

IMAGE PROCESSING – LIVE FEED

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Software Requirement Specification

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DECLARATION

I declare that this is my own work and this Software Requirement Specification entitled “IMAGE PROCESSING –LIVE FEED”, submitted to Sri Lanka Institute of Information Technology is a record of an original work done by me, under the guidance of our supervisor Ms. Shashika Lokuliyana. This document does not incorporate without acknowledgment any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of our knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgment is made in the text.

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The above candidate is carrying out research for the undergraduate Dissertation under my supervision.

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Table of Contents

List of Figures.....	5
List of Tables	6
1 Overall Descriptions	7
1.1 Product Perspective	8
1.1.1 System Interfaces	8
1.1.2 Hardware interfaces	9
1.1.3 Software Interfaces	9
1.1.4 Communication Interfaces	10
1.1.5 Memory Constrain	10
1.1.6 Operations	10
1.1.7 Site adaptation requirements	11
1.2 Product Function	11
1.2.1 Breakdown the Video feed into frames.....	11
1.2.2 Lighting Condition Method	11
1.2.3 Grayscale.....	11
1.2.4 Extract Blobs.....	11
1.2.5 Frame Differentiation.....	12
1.2.6 Notification	12
1.2.7 Process Diagram	12
1.3 User Characteristics.....	15
1.4 Constraints.....	15
1.5 Assumptions and Dependencies	15
1.5.1 Assumptions.....	16
1.5.2 Dependencies	16
1.6 Apportioning of requirements	16
2 Specific requirements	17
2.1 External interfaces	17
2.2 Classes/Objects.....	17
2.3 Performance requirements.....	17
2.4 Design constraints	17
2.5 Software system attributes	18

2.5.1 Reliability.....	18
2.5.2 Availability	18
2.5.3 Security	18
2.5.4 Maintainability	18
3 Supporting information.....	18
3.1 References	18

List of Figures

Figure 1 High-Level System Diagram (Live Feed)	7
Figure 2 Activity Diagram of the Process (Live Feed).....	12
Figure 3 Class Diagram (Live Feed).....	17

List of Tables

Table 1 Process Description (Live Feed).....	15
Table 2 Description of User Characteristic.....	15

1 Overall Descriptions

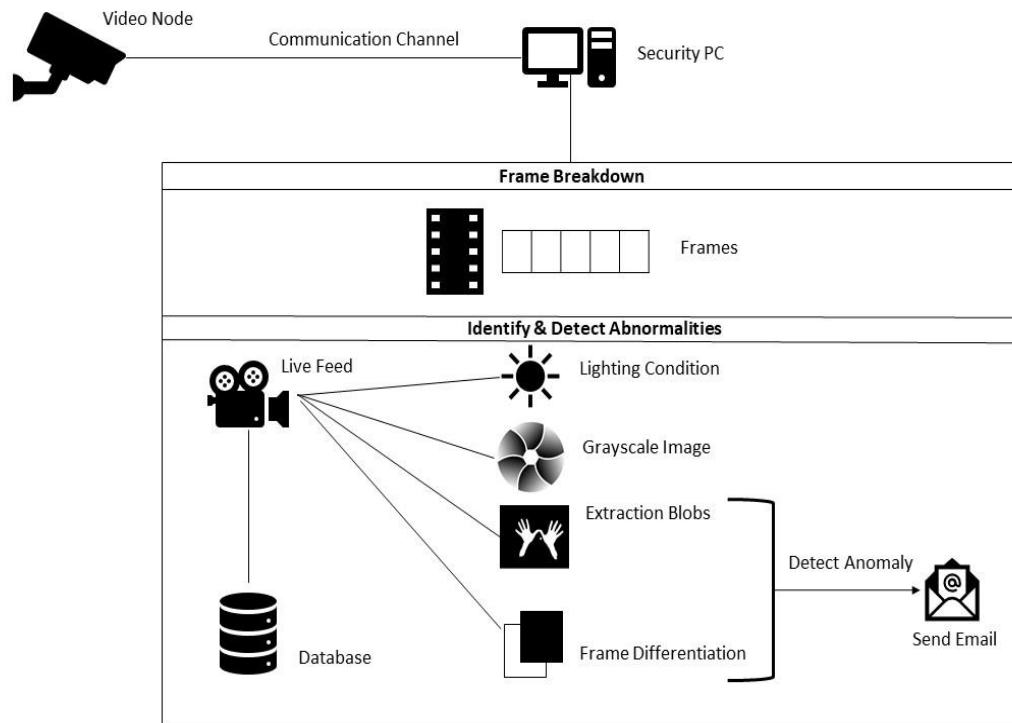


Figure 1 High-Level System Diagram (Live Feed)

The above High-Level Diagram has described the overall part of the live feed component which is considered the identifying and detection of the multiple human activities and unusual objective in real time and notify that activity by the Email[1].

The live feed process we initially get the video feed from the ATM camera and video feeds break down into the video frames as an example 15, 30 or 60fps (camera capture the x frame in a single second of video)[2]. After breakdown the frames it considers the lighting condition of the image and constantly maintain the fixed contrast ratio of the image though under the dark light condition and in additionally convert the original image to greyscale image[1]. and parallelly extract the blobs of the image which recognizes the outline of the objectives in front of the camera, when the image is dark or block its identified as an anomaly then send the Email to one person [3]. In additionally we identify the moving objects of the approach is to detect the moving objects from the difference between the existing image and the reference image in the ATM room[4]. Every function of the live feed components happens in separately.

1.1 Product Perspective

Over the years, in the Banking industry, there was no proper technology for identifying unusual human behaviors or objects in real time to notify those activities by the alert or notification. Up to now, every suspicious behavior and unusual objects are monitored manually. The banking industry, however, has been developing and conducting many experiments to increase their security and as a result, has installed multiple CCTV surveillance systems to detect anomalies that pose a threat to a bank. Nowadays, most of the banks worldwide are using facial recognition systems, biometric, motion detection systems and human or object detection systems etc. to ensure their security, but there is no proper system to identifying threats.

In our research, we are focusing on a live feed to identifying and detecting abnormal human behaviors and unusual objectives in real time to prevent threat and notify by the alert as a response. The automatic detection of abnormal human and object can be used to alert security. Abnormalities mean that which can't be seen inside ATM premises usually. The processes have to be clearly defined in the system in order to process proactively.

1.1.1 System Interfaces

The live feed components using existent video surveillance system to get the video feed and notify by the email application through API. Video surveillance system depends on the surveillance CCTV camera and its quality of the video feed. This live feed component has connected to the other components of the system. Currently, in the banking industry, they are monitoring the live feed as manually by the human and arise the problems during the monitoring such as monitoring issue and missing theft. We propose to breakdown the video feed into the frame then identify the abnormality in real time using the system feature that we going to use and send the notification via email to one person[7][8].

- Microsoft .NET and Microsoft Expression Encoder 4
- Microsoft Web Platform
- Microsoft Outlook/ Gmail

1.1.2 Hardware interfaces

Live Video feed is captured using the camera module which is important in capturing quality images to achieve a higher accuracy in vulnerability scanning process and graphical User interface to monitor the selected vulnerable frames by the security officer.

- Camera
- Monitor

1.1.3 Software Interfaces

- Visual Studio - is a powerful IDE that ensures the quality code throughout the life cycle of the application, from design to implementation. To implement the feature extraction and human and object identification application, Visual Studio will be used. It provides all the facilities and features needed for developers, as well as an easy-to-use programming environment.
- MSSQL - is a secure and reliable platform to protect data and build compliance solutions. Compliance with regulatory legislation often affects the way in which data is stored and how it is accessed. MSSQL will provide all the facilities and features necessary to implement the database of the abnormal object identification application.
- MATLAB - is a numerical computing environment with multiple paradigms. MATLAB allows matrix manipulations, tracing of functions and data, implementation of algorithms with C #.
- EmguCV (OpenCV) - is a cross-platform. Net wrapper to the OpenCV image processing library. Allow OpenCV functions to be called from .Net. Supported languages The OpenCV features will be used to compare the images and differentiate the 2D images from 3D[9].
- Draw.io - is a completely free online diagram editor built around Google Drive (TM), which allows you to create the flow diagram, use case diagrams, class diagrams and activity diagrams, etc.
- Microsoft PowerPoint - To design presentation slides and diagrams (High-level diagram) we use Microsoft PowerPoint. We must present the status of the project. Progress and whatever the project comes, to those interested (Project Supervisor and Lecturer in charge).

1.1.4 Communication Interfaces

video surveillance cameras are digitized to capture images in real time and have been improved to integrate into modern society for the centralized intelligent video surveillance system.

Connections between cameras and users are maintained through web-based services on the Internet as a server and a client, respectively[10].

1.1.5 Memory Constrain

For a better performance in order to implement and run this system efficiently a specific much of RAM space and Memory space is required the system storage has several memories such as volatile and nonvolatile memories. The minimum ram requirement of the system is 4GB.Storage memory (nonvolatile memory) 10 GB. hence, it's a great advantage. this purposed system could be run on a machine composed of standard PC requirements which come along with a machine.

1.1.6 Operations

Windows OS, External software, and the application need to be installed properly on the PC.

User & system has to perform following set of actions to interact with Comparison of knowledge in the anomaly detection component of the live feed. The basic idea is listed below:

- The user should have to perform the ATM process without any abnormal behavior and unusual objects or else the system has to detect.
- 5s duration video clip -> process it frames wise.
- The system will identify different shapes from the image.
- And among them, the system will recognize the abnormal behavior and objects.

After understanding the scope and the project solution steps, and the challenges are identified as:

The first challenge is to recognize the abnormal behavior and object through image processing of individual frames of the real-time video from the CCTV camera. The key challenges of this project are to recognize the abnormal human and object through the real-time video capture and simulate appropriate functionality. Overcoming various factors like frame rate, frame size, resolution, background environment, physical characteristics of the abnormal human and object. Find the most suitable algorithm to reflect abnormal human and object identification and

detection actions and coordinates efficiently. Select the appropriate development methodology that is more suitable for this type of application, to reduce the risk of errors within the system. Testing the system under three levels namely unit testing, integration testing and system testing.

1.1.7 Site adaptation requirements

The system must first connect to the Internet to retrieve the CCTV video node from ATM premises CCTV.

1.2 Product Function

This Software Requirement Specification(SRS) will base on the Live Feed components that are being implemented in the “Identification of Abnormalities in the Banking Industry”. Identifying and Detect the abnormal human behavior and unusual objectives in real time and send the notification via email. and mitigate the human monitoring errors and reduce more theft being missed.

1.2.1 Breakdown the Video feed into frames

We proposed to breakdown the video feed into frames (30 frames per second) due to 30fps is necessary to smoothly record movement and capture the quality images. Frame rate has an impact on the size of the video file. when considering the fast motion, the increasing frame rate may be an option.[11] This method implemented in live feed class which is exposed to a public since it is used by other connected classes. Through this function, other classes can get the current breakdown frames in live feed[2][8][12].

1.2.2 Lighting Condition Method

After breakdown the video feed into frames then checks Lighting Condition of the image and it constantly maintains the fixed contrast ratio using algorithm though under dark light condition. The lighting condition of the ATM would be in a constant to capture the quality image to the video feed[13].

1.2.3 Grayscale

An also we used the Grayscale method to convert the RGB color pixel value to one single color which belongs to the shade of gray[14]. The inherent complexity of greyscale images is lower than from the color images. Compare the grayscale algorithms with the type of images.

1.2.4 Extract Blobs

We proposed a method extract the blobs of the image which is recognize the outline of the moving human and the objective in the video feed and identify anomalies in front of the camera,

when image is dark or block the camera lenses by someone or something and it identified as an anomaly then send the Email to one person kind of images and the algorithms analyses the image looking for in front of the camera objects[15][3][16].

1.2.5 Frame Differentiation

We use Frame Differentiation to identify the moving objects. It refers to a very small-time intervals of the two images before and after the pixel based on the time difference, and then thresholding to extract the image region of the movement, according to which changes in the region to distinguish background and moving object in the ATM room and if there is no difference between before and after images it must be anomaly. [17][4] [18][12][19].

1.2.6 Notification

When identifying and detecting the abnormalities the automatic Email will be sent to the person who more responsible with the bank security.

1.2.7 Activity Diagram

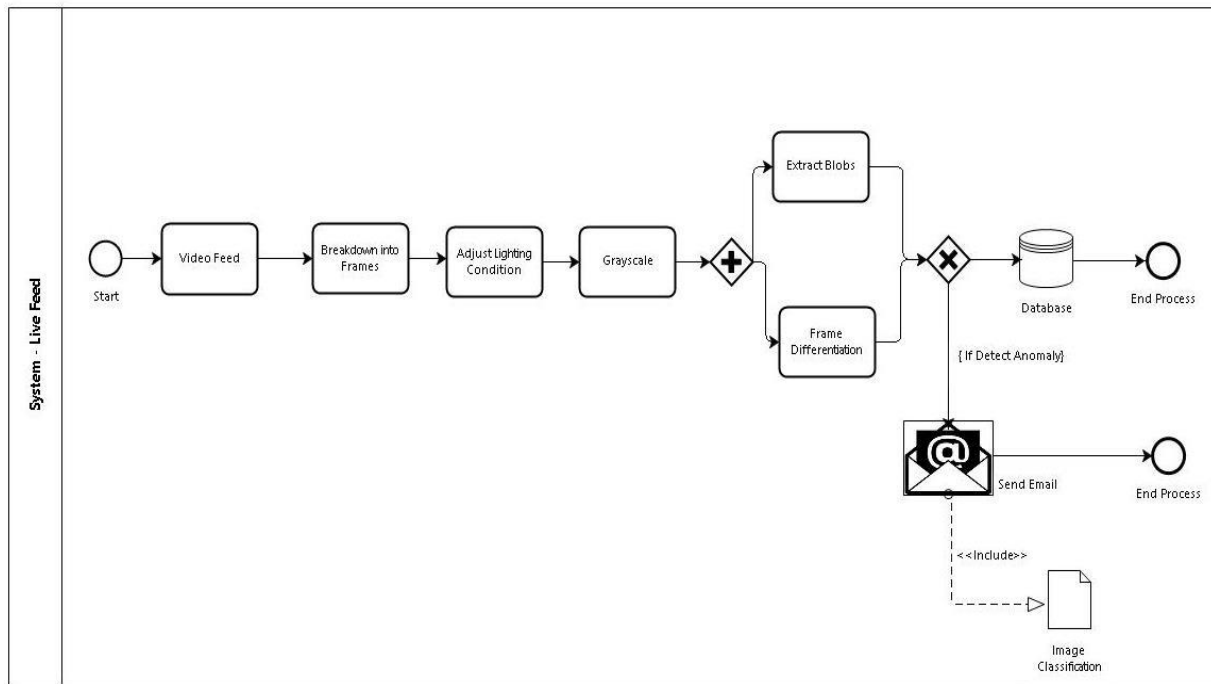


Figure 2 Activity Diagram of the Process (Live Feed)

Process 1	Get Video Feed
Primary Actor	System
Summary	Transmitting live signal to a central location for monitoring, recording and video analysis.
Pre-Condition	<p>Camera to be High Resolution (720p)</p> <p>The camera should be installed and configured properly</p> <p>The camera should be placed in the right position.</p>
Process 2	Breakdown video feed into frames
Primary Actor	System
Summary	Breakdown the images at multiple levels which are used for analysis image and identifying the human abnormalities and unusual objectives.
Pre-Condition	<p>Image quality to be high.</p> <p>Video Framerate to be higher than (15fps)</p>
Process 3	Lighting Condition method.
Primary Actor	System
Summary	Constantly maintain the fixed contrast ratio using algorithms.

Pre-Condition	Measured contrast sensitivity under different lighting condition.
Process 4	Grayscale
Primary Actor	System
Summary	Used to convert the RGB color pixel value to one single color which belongs to the shade of gray.
Pre-Condition	The reduced inherent complexity of the image.
Process 5	Extract Blobs
Primary Actor	System
Summary	Illustrate the outline of the objects on different kind of images and the algorithms analyses the image looking for in front of the camera objects.
Pre-Condition	Identified the anomaly in front of the camera.
Process 6	Frame Differentiation
Primary Actor	System
Summary	It is a technique using the difference between the current image and background image to detect moving targets.
Pre-Condition	Detected and extracted from the moving targets from the scene of the video image sequence.
Process 7	Notification

Primary Actor	System
Summary	Identifying and detecting the abnormalities the automatic Email will be sent to the security officer.
Pre-Condition	Sent email to the Security officer.

Table 1 Process Description (Live Feed)

1.3 User Characteristics

The live feed component we mainly focus to identify a human abnormality and unusual object in real time to notify that activity via email to the security office. This application mainly targets for the banking industry, but this application can be used by any organization that was based on security. Researchers can see the technology that we used while using the application.

User Type	Description
Security Officer	The person who directly involved and responsible for the bank security.
Researchers	The someone who doing the experiment or researches related to the Video surveillance system in ATM.

Table 2 Description of User Characteristic

1.4 Constraints

The Internet connection is a constraint for this function. Since the input is a video for the system over the Internet and will use API. It is crucial that there is an Internet connection for the application to function and c # shall be the implementation language.

1.5 Assumptions and Dependencies

We have found few assumptions and dependencies, that the security office should consider after we implemented the application ATM.

1.5.1 Assumptions

- Unavoidable circumstances can arise like power issues.

1.5.2 Dependencies

- Notification should be identified by the security office to avoid the mistake and threat.
- Security office must take the action immediately to prevent the threat.
- The system needs to get updated with the new versions of the software.

1.6 Apportioning of requirements

The live feed components we considered the most important features which are mentioned in section 2 to be implemented as effectively to the application.

- Breakdown Video feeds into frames – For smoothly record movement and capture the quality image.
- Control contrast level- To constantly maintain the fixed contrast ratio of the image.
- RGB to Grayscale- To reduce the complexity of the color image.
- Extraction Blobs- To identify moving human and the objectives.
- Tamper Detection-To identify the tampering things.
- Frame Differentiation – To identify abnormal activity.
- Notification- The Abnormality notifies by the Email.

2 Specific requirements

2.1 External interfaces

2.2 Classes/Objects

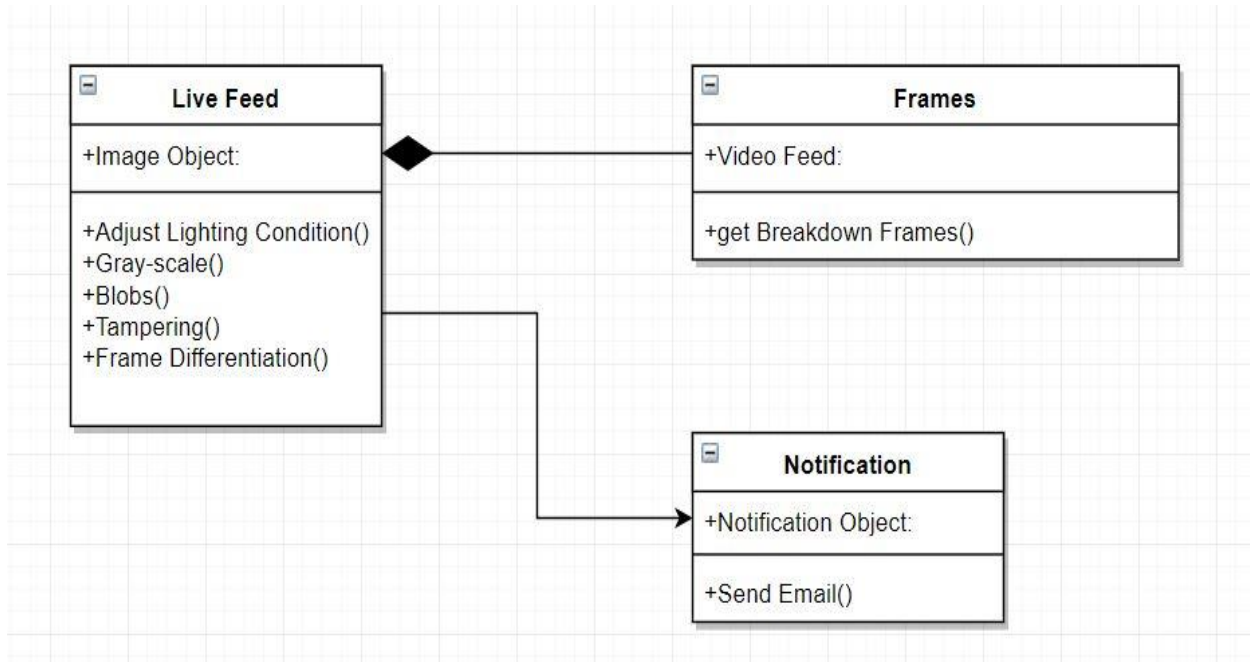


Figure 3 Class Diagram (Live Feed)

2.3 Performance requirements

This product will be built to function itself without any interaction with other external systems. For efficient performance of the system, the system should use machines running Windows with a minimum speed of 1.80 GHz and 4GB RAM. The overall performance of the application is determined by CPU and RAM work together and as well as GPU Processing power[20].

2.4 Design constraints

- Our system is managing the different data type of abnormal objects. Hence, we need to use the MSSQL database. The abnormal object detection tool will be restricted by the capacity of the database.
- The requirement for internet connectivity.
- Design of identification and feature extraction algorithms to detect anomalies.

2.5 Software system attributes

2.5.1 Reliability

The reliability of a system is the ability to perform normal operations with minimal failures for a specified time in a given environment. The proposed application is being developed to provide a reliable and efficient service to the banking industry. All the latest technology is used to provide the precise service and, in less time.

2.5.2 Availability

The proposed system must be available to do proper validations.

2.5.3 Security

It is essential that the ATM network be totally secure against any conceivable type of attack, either from within the bank or from an external attack. Security is now receiving a great deal of attention from both implementers and technology providers to ensure that ATMs are impenetrable against any type of attack[21][22][23].

Security is a very important characteristic for this type of application because all the details that are provided to the system must be valid and accurate. There is a high security to overcome the threats and keep the details in a safe way.

2.5.4 Maintainability

The maintenance ability is an important aspect since the player intends to improve in the future. Standard coding practices will be followed during the implementation of the system. The system will be implemented to minimize bugs and errors as much as possible. The system should be solid but simple security features that make managing the system much easier.

3 Supporting information

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