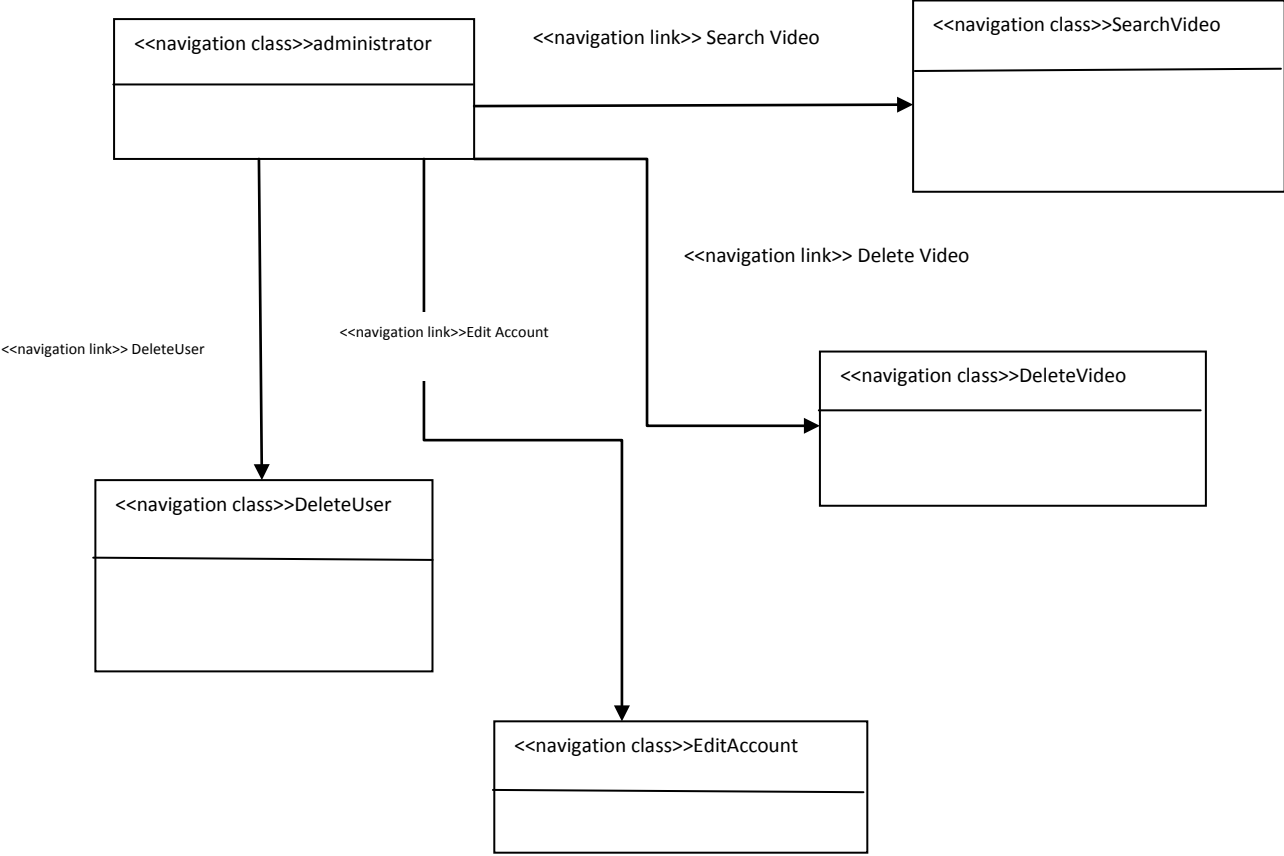
USER



REGISTERED USER

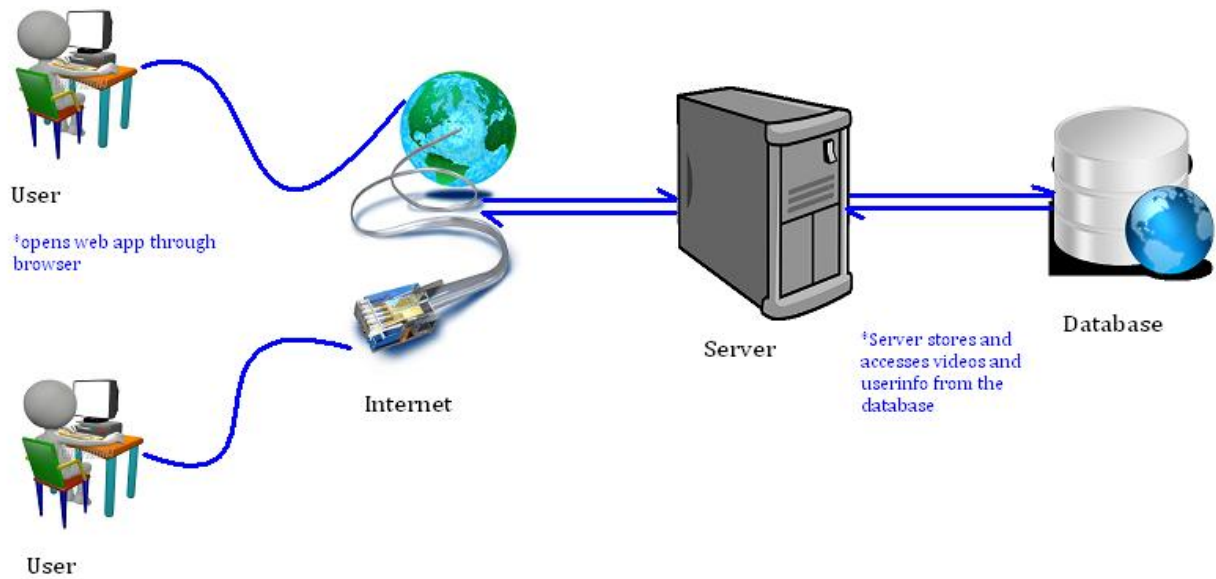


ADMINISTRATOR



11. DEPLOYMENT VIEW

Given Below is the deployment view of the project.



Chapter 1: Introduction

1.1. INTRODUCTION:

Textual Content Based Video Indexing and Retrieval is the labeling of an object in video based on its textual content which help us in classifying the item and helps the user in its search.

It also helps in the later retrieval of the information as once the tags have been given its easy to identify videos having certain characteristics. Currently the bulk of video classification and segmentation is being done manually by users or operators. The classification of the videos is based on their titles and tags already allotted to them by the users and these tags may not reflect the content of the video completely and there may be certain events in the video for which no tags are present. Internet search engines search for the videos by incorporating their title, description and tags only. So for efficient and meaningful search these tags must truly reflect the video content and must be comprehensive.

This problem can be solved using an automated **Textual Content Based Video Indexing** system. This system can classify and index the videos based on the text appearing in the videos. This text appears in many forms, such as the ticker text in news and cricket videos, information in music videos etc. The system detects the text appearing in the video frame, separate individual letters from the text areas in the frames, and use OCR (Optical Character Recognition) for the recognition of the character. This character can be saved in a database. The database can be searched for the video containing a specific word. The database can then return the video title and the time/frame no that contains the word.

Video tagging is the labeling of a video according to certain events in the video or its contents. It helps in the efficient search, classification and segmentation of videos. The content of the video utilized in the project is the ticker text running in news and cricket videos. Currently the bulk of video classification and segmentation is being done manually by users or operators and this is based only on the titles and tag already allotted to the videos. There may be certain events in the video for which no tags are present. Internet search engines search for the videos by incorporating their title, description or tags only So, for efficient and meaningful search these tags for a video must be comprehensive. Also, the video searching is not based on the inner video content for e.g. identifying text in the videos and then incorporating this feature into the search engine. To solve these problems, automated software for video tagging is developed based on the recognition of ticker text in the videos. The video tagging requires first that the text in videos should be detected. Once the text areas in the video

frames have been detected, they are segmented into letters. These letters are then passed through a character recognition mechanism where the letters are recognized. The recognized text is saved in a database for future retrieval and searching.

1.2. BACKGROUND

1.2.1. Video Tagging

Tagging is the labeling of an object. This labeling is based on certain characteristics of the object. The object could be anything, in our case it is a video i.e. video tagging. Tagging a video describes its properties and can help in the efficient search of a particular video and classification of video. Videos are of very diverse topics related to news, sports, music, documentaries, films and many more. The amount of videos of all genres has increased exponentially with the advent of the internet. Gigabytes of new videos are uploaded on internet each day building up a huge repository of multimedia information. Due to the large number of videos being handled each day, it is very difficult

to correctly classify each video. Videos are retrieved by users by following ways :

Free Browsing and Text-based Retrieval

In Free Browsing, users can browse through the videos and find the desired video.

In Text-based Retrieval, metadata can be added during the cataloging stage of the video. This may include the title and some tags allotted to the video.

1.2.2. Text Based (Titles and Allotted Tags) Retrieval

The text based retrieval refers to the simple searching a video by its title on the internet by a user. The title can be searched in the video database and the database can then return the best matching title to the searched title. Along with the title, there are also tags allotted to the video which describes the properties of the video. Many popular video hosting websites such as YouTube or Metacafe use this feature in their search engines. The title and tags are given to the videos by the users who upload the videos themselves.

1.3. PROBLEMS ADDRESSED

Although this technique is the most popular for searching and is used by all the video hosting websites and video databases; this technique has its flaws as well. These

consist of considerable amount of time and effort required to manually annotate each video; a user or operator must watch the whole video in order to extract the required information and allot the tags; imprecision associated with the human perception of the contents being annotated; this type of retrieval is not based on the inner video content. For example if there is a news bulletin it may contain news on diverse topics. A user uploading the video might not give tags related to each of these topics and consequently each different type of news in the bulletin cannot be searched. To solve this problem, content based video retrieval is required.

To solve the problem of manually identifying, classifying, indexing and tagging the videos, content based video retrieval system can be adopted. This content can be in the form of the visual content in the videos such as color, texture, objects" shape and movement. The content based video retrieval system can help reduce the time of video indexing and retrieval by working on the visual content of the video.

One of the contents that can be utilized for this purpose is the text that appears in the video. There are many types of videos which are rich in textual content and this textual content can be utilized for tagging and classification of a video.

1.3.1. Video Tagging based on Text in Videos

As mentioned previously, the text in videos is a rich source of information, which can identify the nature of video and its genre. There are many types of videos which have text in them. This text can be used to tag a video and properly index it for future retrieval of the video. Some of these are:

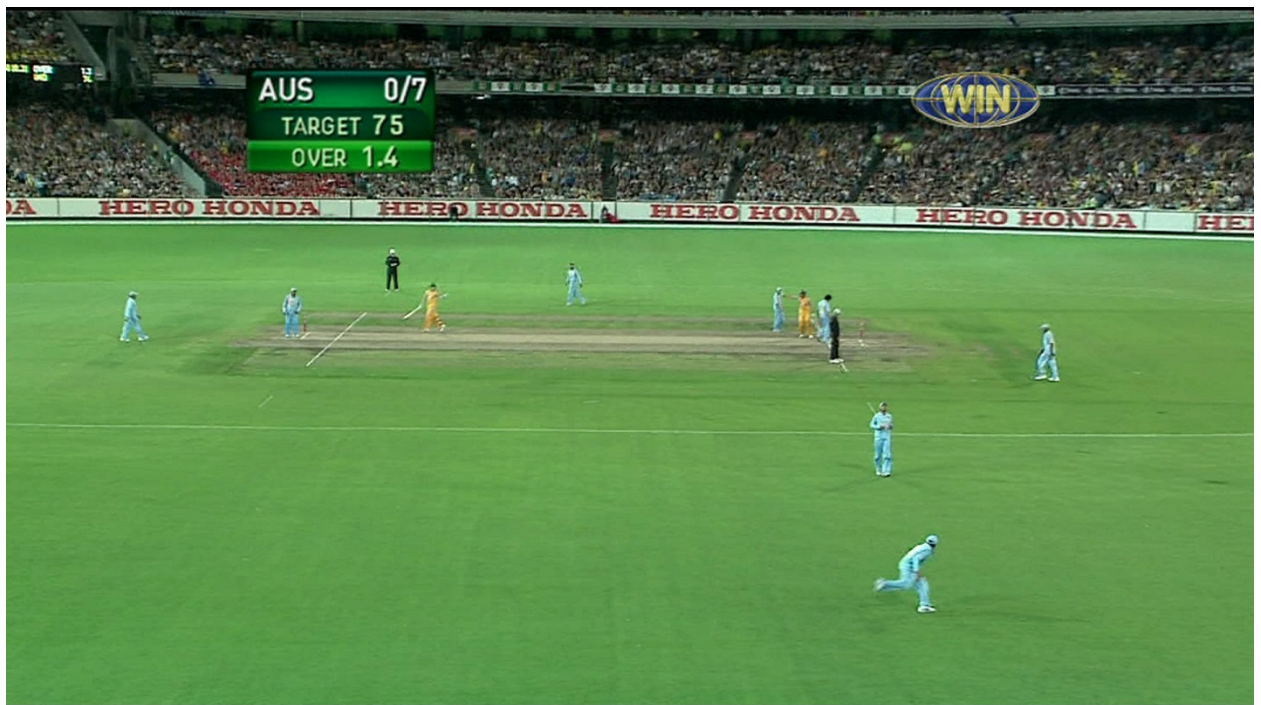
Text in News Bulletins

The text in the news strips can be used to tag the news bulletins according to the certain keywords like terrorism, corruption as shown in Figure:



Text in Cricket Match

Text in the cricket matches can be used to tag the key events like the score, boundary, dismissal or any score change. The match video can then be segmented accordingly. For example creation of highlights based on the recognized score as shown in Figure



Text in Music Videos

Text in the music videos such as artist, album or song name can be used to tag the video.



1.4. GOALS AND OBJECTIVES

The main objective of this application is to retrieve specific artificial text (as given by the user) from a video. The users will also be given an option to upload their own video on the web application.

1.4.1. ACADEMIC OBJECTIVES:

- Database
- Software Requirements
- Software Design aspects
- Image processing
- Software Quality Assurance concepts
- Web Engineering concepts
- Software Project Management

1.4.2. END GOAL OBJECTIVES:

The main objective is to build a system that indexes a video file based on the actual textual content (artificial text) and retrieval of the video from the database based on the text retrieved.

1.5. DELIVERABLES:

1.5.1. Development Process:

Standard development method will be used:

- Requirements will be gathered first and analyzed properly resulting in the Software Requirements Specification Document
- System Architecture Design will be made available for the 'User Reviews'
- System Detailed Design will be developed for the major components of the system and classes
- At this stage, Project will enter into the Development(Coding) phase, where the unit, integration, regression and system testing will being applied along the development
- Passing the project through the Quality Assurance, project will be released with all the promised deliverables

1.5.2. Document Deliverables:

- Requirement document -Software Requirements Specification.
- Architectural Design
- Detailed Design
- Coding and development
- Testing (Report with test cases and analyzed result)
- Improving and maintaining the system.

2. Chapter 2: Literature Review

2.1. Previous and latest work done on problem domain:

Various methods and techniques have been presented, which allow to query big databases with multimedia contents (images, videos etc.) using features extracted by low level image processing methods and distance functions which have been designed to resemble human visual perception as closely as possible. Nevertheless, query results returned by these systems do not always match the results desired by a human user. This is largely due to the lack of semantic information in these systems. Systems trying to extract semantic information from low level features have already been presented, but they are error prone and very much depend on large databases of pre-defined semantic concepts and their low level representation.

Another method to add more semantics to the query process is relevance feedback, which uses interactive user feedback to steer the query process.

The first algorithms, introduced by the document processing community for the extraction of text from colored journal images and web pages, segmented characters before grouping them to words and lines. Jain et al performs a color space reduction followed by color segmentation and spatial regrouping to detect text. Although processing of touching characters is considered by the authors, the segmentation phase presents major problems in the case of low quality documents, especially video sequences.

A similar approach, which gives impressive results on text with large fonts, has been presented by Lienhart .

A segmentation algorithm and regrouping algorithm is combined with a filter detecting high local contrast, which results in a method which is more adapted to text of low quality, but still the author cannot demonstrate the applicability of his algorithm to small text. False alarms are removed by texture analysis, and tracking is performed on character level. Similar methods working on color clustering and regrouping of components have been presented by Zhou and Lopresti and by Sobottka, Bunke et al.

2.2. Papers and reviews/surveys

Related documents read for studying problem domain:

**Extraction and Recognition of Artificial Text in Multimedia Documents by
Christian Wolf and Jean-Michel Jolion, RFV RR-2002.01, Laboratoire
Reconnaissance de Formes et Vision, FRANCE**

2.3. SUMMARY

The concept of text detection, extraction and identification is mainly introduced in this paper. This approach involves of five steps.

- Text detection
- Text tracking
- Multiple frame integration
- Binarization
- OCR

2.4. CONCLUSION

Results of proposed methodology clearly show that the above method is better than the previous methodologies proposed by others.

2.4.1. Conclusion for project after reading paper:

After reading this research paper, the group members were convinced in keeping this methodology as a reference baseline while developing the project.

2.5. TECHNOLOGICAL REQUIREMENTS:

2.5.1. HARDWARE REQUIREMENTS:

The Textual Content Based Video Indexing and Retrieval software will be able to run smoothly on the following minimum hardware requirements.

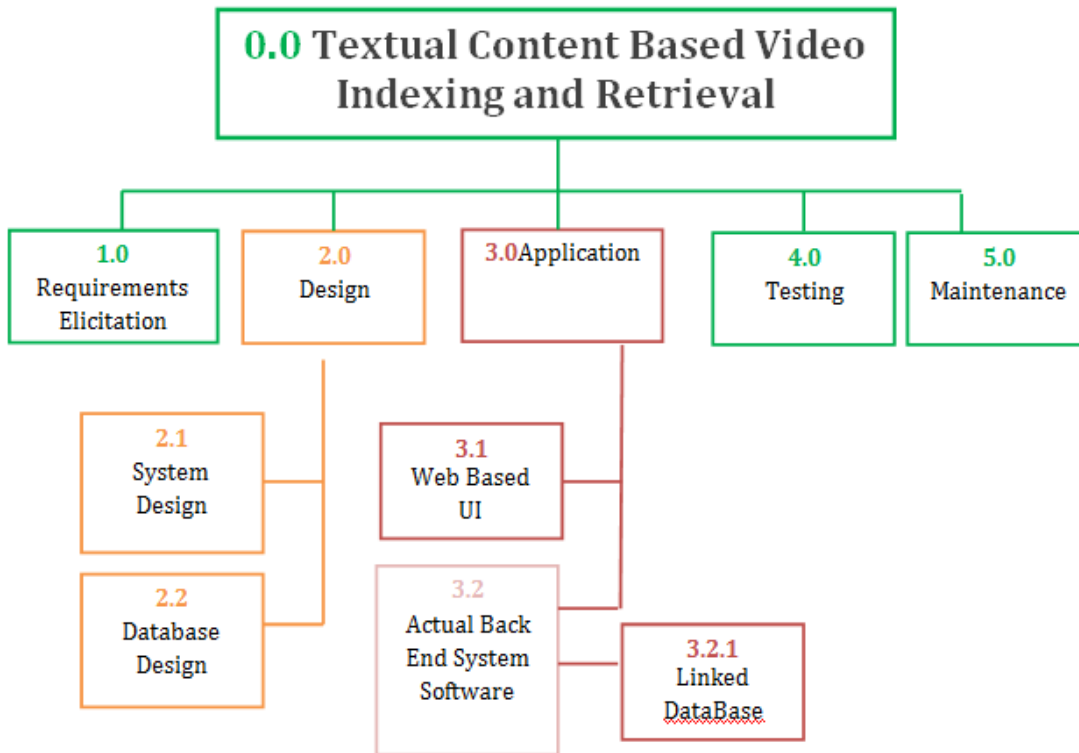
- **Core Workstation:** Software will be uploaded on dedicated server.
- **Customer peripherals:** The PCs, PDAs, and smart phones used by users to communicate with the Textual Content Based Video Indexing and Retrieval software over the Internet using a web interface.
- **Internet:** The global network used for communication

2.5.2. SOFTWARE REQUIREMENTS:

- **DotNet framework 3.5**
DotNet framework is used for development and our application is in C# and ASP.NET.
- **Windows XP,Vista,Windows 7**

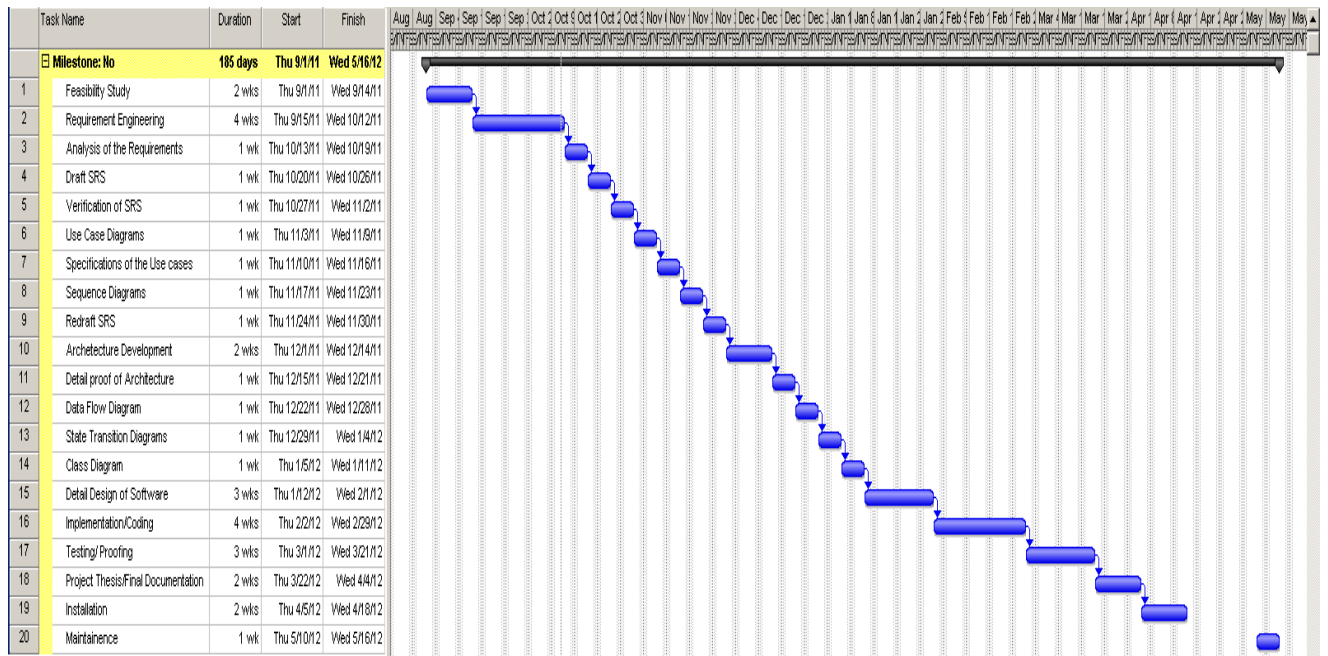
All the upper applications are window based so we are using and making our application compatible to these windows versions.

2.6. WORK BREAKDOWN STRUCTURE:



2.7. PROJECT PLAN

2.7.1. Timeline:



2.7.2. Milestones:

- Completion of 1st milestone : SRS
- Completion of 2nd milestone: Detailed Design
- Completion of 3rd milestone: Implementation
- Completion of 4th milestone: Testing and Installation

2.7.3. Task Distribution:

Task Name	Altan	Asmat	Asad
Feasibility Study			yes
Requirement Engineering	yes	yes	yes
Analysis of the Requirements		yes	yes
Draft SRS	yes		
Use Case Diagrams	yes		
Specifications of the Use cases	yes		
Sequence Diagrams			yes
Redraft SRS	Yes	yes	
Architecture Development	Yes	Yes	Yes
Detail proof of Architecture	Yes	Yes	yes
Data Flow Diagram			yes
State Transition Diagrams		yes	
Class Diagram	yes	yes	yes
Detail Design of Software	yes	yes	yes
Implementation/Coding	Yes	yes	
Testing/ Proofing	yes		yes
Project Thesis/Final Documentation	Yes		yes
Installation		yes	
Maintenance	Yes	Yes	yes

Chapter 3: System Requirements Specification

Software Requirements Specification

For

Textual Based Video Indexing And Retrieval

Version 1.0

Prepared by:

**Syed Altan Haider
Sardar Asad
Asmat Jamal**

**BESE 14
Computer Science Department
Military College of Signals-NUST**

October 14th, 2011

TABLE OF CONTENTS

1. Introduction	50
1.1. Purpose	50
1.2. Document Conventions	50
1.3. Intended Audience and Reading Suggestions	51
1.4. Project Scope	52
1.5. References	52
2. Overall Description	52
2.1. Product Perspective	52
2.2. Product Features	52
2.3. User Classes and Characteristics	53
2.4. Operating Environment	55
2.5.1 Design and Implementation Constraints	55
2.6. User Documentation	57
2.7. Assumptions and Dependencies	57
3. System Features	58
3.1. Use Case: Login	58
3.2. Use Case: Upload video	59
3.3. Use Case: Video selection from search results	60
3.4. Use Case: Video Search	61
3.5. Use Case: Signup	62
3.6. Use Case: Video selection from profile	63
4. External Interface Requirements	64
4.1. User Interfaces	64
4.2. Hardware Interfaces	64
4.3. Software Interfaces	64
4.4. Communications Interfaces	64
1. Nonfunctional Requirements	64
6.1. Performance Requirements	64
6.2. Safety Requirements	65
6.3. Security Requirements	65
6.4. Software Quality Attributes	66



1. Introduction

The section introduces the Software Requirements Specification for the Textual Content Based Video Indexing and Retrieval to its readers.

1.1. Purpose

The Purpose of this SRS of the Video Indexing are to provide a system overview of the Software including

- Definition of project
- Goals of project
- Objectives of project
- Context of product
- Major issues for developers

And to specify the:

- Functional requirements.
- Non functional requirements.
- Quality requirements.
- Constraints.

1.2. Document Conventions

This section describes the standards followed while writing this document.

1.2.1. Headings:

Heading are prioritized in a numbered fashion, the highest priority heading having a single digit and subsequent headings having more numbers, according to their level

All of the main headings are titled as follows: single digit number followed by a dot and the name of the section. All bold Times New Roman, size 18.

All second level sub headings for every sub section have the same number as their respective main heading, followed by one dot and subsequent sub heading number followed by name of the sub section. All bold Times New Roman, size 14.

Further sub headings, i.e. level three and above, follow the same rules as above for numbering and naming, but different for font. All bold Times New Roman, size 12.

1.2.2. Bullets and numbering:

Bullets have been given where there is no need for prioritizing a list. For example the list of use cases, where uses cases may appear in any order.

Numbered lists are normally used for prioritizing purposes. Prioritizing purposes arise when the customer has specified a specific order for the requirements or when a need for prioritizing arises due to business needs. For example, in a use case example, the steps the external may perform, are listed in a numbered fashion. Also when specifying the organization of intended audiences, the people in need of reading the SRS are listed first, and so on.

1.2.3. Figures:

All figures in this document have captions, but no figure numbers. Context and flow diagrams are based on UML standards.

1.2.4. Reference:

All references to headings in this document are provided where necessary, however where not present, the meaning is self explanatory. All ambiguous terms have been clarified in the glossary at the end of this document.

1.2.5. Links to web pages:

All links have been provided with underlined font, the title of the web page or ebook is written at the top of the link and the title may be searched on Google to pinpoint to the exact address.

1.2.6. Acronyms:

All acronyms have been explained at the glossary at the end of this document.

1.2.7. Basic Text:

All other basic text appears in regular, size 12 Times New Roman. Every paragraph explains one type of idea.

1.3. Intended Audience and Reading Suggestions

Audience for this SRS template is:

- Supervisors
- Project team members for further consultation for designing, development and other stages.
- Project Coordinator
- Faculty Members of respected evaluation panel
- Others include the people who will use this system i.e. customers like stock market analyzers and other stakeholders.

1.3.1. Reading suggestions:

The SRS begins with the title and table of contents. All level 1 and level 2 headings are given in the table of contents, but the lower sub headings are not included. Each main heading is succeeded by a number of sub headings, which are all in bold format. The product overview is given at the start, succeeded by the complete detailed features, including both functional and non functional requirements. The entire interfaces are also described. The SRS ends with a bunch of appendices, including a glossary.

1.4. Project Scope

The product to be developed is the software side for Textual Content Based Video Indexing and Retrieval.

1.4.1. Product Objective:

The product to be built is a WEB-BASED VIDEO INDEXING AND RETRIEVAL ON THE BASIS OF ITS TEXTUAL CONTENT. As clear from the name, the main objectives of this project is to build a system that process a video file, detecting , extracting and then identifying the text, and then storing the video in an internet database on the basis of the text present, retrieved, in the video file. The video processing will be done when a user uploads a file in the database and then the video is stored in the database on the basis of the text retrieved form the video and the users will be able to view the video part that has the text, starting from the text appearance till the appearance ends. The user can also view the whole video.

1.5. References

1.5.1. IEEE Computer Society Conventions:

- **Use Case Modeling Guidelines**, which documents the guidelines used to develop the use case model specifying the functional requirements in this specification.
http://ieeexplore.ieee.org/xpl/freeabs_all.jsp?arnumber=787548
- **System Requirements Specification Content and Format Standard**, which specifies the content and format of this specification.
http://ieeexplore.ieee.org/xpl/freeabs_all.jsp?tp=&isnumber=15571&arnumber=720574&punumber=5841
- **System Requirements Specification Template**, which provides the skeleton for this specification.
http://ieeexplore.ieee.org/xpl/freeabs_all.jsp?tp=&isnumber=16016&arnumber=741940&punumber=5982

2. Overall Description

2.1. Product Perspective

This project identifies the process of video indexing and its retrieval on the basis textual content present inside the video. This helps in efficient search, classification and segmentation of videos in large database, where video files will be saved with the help of this kind of intelligent system. This is more efficient video storage system in databases, where videos are stored on the basis of the titles and tags given by the user. This process is will be done on the artificial text only. This product will be of great help for large databases like Youtube, Google, and Yahoo etc. and will also have one great usage for TV monitoring of new channels.

2.2. Product Features

This product will have the following features:

End User	Software Back End
<p>1. Providing the users an interface for uploading their own videos. The software should be able to provide a platform where the user can upload a video file.</p>	<p>2. Indexing the video file. The video in the database will be indexed by the software. This indexed video will now be stored to database dedicated to storing indexed videos.</p>
<p>3. Giving the user the facility to enter a search query in textual form. After the time taken to index the video, the user should be able to enter the required search term in the form of text.</p>	<p>4. Search the indexed video database for the entered query. At the back end, the software will be able to search for the required text in the indexed video which the user uploaded. The video will be available in the indexed database.</p>
<p>5. Providing the output to the user. The software will provide the frame which contains the search term as an output.</p>	<p>6. Find the frame number and time associated with the final frame in the indexed video. The output frame will be searched in the uploaded video. It will be the one having a matching frame number and time slot with the final searched frame in the index video.</p>

2.3. User Classes and Characteristics

2.3.1. Summary of User Classes

The Textual Content Based Video Indexing and Retrieval software will have a single user class, i.e. the end user. The capabilities of the end user class along with a brief summary are given below.

2.3.2. The End User Class

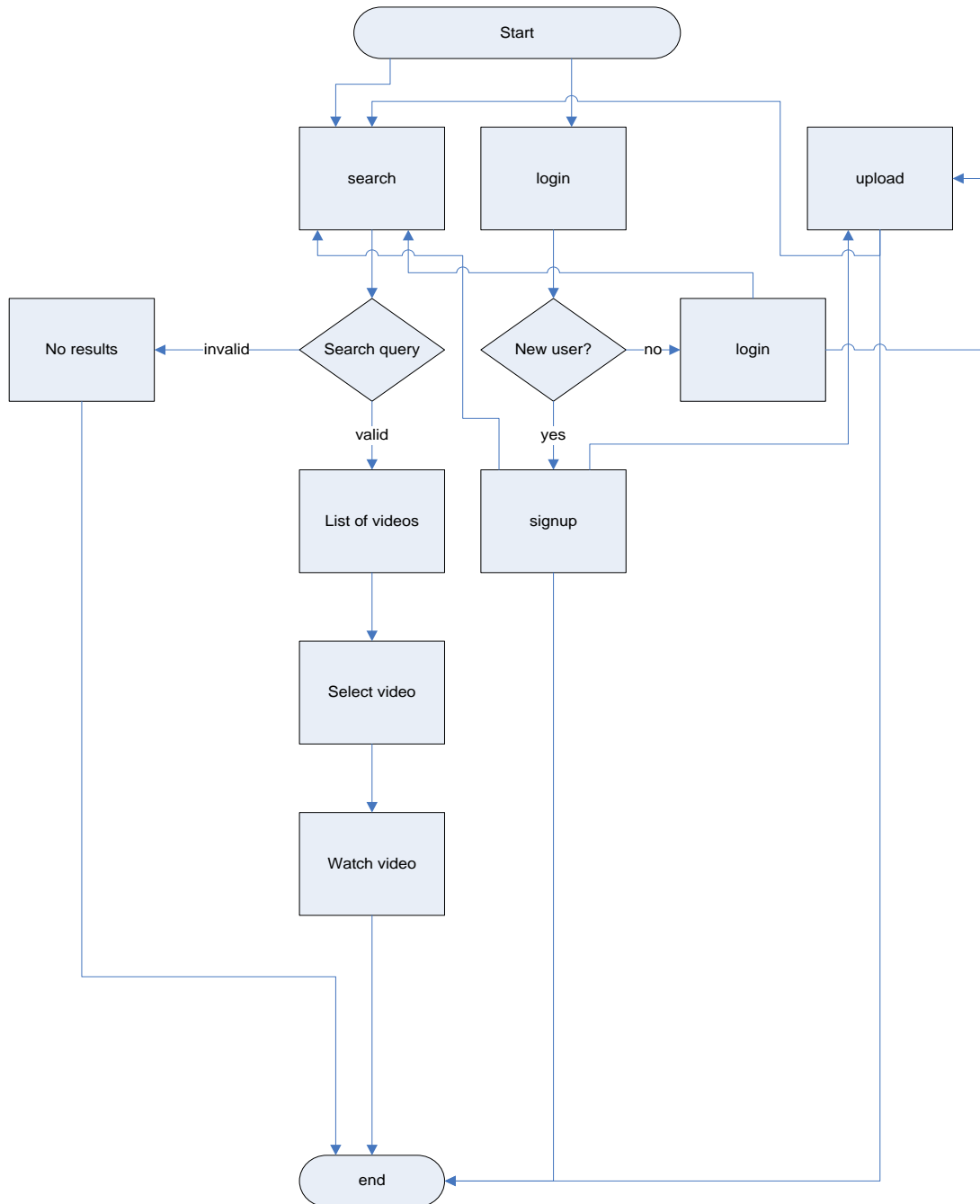
The end user will be the average computer user which means that the user will have basic computer knowledge. Thus, the fact that end users have the ability to use simple application software is assumed.

Following are the capabilities that the Textual Content Based Video Indexing and Retrieval software provides to the end user.

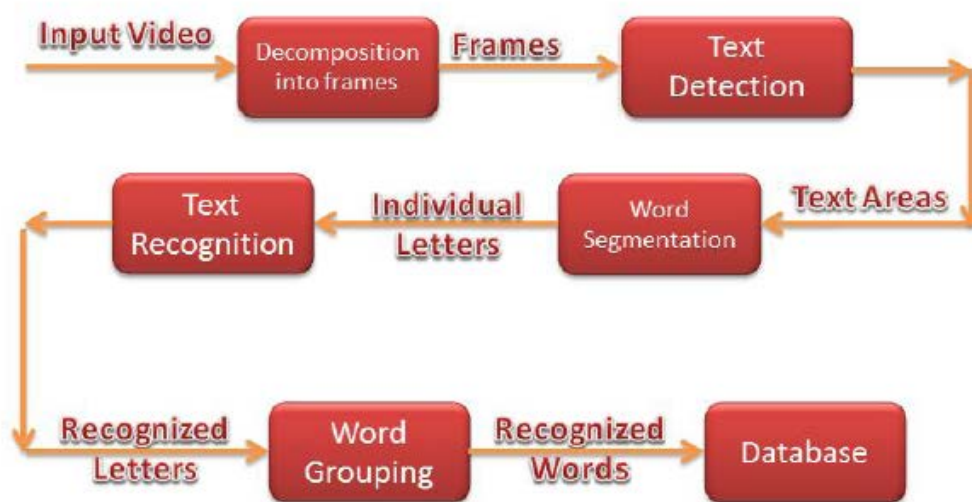
- Allowing the end users to upload their video files to a database.
- The utility to search the database for already stored videos.

- The end user will be able to search the video files for the respective frame with the help of a search facility in the form of next and previous buttons.

SYSTEM FLOWCHART



VIDEO TAGGING PROCESS FLOW:



2.4. Operating Environment

2.4.1. Hardware

The Textual Content Based Video Indexing and Retrieval software will be able to run smoothly on the following minimum hardware requirements.

- **Core Workstation:** Software will be uploaded on dedicated server.
- **Customer peripherals:** The PCs, PDAs, and smart phones used by users to communicate with the Textual Content Based Video Indexing and Retrieval software over the Internet using a web interface.
- **Internet:** The global network used for communication.

2.4.2. Software

The Textual Content Based Video Indexing and Retrieval software will operate with the following software:

2.4.2.1. Operating System: It will be hosted on sever which supports Asp.Net and SQL Server 2008 R2.

2.4.2.2. Browser: The software web application which will run on personal computers of the end users. This would allow them to communicate over the internet with the Textual Content Based Video Indexing and Retrieval software. The browser version will have to be at least IE6, Mozilla Firefox 2 and equivalent Opera/Chrome versions.

2.5.1 Design and Implementation Constraints

2.5.1 Business Rules

1. The video should be of good quality. This means it should not have pixilation and ghosting in it.
2. The software will not be able to process real time video.
3. A self designed Textual Content Based Video Indexing and Retrieval software logo will be displayed in the GUI.

4. A proprietary OCR will be used.

2.5.2 Data and Content Constraints

1. The text portion in the video must have high contrast difference with its background.
2. The system will be using a .Net framework(C#, Asp.net 3.5, SQL Server 2008 R2)
3. The text will be at most as big as the detection rectangle's threshold.
4. The search terms can only be in text.

2.5.3 Hardware Constraints

- **Core Workstation:** Software will be uploaded on dedicated server.
- **Customer peripherals:** The PCs, PDAs, and smart phones used by users to communicate with the Textual Content Based Video Indexing and Retrieval software over the Internet using a web interface.
- **Internet:** The global network used for communication.

2.5.4 Software Constraints

The software should be compatible with SQL Server Database.

2.5.5. High-Level Languages

The subsection documents all required design constraints associated with the use of high-level programming languages.

- Application software shall be written in C# and ASP.NET.
- Databases will be designed on SQL Server 2008 R2.
- The design will follow an Object Oriented approach.

2.5.6 Industry Standards

1. The subsection documents all required design constraints associated with industry standards.
2. The system shall conform to ISO 10646 (Unicode UTF-8) and ISO 10646-1 (Unicode UTF-16) standards for character set encoding.
 - www.unicode.org
 - <ftp.informatik.uni-erlangen.de/pub/doc/ISO/charsets/ISO-10646-UTF-8.html>
 - <ftp.informatik.uni-erlangen.de/pub/doc/ISO/charsets/ISO-10646-UTF-16.html>
3. The system shall conform to ISO639-1 Languages, codes for the representation of languages.
 - http://sunsite.berkeley.edu/amher/iso_639.html
4. The system shall conform to ISO 8601, representation of dates and times.
 - www.state.ak.us/local/akpages/ADMIN/info/iso8601.htm
5. The system shall conform to E.123: Notation for national and international telephone numbers, e-mail addresses and Web addresses

- <http://www.itu.int/rec/T-REC-E.123-200102-I/e>

2.5.7 Legal and Regulatory Constraints

The subsection documents all required design constraints associated with legal and regulatory constraints.

- Government of Pakistan Cyber Crime Ordinance 2007 is applicable to the Textual Based Video Indexing and Retrieval software.

[http://202.83.164.26/wps/wcm/connect/1b1e72004839100eb710bf1dad1f3d5a/Page.pdf?MOD=AJPERES&CACHEID=1b1e72004839100eb710bf1dad1f3d5a&CACHEID=1b1e72004839100eb710bf1dad1f3d5a&CACHEID=1b1e72004839100eb710bf1dad1f3d5a&CACHEID=1b1e72004839100eb710bf1dad1f3d5a&CACHEID=1b1e72004839100eb710bf1dad1f3d5a&CACHEID=1b1e72004839100eb710bf1dad1f3d5a&CACHEID=1b1e72004839100eb710bf1dad1f3d5a&CACHEID=1b1e72004839100eb710bf1dad1f3d5a&CACHEID=1b1e72004839100eb710bf1dad1f3d5a&CACHEID=1b1e72004839100eb710bf1dad1f3d5a&CACHEID=1b1e72004839100eb710bf1dad1f3d5a&CACHEID=1b1e72004839100eb710bf1dad1f3d5a&CACHEID=1b1e72004839100eb710bf1dad1f3d5a&CACHEID=1b1e72004839100eb710bf1dad1f3d5a&CACHEID=1b1e72004839100eb710bf1dad1f3d5a](http://202.83.164.26/wps/wcm/connect/1b1e72004839100eb710bf1dad1f3d5a/Page.pdf?MOD=AJPERES&CACHEID=1b1e72004839100eb710bf1dad1f3d5a&CACHEID=1b1e72004839100eb710bf1dad1f3d5a&CACHEID=1b1e72004839100eb710bf1dad1f3d5a&CACHEID=1b1e72004839100eb710bf1dad1f3d5a&CACHEID=1b1e72004839100eb710bf1dad1f3d5a&CACHEID=1b1e72004839100eb710bf1dad1f3d5a&CACHEID=1b1e72004839100eb710bf1dad1f3d5a&CACHEID=1b1e72004839100eb710bf1dad1f3d5a&CACHEID=1b1e72004839100eb710bf1dad1f3d5a&CACHEID=1b1e72004839100eb710bf1dad1f3d5a&CACHEID=1b1e72004839100eb710bf1dad1f3d5a)

2.6 User Documentation

A few documents shall be delivered along with the software:

- A Guide which will help the installation process.
- Usage manuals with pictures and text for using the software.
- A Help manual for helping the user to remove bugs and problems.
- A FAQ (Frequently Asked Questions) document.
- Product Requirements Specifications.
- Product Design Specifications.

2.7 Assumptions and Dependencies

The group is obliged to state the following assumptions while making this SRS

2.7.1 Product Quality level

The product is only intended to serve as a model for future versions of the Textual Based Video Indexing and Retrieval software. With a few tweaks, however, it is intended to be deployed in the actual working environment but it would only feature subsets of the functions envisioned by the team.

2.7.2 Product features limitation

Scene text will not be processed; hence only artificial text will be searched for.

2.7.3 Testing and debugging

It will be a topmost priority of the group to deliver the product within the best quality standards that can be achieved within the limited skill level and the budget that the group possesses. There is still a possibility that higher level bugs might appear at a later stage of implementation after the testing phase is over.

2.7.4 User Manuals

The group shall provide an expansive user manual to the customer who will explain the working of the Textual Content Based Video Indexing and Retrieval software and will provide help on the most common features such as installation, basic usage and most frequent errors. A Frequently Asked Questions document will also be provided.

2.7.5 Hardware and software platforms

The software shall be developed on dedicated server which support the product programming language and database.

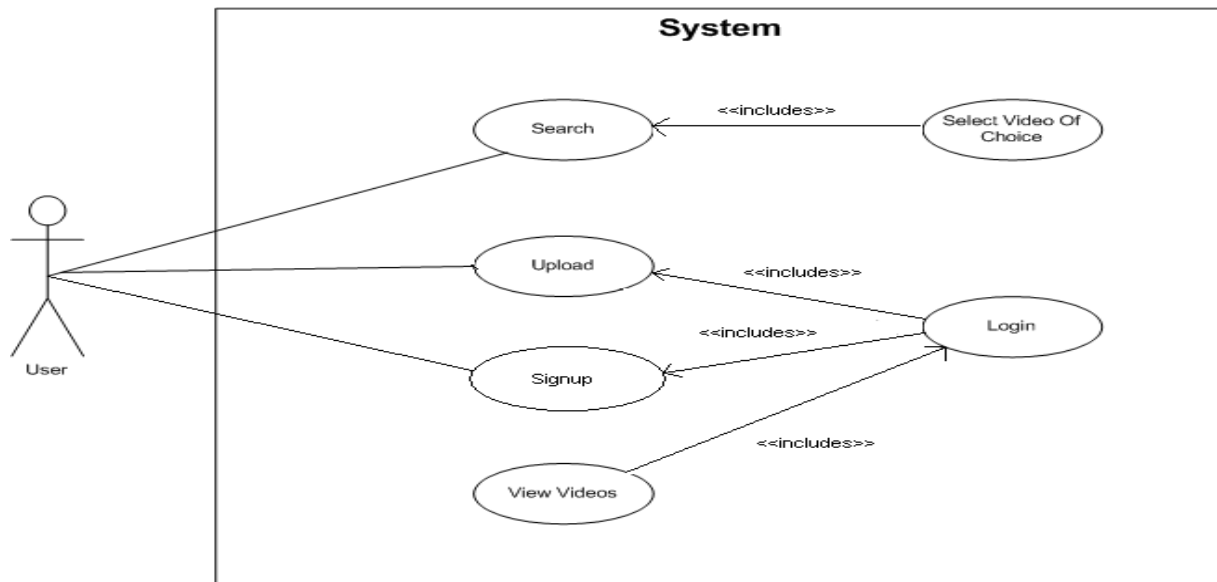
3. System Features

This section describes in detail the system features of the Textual Content Based Video Indexing and Retrieval. System features are classified by use cases. The use cases are classified on the basis of the prime features that the website system provides to the user. The diagram below shows the use cases and their interaction

USE CASES:

The following are the list of use cases for the software.

- User login (authentication)
- Video search
- Video selection from search result.
- Video uploading
- Signup
- Video selection from user profile



3.1. Use Case: Login

Use Case Requirement

The Software enables End user to log in to the system with a username and password:

Business Justification

- The End user can be under check, and security loopholes are minimized

Use Case Paths

- Normal:
 - EU authenticates himself
- Exceptional:
 - EU is unable to authenticate

3.1.1. Normal Path: EU authenticates himself

Externals

- End User

Preconditions

- The Software is up and running, ready to take username and password

Interactions

1. The EU inputs username and password in their respective fields and presses enter key, or an appropriate button.
2. The Software shall authenticate the EU after checking the username and password.

Post conditions

- The EU is displayed the Software home screen.

Categorization

- **Frequency:** High (Daily)
- **Criticality:** High
- **Probability of Defects:** Medium
- **Risk:** High

3.1.2. Exceptional path: EU is unable to authenticate himself

Externals

- End User

Preconditions

- The software is up and running, ready to take username and password

Interactions

1. The EU inputs username and password in their respective fields and presses enter key, or an appropriate button.
2. The Software shall not authenticate EU due to incorrect username and/or password.

Post conditions

- The EU is displayed the log in screen again with error message “wrong username/password, please enter correct password”

Categorization

- **Frequency:** High (Daily)
- **Criticality:** High
- **Probability of Defects:** Medium
- **Risk:** High

3.2 Use Case: Upload video

Use Case Requirement

The software displays the videos in a chronologically ordered list, from where the EU selects video or upload his own video.

Business Justification

The users will be able to upload their video in the database.

Use Case Paths

- Normal:
 - EU is able to upload video.
- Exceptional:
 - EU is unable upload video.

3.2.1. Normal Path: EU is able to upload video

Externals

End User

Preconditions

The user is connected to the internet and has visited the upload page.

Interactions

1. The user opens the local drive and selects a video.

2. The user clicks the upload button to complete the upload process.

Post conditions

The selected video will be uploaded on the database.

Categorization

- **Frequency:** High (Daily)
- **Criticality:** High
- **Probability of Defects:** Medium
- **Risk:** Low

3.2.2. Exceptional Path: EU will be unable to upload his own video

Externals

End User

Preconditions

- The Software is logged in with an authenticated user and home screen is displayed

Interactions

1. The user opens the local drive and selects a video.
2. The user clicks the upload button to complete the upload process.

Post conditions

The video cannot be uploaded due to the following reason:

1. The internet connection broke down.
2. The file size is bigger, if incase there is any limit for the file size.
3. The file size is big and the uploading process is taking longer than expected, therefore, session timed out.

Categorization

- **Frequency:** Medium (Daily)
- **Criticality:** High
- **Probability of Defects:** Low
- **Risk:** High

3.3. Use Case: Video selection from search results

Use Case Requirement

After searching for specific content the software enables the user to select from a list of videos.

Business Justification

The user will be able to view the video and check, so that is the one needed

Use Case Paths

- Normal:
 - EU is able to select/view a video
- Exceptional:
 - EU is unable to select/view a video

3.3.1 Normal Path: EU is able to select/view a video

Externals

End User

Preconditions

EU has searched for specific video.

Interactions

EU clicks on a video from a list of video obtained as search result.

Post conditions

EU will be directed to the video link and will be able to see the video.

Categorization

- **Frequency:** High (Daily)
- **Criticality:** Low
- **Probability of Defects:** Low
- **Risk:** Low

3.3.2. Exceptional Path: EU is unable to select/view a video

Externals

End User

Preconditions

EU has search for a specific video.

Interactions

EU on a video from a list of video obtained as search result.

Post conditions

After clicking on a video link the user is unable to see the video because of the following reasons:

1. The video is removed.
2. The video content is restricted.
3. The internet connection is down.

Categorization

- **Frequency:** Low (Daily)
- **Criticality:** High
- **Probability of Defects:** Medium
- **Risk:** Medium

3.4 Use Case: Video Search

Use Case Requirement

EU is connected to internet and has opened the homepage.

Business Justification

- EU will be able to search for a specific video content.

Use Case Paths

- Normal:
 - EU gets search result.
- Exceptional:
 - EU is unable to get list of videos or a search result

3.4.1 Normal Path: EU gets search result

Externals

End User

Preconditions

EU has typed a search title in the search bar.

Interactions

EU enters the intended search title in the search box.

Post conditions

EU gets a list of videos.

Categorization

- **Frequency:** High (Daily)
- **Criticality:** High
- **Probability of Defects:** Low
- **Risk:** Medium

3.4.2. Exceptional Path: EU is unable to get a list of videos of a search result

Externals

End User

Preconditions

EU has typed a search title in the search bar.

Interactions

EU enters the intended search title in the search box.

Post conditions

The user is unable to get a list of videos or a search result because there is no data related to the given search title or the internet connection has gone down.

Categorization

- **Frequency:** Low (Daily)
- **Criticality:** High
- **Probability of Defects:** Low
- **Risk:** Low

3.5 Use Case: Signup

Use Case Requirement

The user does not have an account to login into the system.

Business Justification

The user will be able to search and upload videos.

Use Case Paths

- Normal:
 - EU is able to signup for an account.
- Exceptional:
 - EU is unable to sign up.

3.5.1. Normal Path: EU is able to signup for an account

Externals

End User

Preconditions

EU does not have an account to login.

Interactions

1. From the homepage the user goes to sign up page.
2. The user enters the account information.
3. The user submits the information filled and completes the signup process.

Post conditions

The user will have an account created to login into the system.

Categorization

- **Frequency:** High (Daily)
- **Criticality:** Low
- **Probability of Defects:** Low
- **Risk:** Medium

3.5.2. Exceptional Path: EU is unable to sign up

Externals

End User

Preconditions

EU does not have an account to login.

Interactions

1. From the homepage the user goes to sign up page.

2. The user enters the account information.
3. The user submits the information filled and completes the signup process.

Post conditions

The signup process cannot complete due to the following reasons:

1. The internet connection broke down.
2. The filled information is not in the required format.

Categorization

- **Frequency:** Low (Daily)
- **Criticality:** High
- **Probability of Defects:** Low
- **Risk:** Medium

3.6 Use Case: Video selection from profile

Use Case Requirement

The user has visited his/her own profile or another user's profile.

Business Justification

The user can view the video from a user profile, who upload the video.

Use Case Paths

- Normal:
 - EU is able to select/view a video
- Exceptional:
 - EU is unable to select/view a video

3.6.1. Normal Path: EU is able to select/view a video

Externals

End User

Preconditions

EU has visited a user profile.

Interactions

EU clicks on a video from a list of videos present in the user profile.

Post conditions

EU will be directed to the video link and will be able to see the video.

Categorization

- **Frequency:** High (Daily)
- **Criticality:** Low
- **Probability of Defects:** Low
- **Risk:** Low

3.6.2 Exceptional Path: EU is unable to select/view a video

Externals

End User

Preconditions

EU has visited a user profile.

Interactions

EU clicks on a video from a list of videos present in the user profile.

Post conditions

After clicking on a video link the user is unable to see the video because of the following reasons:

1. The video content is restricted.
2. The internet connection is down.

Categorization

- **Frequency:** Low (Daily)
- **Criticality:** High
- **Probability of Defects:** Medium
- **Risk:** Medium

4. External Interface Requirements

4.1 User Interfaces

The software would have one main interface Home page. Some snapshots are shown to present a general idea of how the Software would look like.

4.1.1 Login/Authentication screen: On start up of site user will see home page.

If he wishes to login to site he will see two fields, namely the username and password fields. After the EU has entered the required information and has been authenticated, then he will be able to upload his own video.

4.1.2 Website Home: This screen would include:

- Videos from database on sidebar
- Option for Login.
- Signup option.
- Search option.

4.1.2.1 Videos from database: Website sidebar contains most recent videos uploaded. EU have option to search from these videos.

4.1.2.2 Login: After login user can upload new video. After uploading new video EU will be redirected to home page.

4.1.2.3 Signup: The users can signup for a new account.

4.1.2.4 Search: The user can search for an intended by giving a search query in the search box.

4.2 Hardware Interfaces

The hardware would be dedicated server which supports Asp.Net 3.5 and SQL Server 2008 R2.

4.3 Software Interfaces

Software interfaces would require up-to-date browsers and flash player etc.

4.4 Communications Interfaces

Protocols such as FTP/HTTP are will used for this implementation of the software.

1. Nonfunctional Requirements

6.1 Performance Requirements

6.1.1 Response time

On a standard hosting machine (defined to be equivalent to Intel Core 2 Duo CPU, 2 GHz with 4 GB RAM and 32 bit Windows installed on it) the response time of the application while fetching data from the last tier (supposedly DB) must not exceed 10 sec on an average and 40 sec max.

6.1.2 Throughput

The application will response for a throughput of 250 users @ 2 queries every 3 minutes. This throughput must be tested for 3 hours contiguous at the min.

6.1.3 Concurrency

A min of 250 concurrently active named users must support the above base lined response time and throughput.

6.1.4 Reliability

- 1) Failure rate of applications must not exceed 1 in 100,000.
- 2) MTBF (mean time between failures) must be 100 hours at the min.
- 3) MTRS (mean time to restore service) must be 4 hrs max for critical, 12 hours max for major and 72 hours max for minor faults.

6.2 Safety Requirements

1. Integrity of information
2. Export / import for backups
3. Restorations of apps and data
4. Recovery of apps and data
5. Checkpoint System (snapshot of system's last state before fail and restoring system from there)

6.3 Security Requirements

- ISO/IEC 17799:2005 compliant
- The product must be secure from following viewpoint of following criteria:

Input Validation	Buffer overflow; cross-site scripting; SQL injection; canonicalization
Authentication	Network eavesdropping; brute force attacks; dictionary attacks; cookie replay; credential theft
Authorization	Elevation of privilege; disclosure of confidential data; data tampering; luring attacks
Configuration management	Unauthorized access to administration interfaces; unauthorized access to configuration stores; retrieval of clear text configuration data; lack of individual accountability; over-privileged process and service accounts
Sensitive information	Access sensitive data in storage; network eavesdropping; data tampering
Session	Session hijacking; session replay; man in the middle

management	
Parameter manipulation	Query string manipulation; form field manipulation; cookie manipulation; HTTP header manipulation
Exception management	Information disclosure; denial of service
Auditing and logging	User denies performing an operation; attacker exploits an application without trace; attacker covers his or her tracks

6.4 Software Quality Attributes

	<i>specific</i>	<i>quantitative</i>	<i>verifiable</i>
<i>adaptability</i>			✓
<i>availability</i>			✓
<i>correctness</i>		✓	
<i>flexibility</i>			✓
<i>interoperability</i>			✓
<i>usability</i>		✓	
<i>testability</i>	✓		

Appendices

Appendix A: Glossary

- **EU:** End User is the user of this service.

