Palestine Polytechnic University

College of Administrative Sciences and Informatics

Department of Information Technology

Vision Based Monitoring System
(VBMS)

Prepared by

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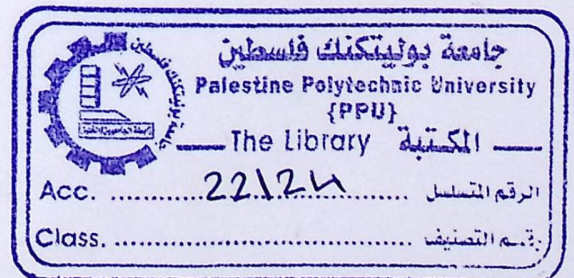
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A final project submitted in partial fulfillment of the requirements

for the degree of B.Sc. in Information Technology.

June, 2008

II

ملخص المشروع

يهدف هذا المشروع إلى بناء نظام مراقبة و حماية قليل التكلفة بالمقارنة بالأنظمة الموجودة حاليا، و ذلك لتلبية حاجة المكاتب و المتاجر الصغيرة. ولتحقيق هذا الهدف تم استخدام كاميرات تعمل على تقنية الكوابل المتسلسلة (USB) المتصلة مباشرة بنظام متصل بشبكة الإنترنت لتمكين المستخدم من متابعة المكتب أو المتجر من أي مكان في أي وقت .

ويستطيع المستخدم إدارة النظام محليا، أو من بُعد عن طريق شبكة الإنترنت أو باستخدام خدمة الرسائل القصيرة، و عند حدوث أي اختراق أو دخيل يعمل نظام الإنذار بإرسال الرسائل القصيرة إلى المستخدم.

حيث تم استخدام تقنيات معالجة الصور التي تعتمد على مقارنة الصور للكشف عن التغييرات التي طرأت على الصورة ويقرر النظام ما إذا كان مستوى التغيير يمثل تهديدا أم لا.

و في النهاية تبين أن هذا النظام يمكن أن يحقق عملية الرصد بالكامل محليا، أو من بُعد عن طريق الإنترنت أو عن طريق الرسائل القصيرة أيضا. و تكلفة هذا النظام منخفضة جدا بالمقارنة مع العديد من الأنظمة القائمة.

Abstract

This project aims at building a low-cost online monitoring system for security in small offices or shops. To achieve this goal, USB-based cameras are used on a system connected to the internet to permit the user to monitor her/his office or shop from any where and any time she/he wants. The user can administrate the system locally, remotely through the internet or using SMS. When there is an intruder, the system makes an alarm and sends SMS to the user.

We have used image processing techniques that depend on histogram comparison to detect the changes in the image and decide whether level of change represent a threat or not.

The results of the work show that the system can achieve full monitoring of the place locally, remotely through the internet or of by SMS. Also, the cost of the system is being very low compared to the many existing security systems.

Dedication

To our parents for their support and encouragement all the time.

To the Supervisor of the project Mohammed Al-Dasht.

To all our teachers, lecturers, and friends.

Yazan

Awni

Acknowledgment

We want to thank a lot our supervisor Dr. Mohammed Al-Dasht.

Also, thanks to the head of the Information Technology Department in our University Mr. Akram Ihshish.

Thanks for all, our colleagues and our teachers at PPU who help us in our project.

Special thanks for teachers Dr. Hashem Tamimi, Wesam Al-Herbawi and Muhammad Amro who help us.

All thanks and acknowledgment to everyone who supported us in the completion of this project.

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➤ **Economy Study.**

➤ **Time Scheduling.**

1.1 Introduction:

In this chapter we will explain system objectives, functional and non functional description, constraints, and feasibility study that include risks that face the project, solution of the risks, project alternatives, economy study, cost and time scheduling.

1.2 System objectives:

➢ **This project aims to achieve the following objectives:**

- Create low cost monitoring system for offices using USB-Cameras.
- Using of communication program (open source program) over the internet.
- The focus will shift to the need for image processing and analysis.
- Analyses the image and send warning in the event of a direct threat in the absence of an employer.

1.3 Functional descriptions:

The functional requirements specify the software functionality that the developers must build into the product to enable the users to accomplish their tasks, thereby satisfying the business requirements.

➢ **Office manager requirements:**

- The office manager requests explore and charge his balance (communication program) using internet explorer.
- Determine the level of the system security.
- Control remotely the monitoring system via SMS and internet.

➢ **Material requirements:**

- Providing internet browser.

- Providing application with Visual Basic 6.0.

- Providing ASP.Net 2005.

- Providing Ajax technology.

- Providing animation (Flash) with pictures.

1.4 Non-functional descriptions:

Non-functional requirements has name suggest are requirement that are no directly concerned with the specific function delivered by the system, and Non-functional requirements may be more critical than functional requirements.

1.4.1 Product requirements.

- **Ease to use:** the system provides a friendly interface, and easy to be used across all its functions.

- **Accessibility and availability:** the system easy to access, login, navigate, use, and to be updated recovered by the manager remotely. The system is available 24 hours per day, 7 days per week.

- **High efficiency:** the system provides high efficiency website in a way that no error can be occurred in its transactions.

- **Accuracy:** The system provides a high level of accuracy especially in its transactions.

- **High robustness:** The system provides high robustness for any failure and should work the longest time before coming down.

- **Consistency:** Must be interfaces coordinated system in terms of buttons, colors and general appearance.

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1.4.2 Process requirements:

The system and its documents must be delivered on 10 June, 2008.

1.4.3 Organizational requirements:

Requirements which are a consequence of organisational policies and procedures, for example process standards used implementation requirements.

1.4.4 Legislative requirements:

- **Security:** security is a critical part of the system, from the fact that there are parts of he system have specific users, for example not any user can login to the system except office manager, and the system has limit and control access to online content, resources and back-end functions.

1.4.5 External requirements:

- Manager can log in the office web site anytime and from any where.

- System should provide high level of security for financial transactions, and personal user information.

1.5 System constraints:

- Limitation of mobile network coverage.

- System suns within small geographical area specified (small number of rooms).

- System does not work without light.

- System work in indoor environment.

1.6 Feasibility study:

Feasibility study is one of the most important steps planning for any project, so that we can study sources, and also explain the dangers that can arise during development of the project.

1.6.1 Project alternatives:

- The internet connection to get information of the office system.

  ➢ **Advantages:**

  Provide authentication information by allowing the administrator log in using his username and password.

  1. Timely, current information.
  2. Availability and sharing information.
  3. Low development and maintenance costs.
  4. Quick and easy to distribute the information.
  5. Environmentally friendly it is using only by administrator.

  ➢ **Disadvantages:**

  1. Security.
  2. Inflexibility.

- Using of communication program (for SMS and calls):

  In this way officer can get there information through mobile by sending SMS to other mobile phone, but also this way has some advantages and disadvantages:

  ➢ **Advantages:**
  1. Time and money.
  2. Efficiency with any time, anywhere access.
  3. Flexibility in coordination.
  4. Low cost of SMS.
  5. Personalization.
  6. Global standardization.
  7. Easy to use.

> ➢ **Disadvantages:**

1. Address distance.
2. Speed.
3. Privacy and security.
4. Batteries have poor record.

1.6.2 Cost-benefit analysis:

The programs and software that needed in your system are available for certain cost:

1. Economic aspect:

- Microsoft Windows XP Professional.
- Visual studio.NET 2005.
- Visual Basic 6.0.
- Ajax technology.
- Communication program (Skype).
- Microsoft Office 2003.

2. Legislation aspect:

This project will be developed for Palestine polytechnic university (PPU) and the university agrees on this project.

1.7 Economic study:

> **Development system resources:**

1.Hardware resources:

The following table lists the Hardware resources.

Item	Number of units	Price per unit	Cost per unit
Desktop computer P4, CPU with 3GHz, 1GB RAMS, HD 40 GB, Monitor 17, Keyboard and mouse.	2	900$	1800$
USB –Cameras (Webcams).	2	35$	70$
USB-Connection Cables.	2	7$	14$
Flash memory 1G.	2	20$	40$
Total price		1924$	

Table (1.1) Development hardware cost.

2. Software resources:

The following table shows the software resources necessary for the development of offices monitoring system.

- **Microsoft Windows XP Professional**: Support of a large number of applications and software for the application of the Internet, and multimedia support programs significantly.

- **Multimedia design:** Provide animation with pictures design interface in web application.

- **Microsoft Visual Studio.Net 2005:** Provide an easy way to build web sites dynamically so can be considered a web page seen by users on how to use the web browser.

- **Microsoft Visual Basic 6.0:** Language is easy and quick to run Windows applications.

- **Microsoft Office 2003:** Using in the documentation of project.

- **VideoOCX:** Is an ActiveX control that allows programmers to easily integrate video capture and image processing capabilities into their software applications.

- **Ajax technology:** Support and view a series of images, and don't need load the page every image change.

- **Skype:** Is an open source program that makes communicating with fully automated using SMS directly in the event of any threat or warning.

Software	Cost
Microsoft Windows XP Professional.	180$
Multimedia design (Flash and Photoshop).	200$
Microsoft Visual Studio.Net 2005.	450$
Microsoft Visual Basic 6.0.	100$
Microsoft Office 2003.	450$
VideoOCX.	100$
Ajax technology.	free
Skype.	free
total	1480$

Table (1.2) Development software cost.

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3. Human resources:

The following elements sources have need for human to exchange roles, so that the development of offices monitoring system.

activity	Hours per week	Cost per hour	Total of cost
Programmer.	6	10$	60$
Web page designer.	3	10$	30$
Total cost/week			90$
Total Human Cost [15 week]			1350$

Table (1.3) Development of human resources cost.

➤ **Operational system resources:**

1. **Hardware resources:**

The following table lists the Hardware resources.

Item	Number of units	Price per unit	Total of cost
Desktop computer P4, CPU with 3GHz, 1GB RAMS, HD 40 GB, Monitor 17, Keyboard and mouse.	1	900$	900$
USB –Cameras (Webcams).	2	35$	70$
USB-Connection cables.	2	10$	20$
Total price		990$	

Table (1.4) Operational hardware resources.

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2. Software resources:

The following table shows the software resources necessary for the development of offices monitoring system.

Software	Cost
Microsoft Windows XP Professional.	180$
Microsoft Visual Studio.Net 2005.	450$
Microsoft Visual Basic 6.0.	100$
VideoOCX.	100$
Ajax technology.	free
Skype.	free
total	830$

Table (1.5) Development software cost.

➤ **Total system development costs:**

Resources	Costs
Hardware Resources Development Costs:	1924$
Software Resources Development Costs:	1480$
Human Resources Development Costs:	1350$
Total Costs	**4754$**

Table (1.6) Total development costs.

➤ **Total system operational costs:**

Resources	Costs
Hardware Resource Operational Costs:	990$
Software Resources Operational Costs:	830$
Total Costs	1820$

Table (1.7) Total operational costs.

1.8 Scheduling:

That any project or any idea in any area should be subject to specific time-division of tasks, that our point of this specific certain number of weeks.

Activities	Description	weeks
Activity 1	Information collection	11
Activity 2	System analysis	3
Activity 3	System requirements	3
Activity 4	System design	3
Activity 5	System implementation	6
Activity6	System testing	3
Activity 7	Documentation	15

Table (1.8) Time scheduling.

Task allocation vs. time:

Week / Activity	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A1	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓	▓				
A2															
A3															
A4															
A5										▓	▓	▓	▓	▓	
A6											▓	▓	▓	▓	▓
A7	▓	▓	▓												

Figure (1.1) Gantt chart for time schedule.

Chapter Two

Software Requirements

Specifications

> **Introduction.**

> **Requirement Specification.**

> **Functional Descriptions.**

> **Validation Criteria.**

> **Context Diagram.**

> **System Interface Description.**

> **Data Dictionary.**

2.1 Introduction:

In this chapter we will explain system specifications, functional description, validation criteria for the system and analyses it. And we will describe all of the system data.

Also this chapter will include:

- Context diagram.
- data flow diagram

2.2 Requirements specifications:

➢ **Office manager requirements specifications:**

1. **Authentication:** inserts his username and password at log in area in the log in page.
2. **Control:** office manager can control remote the monitoring system via SMS and internet.
3. **Security:** office manager can determine the level of the system security.

➢ **Material requirements:**

1. **Animation:** that can animation (Flash) with pictures.
2. **Browsing:** providing internet browser.
3. **Language:** that can use the application with Visual Basic 6.0, ASP.NET 2005.
4. **Technology:** using Ajax.Net.

2.3 Functional descriptions:

> **Office manager requirements specifications:**

- Login from the system.

Function: login.	
Description: Identify the manager using User Name, and password.	
Input: User Name, Password.	
Source: monitor Form.	
Outputs: monitor Page.	
Destination: Browser.	
Requires: Nothing.	
Precondition: Nothing.	
Post condition: Nothing.	
Procedure: Possible review page monitor.	

- Logout from the system.

Function: logout.
Description: identify the manager by using valid username and password.
Input: User Name, Password.
Source: manager and form (monitor form).
Outputs: monitor Page.
Destination: Browser.
Requires: valid username and password.
Precondition: logout.
Post condition: the manager form display.
Procedure: Possible exit from page monitor.

> ➤ **Material requirements specifications:**

- Providing animation (Flash,) with pictures.

Function: Provide animation (Flash) with pictures.
Description: This function will supply the users (that use the system) to see the image.
Inputs: Nothing.
Source: Web Page and monitor Page.
Outputs: animation.
Destination: Browser.
Requires: Login.
Precondition: Logging in manager.
Post condition: Display animation.

- Providing internet browser.

Function: Provide HTML page browsing.
Description: this function will enable the student to display the content as a web page.

- Providing application with Visual Basic 6.0.

Function: Provide application with Visual Basic 6.0.
Description: This function allows officer to programming application that is made by Visual Basic 6.0.
Inputs: User Name, and Password.
Source: Windows Form.
Outputs: Application Form.
Destination: Browser.
Requires: Login.
Precondition: Logging in system, enter the application.
Post condition: Exit the application.
Procedure: This function allows officer to programming application that is made by Visual Basic 6.0.

- Display series of image (Ajax.net).

Function: display series of image.
Description: This function supplies the officer with series of image.
Inputs: Nothing.
Source: Web page and monitor page.
Outputs: image.
Destination: browser.
Requires: Login.
Precondition: Login in system, select the image to be displayed.
Post condition: display the selected series of image.
Procedure: This application will allow the officer to display the supporting display images.

2.4 validation criteria:

To avoid user errors we have to meet all required validation to guide the office manager to obtain maximum benefit while using system. These validation criteria as show below:

➢ For the office manager :

- Password at least six character lengths for all accounts.
- Password update and change once at month.
- Password should not contain any space or special character.
- System not needs any administrator.

2.5 context diagram:

2.5.1 Context diagram:

It's the overview of the system and show relations with other systems; this chart shows the scheme without mentioning the names of the details.
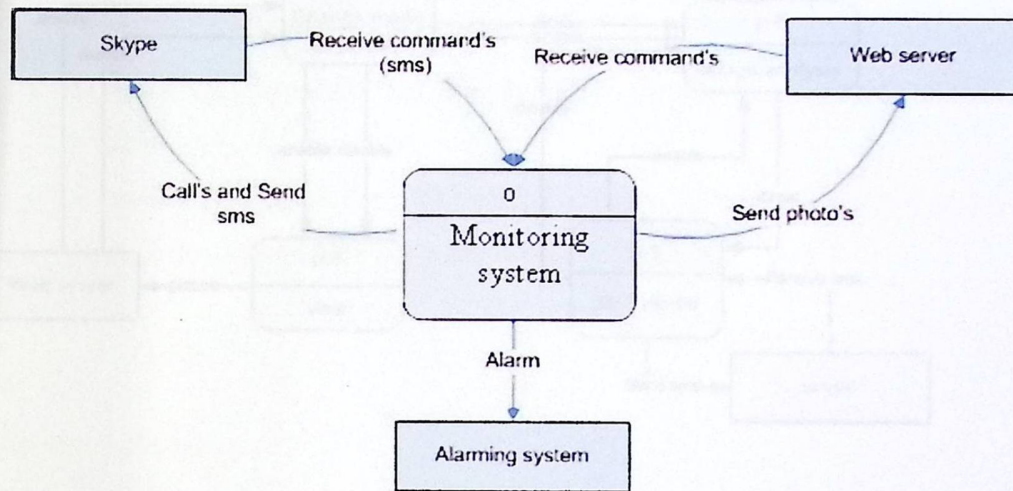

Figure (2. 1) Context Diagram.

2.5.2 Data flow diagram level 0:

This level of DFD shows the main processes which are (login, modify and change status, send and receive SMS, view picture on web server, alarming, calculate MSE).
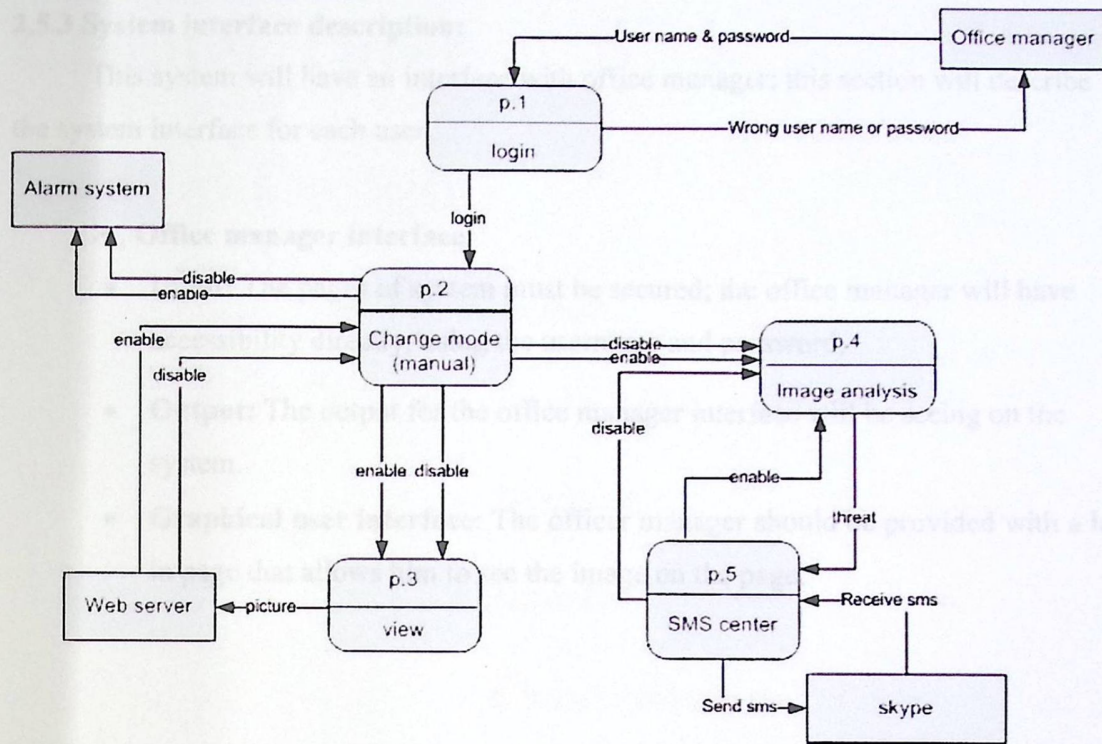
2.5.3 System interface description:

This system will have an interface for the office manager; this section will describe the system interface for each use...

Office manager interface:

... system must be secured; the office manager will have possibility of...

- Output: The output for the office manager interface depending on the system.

- Graphical user interface: The office manager should be provided with a log ... that allows to follow the image...

Figure (2. 2) Data flow diagram level 0.

2.5.4 Data dictionary:

Entity Name	Description
Log in	This procedure allows the office manager to log in to his form.
Log out	This procedure allows the office manager to log out from his forms.
SMS	This procedure allows the office manager to send SMS by backward and forward.
Mean square error (MSE)	This function allows calculating the average of the square difference between the desired response and the actual environment (the error).
Histogram	This function showing for each color the number of pixels that have this color in the image (show the distribution of intensities in an image).

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2.5.3 System interface description:

This system will have an interface with office manager; this section will describe the system interface for each user.

➢ **Office manager interface:**

- **Input:** The pages of system must be secured; the office manager will have accessibility directly, using the username and password.

- **Output:** The output for the office manager interface will be seeing on the system.

- **Graphical user interface:** The officer manager should be provided with a log in page that allows him to see the image on the page.

2.5.4 Data dictionary:

Entity Name	Description
Log in	This procedure allows the office manager to log in to his form.
Log out	This procedure allows the office manager to log out from his forms.
SMS	This procedure allows the office manager to send SMS by backward and forward.
Mean square error(MSE)	This function allows calculating the average of the square difference between the desired response and the actual environment (the error).
Histogram	This function showing for each color the number of pixels that have this color in the image (show the distribution of intensities in an image).

Chapter Three

System Design

> ➤ **Introduction.**

> ➤ **Functional Design.**

> ◆ **Description.**

> ◆ **Interface.**

> ◆ **Constraints.**

> ◆ **Flowchart.**

> ➤ **System Interface Design.**

> ➤ **Navigation Map.**

> ➤ **Design and Administrator Interface.**

> ➤ **Test Plan.**

3.1 Introduction :

In this chapter we will work on the design and structure of the system to be implemented. This includes the interaction between the system and the surrounding environment inputs and outputs.

And we will describe the models that will be the design process by direct exact format required for presentation.

3.2 Functional design:

The main objective of the basic functional design of the system is to support office manager ability to browse the process and access to the system directly. The system also allows the director's permanent supervision system, and interacts with system through fully automated and direct contact in case of any emergency and defects.

➢ **Office manager function design:**

1. **Login to the system:**

    The only person authorized to enter the system is the only director of the office.

    ➢ **Description**: This function provides ability for the office manager log in to his web form.

    ➢ **User Interface:**

    • **Input**: Office manager username and password.

    • **Output**: Office manager web form if the username and password valid, error messages if the username or password invalid.

    ➢ **Restrictions:**

    • **Username**: user name must not contain special characters such a (/,*, %,? etc.).,and more complex.

- **Password**: The password must be no less than six characters in Length and contains no special characters such as (/,*, %,?... etc.).
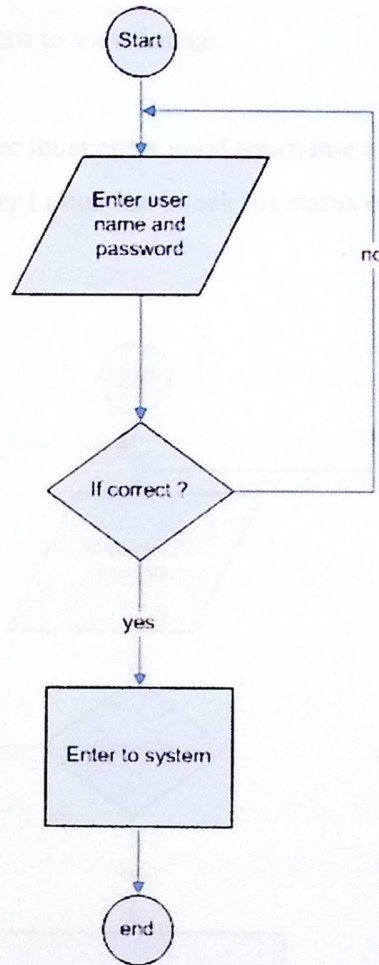
  ➢ **Flowchart:**

Start

Enter user name and password

no

If correct ?

yes

Enter to system

end

Figure (3. 1) Login flowcharts.

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2. View image from folder:

➢ **Description**: This function provides ability to view image from folder.

➢ **Interface** :

- **Input:** Enable status from file.
- **Output:** Return to view image.

➢ **Constraints:**

- Office manager must enter valid username and password.
- Office manager t must use check his status enable or disable.
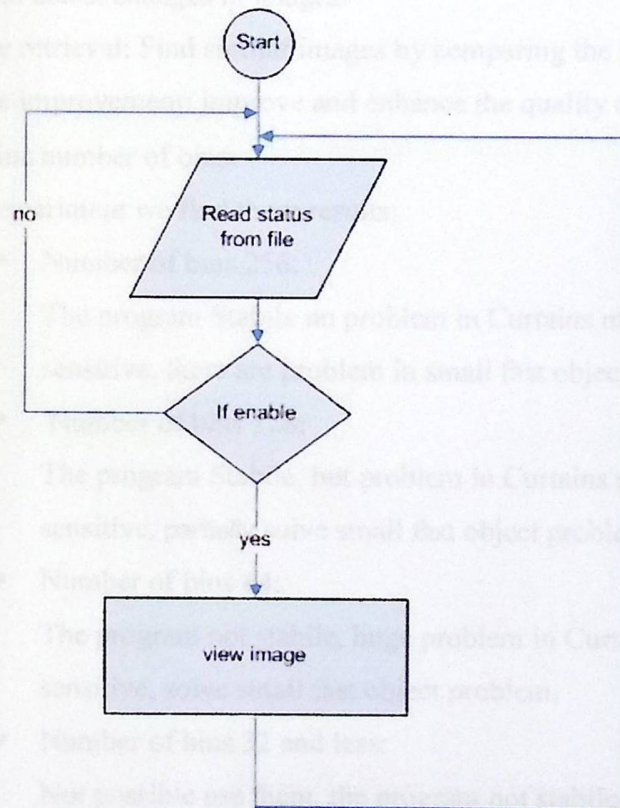
➢ **Flow chart:**

Figure (3. 2) View image from the folder flowchart.

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3. Image Histogram: is a chart shows the distribution of intensities in an image, show for each color number of pixels that have this color in the image.

- Using a grayscale (or gray level) image that is support 8-bit images.
- A single intensity value for each pixel in the image.
- The context of a histogram known as **bins,** that stored as an 8-bit integer giving 256 possible different shades of gray from black to white.
  Example: HIST [0...bins] for one dimensional array.

- Why used Image Histogram?
  a. Image comparison: Compare their histogram and show how histograms are used to detect changes in images.
  b. Image retrieval: Find similar images by comparing the histogram.
  c. Image improvement: improve and enhance the quality of image.
- Determine number of bins:
  by experiment we find these results:
  - Number of bins 256:
    The program Stabile no problem in Curtains motion, but low sensitive, there are problem in small fast object (not detect it).
  - Number of bins 128:
    The program Stabile, but problem in Curtains motion, more sensitive, partially solve small fast object problem.
  - Number of bins 64:
    The program not stabile, huge problem in Curtains motion, very sensitive, solve small fast object problem.
  - Number of bins 32 and less:
    Not possible use them, the program not stabile.

- **Mathematical equation:**

$$\text{hist}(c) = \frac{1}{N_0 N_1} \sum_{x0=0}^{N_0-1} \sum_{x1=0}^{N_1-1} \delta(\iota(x_0, x_1) - c). \forall c \equiv C$$

- **Histogram algorithm:**

```
For Y = 0 To (Height) - 1
    For X = 0 To (Width) - 1
        p = matrix(X, Y)
        histo(p) = histo(p) + 1
    Next X
```
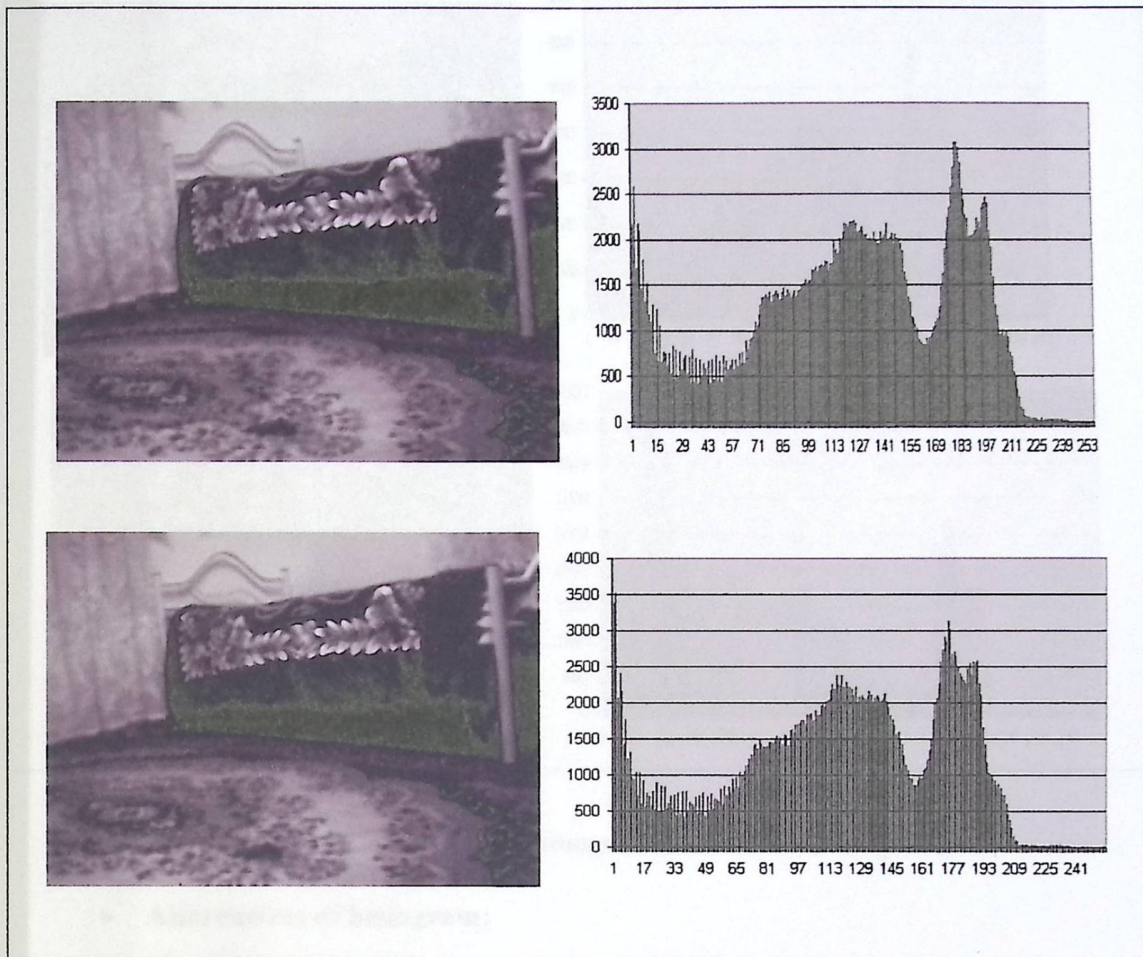
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Figure (3. 3) Two similar images with similar histograms.
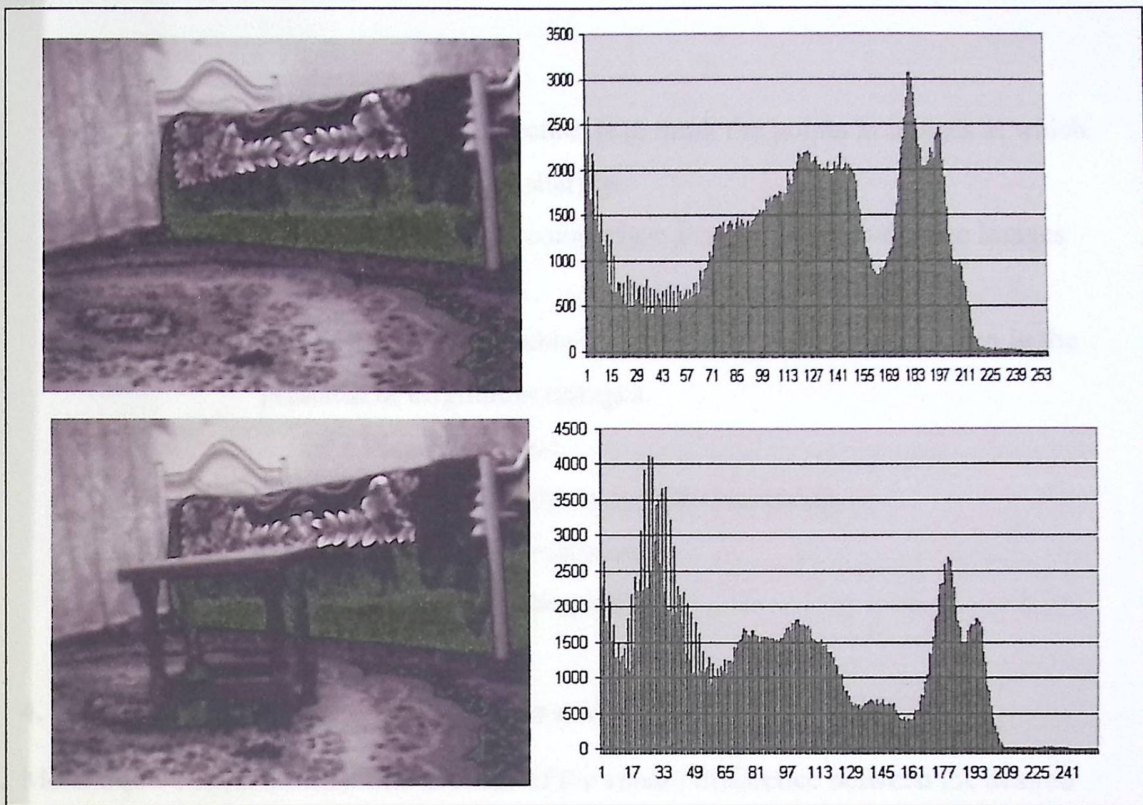
Figure (3. 4) Two different images with different histograms.

- **Alternatives of histogram:**
  1. **Image subtraction:**
     a. That technique computes the difference between two input images.
     b. That produced by subtracting the pixel values of two images on point-by point basis.
     c. Depend on the way the difference image is produced, that used to small relative to the size of image.
        ✓ **Disadvantages:**
     a. The technique use is to subtract background variations in illumination from a scene.

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2. **Edge detection:**

    a. The goal of edge detection is to mark the points in images at which the intensity changes sharply.

    b. That technique using comparison is not done between the images themselves.

    c. That technique is capable of detecting entering objects even in the presence of brightness changes.

      ✓ **Disadvantages:**

    a. Discontinuities in depth, or surface orientation.

    b. Changes in material properties.

    c. Variations in scene illumination.

4. Find the mean square error (MSE) to make alert:

Mean Square Error (MSE): The average of the square difference between the desired response and the actual environment (the error).

- **Mathematical equation:**

$$MSE = \frac{1}{N} \sum_{i}^{N} (H_i^A - H_i^B)^2$$

- **MSE algorithm:**

```
For i = 0 To 255

MSE = MSE + ((indexhisto(i) – currenthisto(i)) * (indexhisto(i) – currenthisto(i)))

Next i

MSE = MSE / 255
```

➢ Step to calculate mean square error:

    1. Check the status of system:

- If system disable not do any thing.
- If system enable:

    a) Get matrix of index image (when system start or when update parameter button), Calculate the histogram.

    b) Get matrix for current image, and calculate the histogram.

    c) find the mean square error:

      i. If the value of mean square error small number, no exist different between images.

      ii. If value of mean square error greater than the ratio, send SMS and alarming to the office manager.

➢ **Description**: This function provides ability to find the histogram and mean square error.

➢ **Interface:**

- **Input:** Calculate and find histogram.
- **Output:** Return the value of square error.

➢ **Constraints:**

- Office manager must enable function to find histogram.
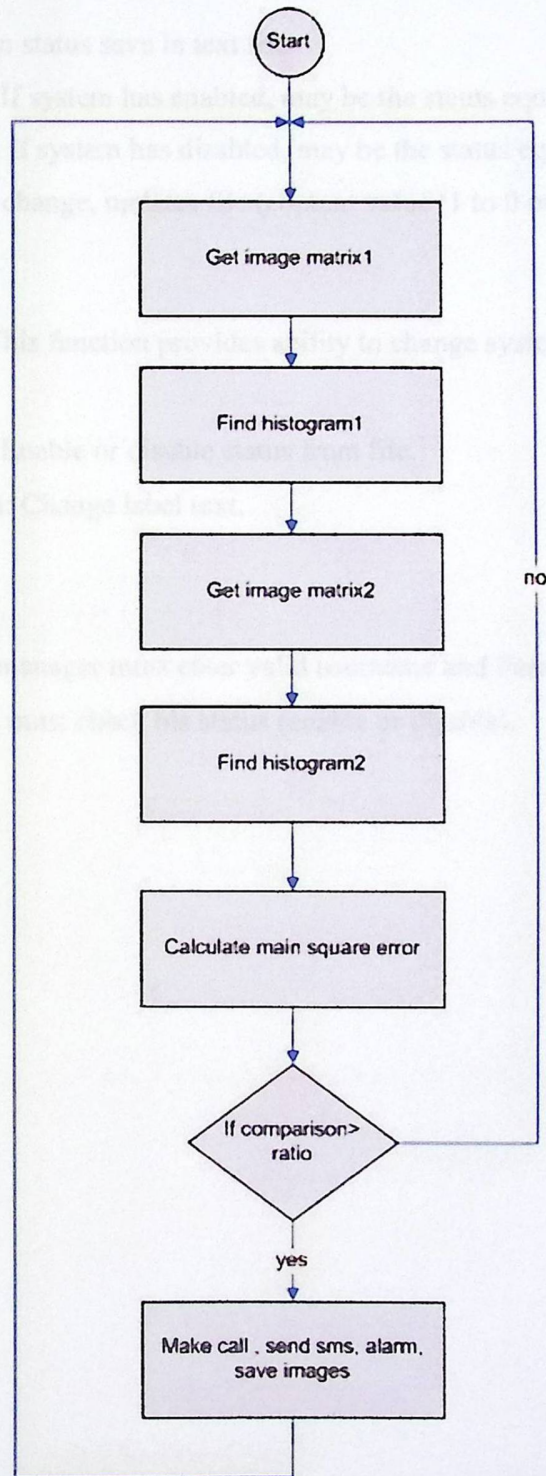- System must check and return the value of square error.

Flowchart:

Figure (3. 5) Find the mean square error for one camera flowchart.

5. Change system mode (manually):

- System status save in text file:
  - ❖ If system has enabled, may be the status equal 1.
  - ❖ If system has disabled, may be the status equal 0.

When system mode is change, updates file (content value (1 to 0 or 0 to 1)).

➢ **Description**: This function provides ability to change system mode.

➢ **Interface** :

- **Input:** Enable or disable status from file.
- **Output:** Change label text.

➢ **Constraints:**

- Office manager must enter valid username and Password.
- System must check his status (enable or disable).

➢ **Flow chart:**

Start

Read status
from file

If enable

no   yes

Change mode to Enable
(Write to file)

Change mode to disable
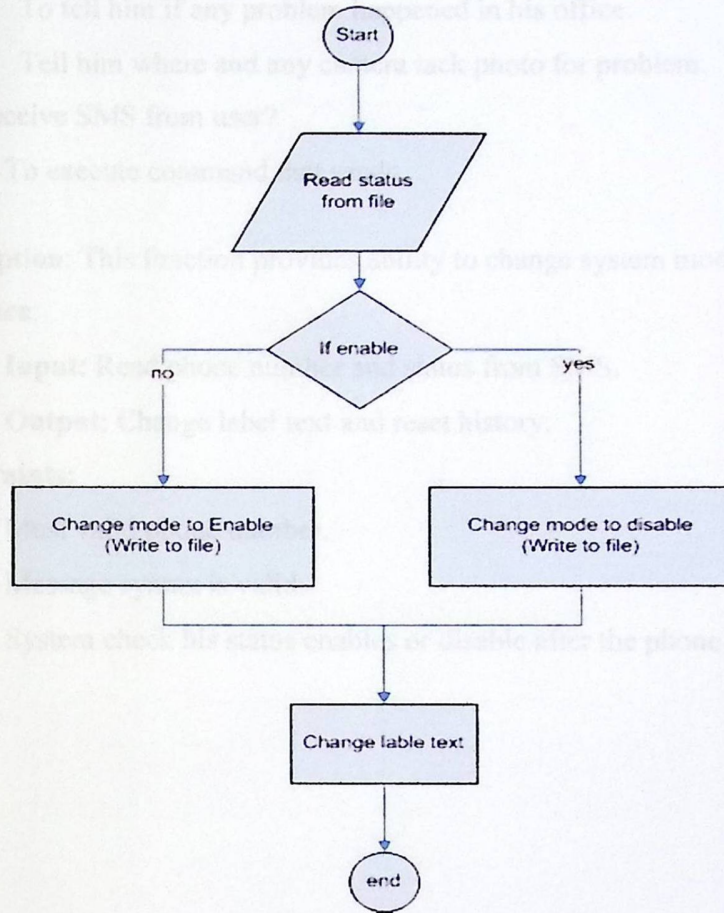(Write to file)

Change lable text

end

Figure (3. 6) Change system mode file flowchart.

6. Change system mode using SMS:

➤ Why send SMS to user?

- To tell him if any problem happened in his office.
- Tell him where and any camera tack photo for problem.

➤ Why receive SMS from user?

- To execute command that sends.

➤ **Description**: This function provides ability to change system mode using SMS.

➤ **Interface:**

- **Input:** Read phone number and status from SMS.
- **Output:** Change label text and reset history.

➤ **Constraints:**

- Must valid phone number.
- Message syntax is valid.
- System check his status enables or disable after the phone number is true.
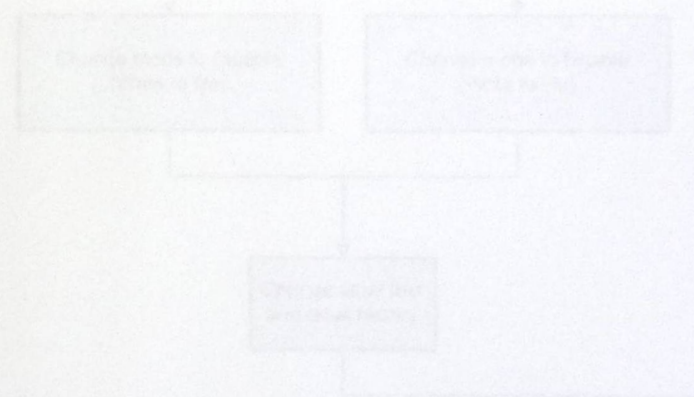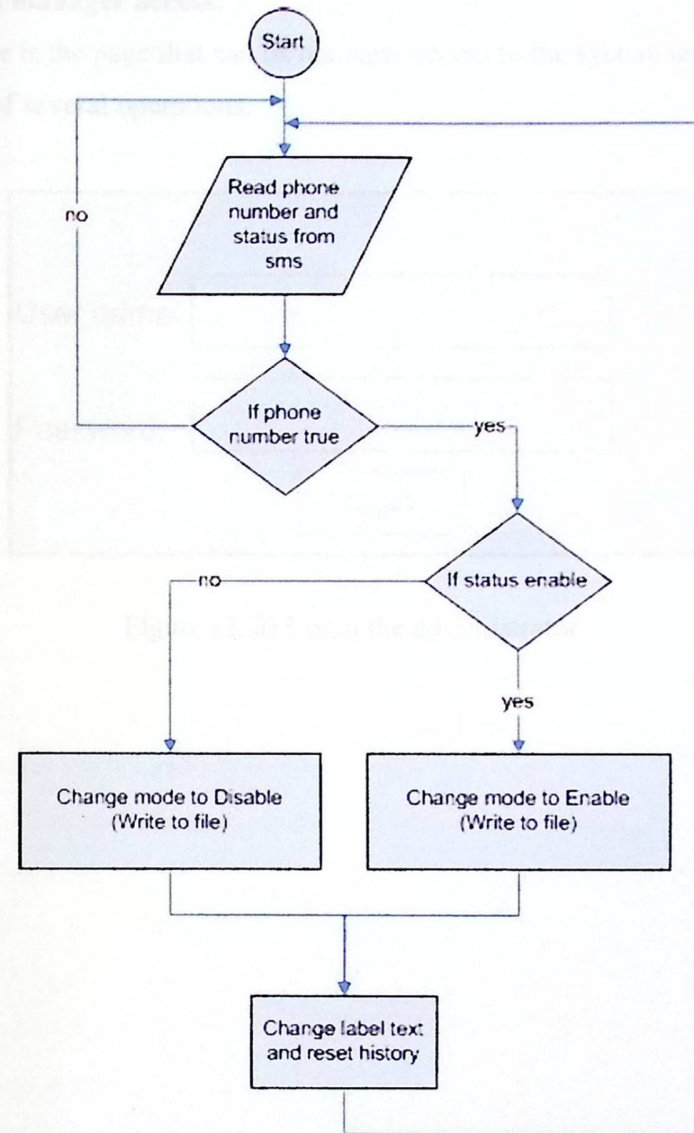
> **Flow chart:**

Figure (3. 7) Change system mode using SMS flowchart.

3.3 Design and administrator interface:

3. 3.1 Screen manager access:

This page is the page that can be manager access to the system using it, so that the director makes of several operations.

User name: [   ]

Password: [   ]

login

Figure (3. 8) Login the administrator.

3.4 Test plan:

The process of examining the rules, the most important stages throughout the development of the system, which could reach the cost of testing the system in some cases to nearly 55% of the cost of the system, also lies the importance of screening system to verify the reliability of each unit, each part of the system to make sure that it serves the specifications and requirements, and the process includes:

1) Examine each model.
2) Examine parts of the system.
3) Screening system integration.

3.4.1 Requirements of test plan:

➢ Requirements software :

1) Microsoft Visual Basic 6.0.
2) ASP.NET 2005.
3) Microsoft Internet explorer.

➢ Physical requirements (Hardware):

Server has the following characteristics:

• Pentium 4.

• CPU with 3GHz.

• 1GB Ram.

• HD 40 GB.

• Monitor 17.

•USB –Cameras (Webcams).

Chapter Four

System Implementation

> ➤ Introduction.

> ➤ System Implementation's Infrastructure.

> ➤ Software for the Development Process.

> ➤ Supporting Software.

> ➤ Operating the System.

4.1 Introduction:

In this chapter we will identify the most important stages of the system development; through the transition from analysis and design stage to implementation stage, to begin programming and building the system significantly.

In this chapter we will be able to clarify the steps involved in preparing the physical and programmatic sources, and techniques used in the development process.

4.2 System implementation's infrastructure:

➢ **Hardware environment:**

In implementing the rules of the team using the following hardware:

➢ Desktop computers Pentium IV:

- CPU with 3GHz, 1GB RAMS, HD 40 GB, Monitor 17.
- USB-Cameras (Webcams).
- USB-Connection Cables.

➢ **Software environment:**

1) Microsoft windows XP Professional.
2) Microsoft Visual Basic 6.0.
3) ASP.Net 2005.
4) Internet Explorer.
5) Ajax technology.

4.3 Preparation software for the development process:

4.3.1 Windows XP professional:

This system is characterized by force and high performance that will enable it to manage files, as he owns a fever can be used when connecting to the Internet browser without access to personal files, as this system is characterized by its support of a large number of applications and software for the application of the Internet, and multimedia support programs significantly.

4.3.2 Microsoft visual basic 6.0:

Visual Basic (VB) is a third-generation event driven programming language and associated development environment (IDE) from Microsoft for its COM programming model. Visual Basic was derived from BASIC and enables the rapid application development (RAD) of graphical user interface (GUI) applications, and creation of ActiveX controls and objects. Scripting languages such as VBA and VBScript are syntactically similar to Visual Basic, but perform differently.

A programmer can put together an application using the components provided with Visual Basic itself. Programs written in Visual Basic can also use the Windows API, but doing so requires external function declarations.

> **Features of visual basic 6.0:**
> 1. The Language is easy and quick to set up Windows applications.
> 2. Visual Basic was designed to be easy to learn and use.
> 3. The language not only allows programmers to create simple GUI applications, but can also develop complex applications as well.
> 4. Programming in VB is a combination of visually organize components or controls on a form, specifying attributes and actions of those components, and writing additional lines of code for more functionality.
> 5. The language is garbage collected using reference counting, has a large library of utility objects, and has basic object oriented support.

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- **Mathematical equation:**

$$\text{hist}(c) = \frac{1}{N_0 N_1} \sum_{x_0=0}^{N_0-1} \sum_{x_1=0}^{N_1-1} \delta\left(I(x_0, x_1) - c\right), \forall c \equiv C$$

- **Histogram algorithm:**

```
For Y = 0 To (Height) - 1
    For X = 0 To (Width) - 1
        p = matrix(X, Y)
        histo(p) = histo(p) + 1
    Next X
```

6. The Visual Basic compiler is shared with other Visual Studio languages (C, C++), but restrictions in the IDE do not allow the creation of some targets (Windows model DLL's) and threading models.

7. Visual Basic can create executables (EXE files), ActiveX controls, DLL files, but is primarily used to develop Windows applications.

8. Easily to detect and discover errors.

9. Relatively strong integration with the Windows operating system and the component object model.

➢ **Disadvantage of visual basic 6.0:**

1. Non-free programs that you often need to pay to obtain the files of open source.

2. Not be fully translated into the language of the machine.

3. Not support all forms of languages programming.

Visual Basic is a Powerful and effective tool for developing applications compatible with the environment Windows, provides you with an easy to use integrated development to create solutions, whether personal or business in record time through Visual Basic philosophy, where the screens and windows designed by your clicks the mouse and move it if you paint with light boxes and services using the fee and other programs.

➢ **Installation programming language installing visual basic 6.0:**

1. Close all applications to avoid any process of re-operating the system during the nomination process.

2. Introduction of the CD I installing.

3. After automation of the CD choose Setup.exe, in the case did not work the CD automatically open the disc and then choose the manner known Setup.exe.

4. After completing the first step we work the second step, which includes.
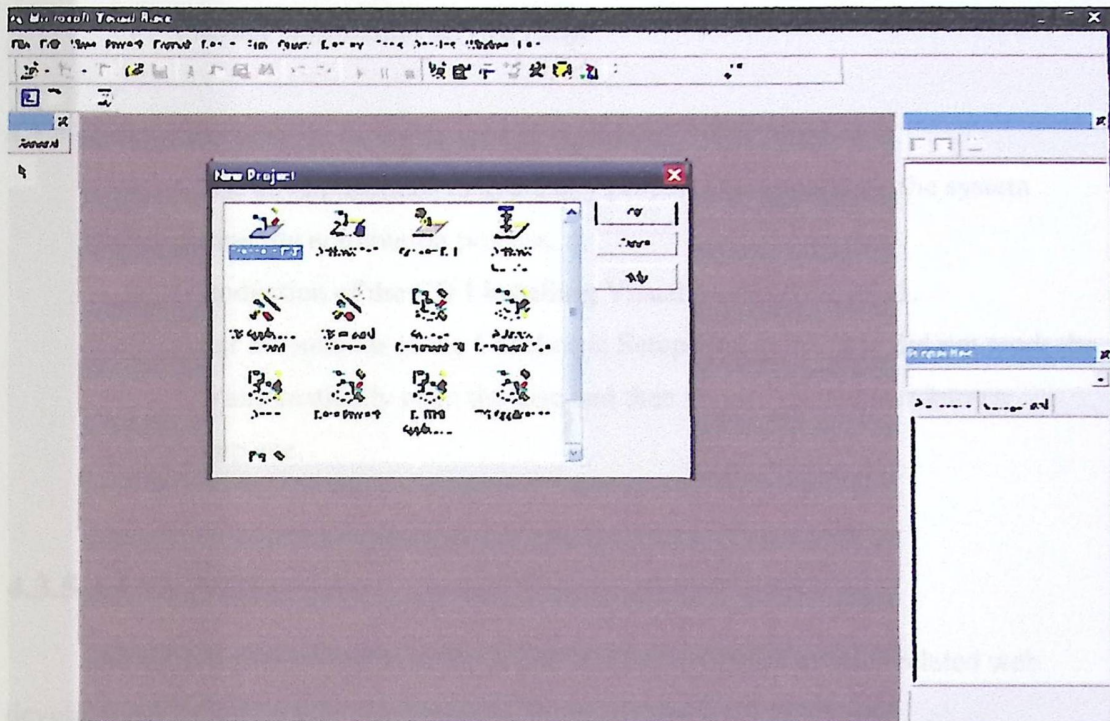
➢ **Open new windows application:**

Figure (4. 1) Selecting VB Standard EXE.

4.3.3 ASP.NET 2005:

This technology that was used for programming system which consists of programming framework builds on. Net framework, and this technology is characterized by ADO.Net which gives high performance to connect data and models of programming makes XML database and powerful and modern, as they provide an easy way to build web sites dynamically so can be considered a web page seen by users on how to use the web browser.

> ➤ **Requirements for loading ASP.NET:**
>   - Windows XP Professional.
>   - Internet information service (IIS).

4.3.4 Installation programming language installing .NET 2005:

1. Close all applications to avoid any process of re-operating the system during the nomination process.
2. Introduction of the CD I installing Visual Studio.NET 2005.
3. After automation of the CD choose Setup.exe, in the case did not work the CD automatically open the disc and then choose the manner known Setup.exe.

4.3.5 AJAX.NET:

AJAX (Asynchronous JavaScript and XML): is a group of inter-related web development techniques used for creating interactive web applications.

A primary characteristic is the increased responsiveness and interactivity of web pages achieved by exchanging small amounts of data with the server "behind the scenes", so that entire web pages do not have to be reloaded each time there is a need to fetch data from the server. This is intended to increase the web page's interactivity, speed, functionality and usability.

- **AJAX is asynchronous:** in that extra data is requested from the server and loaded in the background without interfering with the display and behavior of the existing page.

- **JavaScript:** is the scripting language in which AJAX function calls are usually made. XMLHttpRequest: Data is retrieved using the object that is available to scripting languages run in modern browsers, or, alternatively, through the use of Remote Scripting in browsers that do not support XMLHttpRequest. In any case, it is not required that the asynchronous content be formatted in XML.

AJAX is a cross-platform technique usable on many different operating systems, computer architectures, and web browsers as it is based on open standards such as JavaScript and the DOM (document object model). There are free and open source implementations of suitable frameworks and libraries.

➢ **Advantages of AJAX.NET:**

1. Bandwidth usage:

   By generating the HTML locally within the browser, and only bringing down JavaScript calls and the actual data, Ajax web pages can appear to load relatively quickly since the payload coming down is much smaller in size, and the rest of the layout does not have to be redrawn on each update.

2. Separation of data, format, style, and function:

   A less specific benefit of the Ajax approach is that it tends to encourage programmers to clearly separate the methods and formats used for the different aspects of information delivery via the web. **[1]**

➢ **Disadvantages of AJAX .NET:**

1. Browser integration:

   The dynamically created page does not register itself with the browser history engine, so triggering the "Back" function of the users' browser might not bring the desired Result.

2. Search engine optimization:

   Websites that use Ajax to load data which should be indexed by search engines must be careful to provide equivalent Sitemaps data at a public, linked URL that the search engine can read. **[2]**

3. Reliance on JavaScript and the DOM:

   Ajax relies on JavaScript and the browser's Document Object Model (DOM),

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which are often implemented differently by different browsers or versions of a particular browser.

4. Web analytics:

Many analytics solutions are based on the paradigm of a new page being loaded whenever new or updated content is displayed to the user, or to track a series of steps in a process such as a check-out. Since Ajax alters this process, care must be taken to account for how to instrument a page or a portion of a page so that it can be accurately tracked.

4.3.6 Installation Microsoft ASP.NET 2.0 AJAX extension:

1. Close all applications to avoid any process of re-operating the system during the nomination process.

2. Introduction of the CD Installing Microsoft ASP.NET 2.0 AJAX extension.

3. After automation of the choose Setup.exe, automatically open the disc and then choose the manner known Setup.exe.
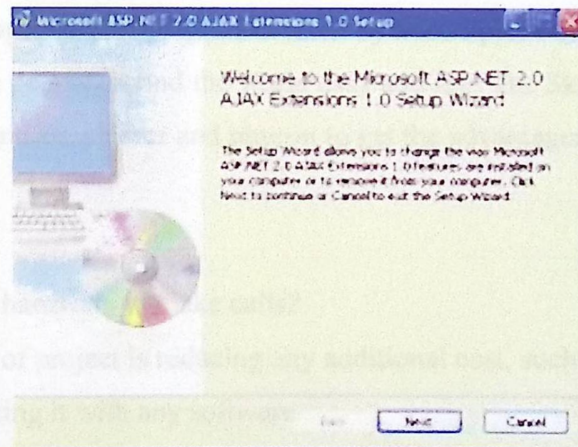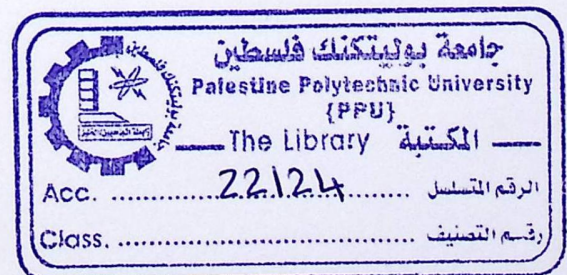
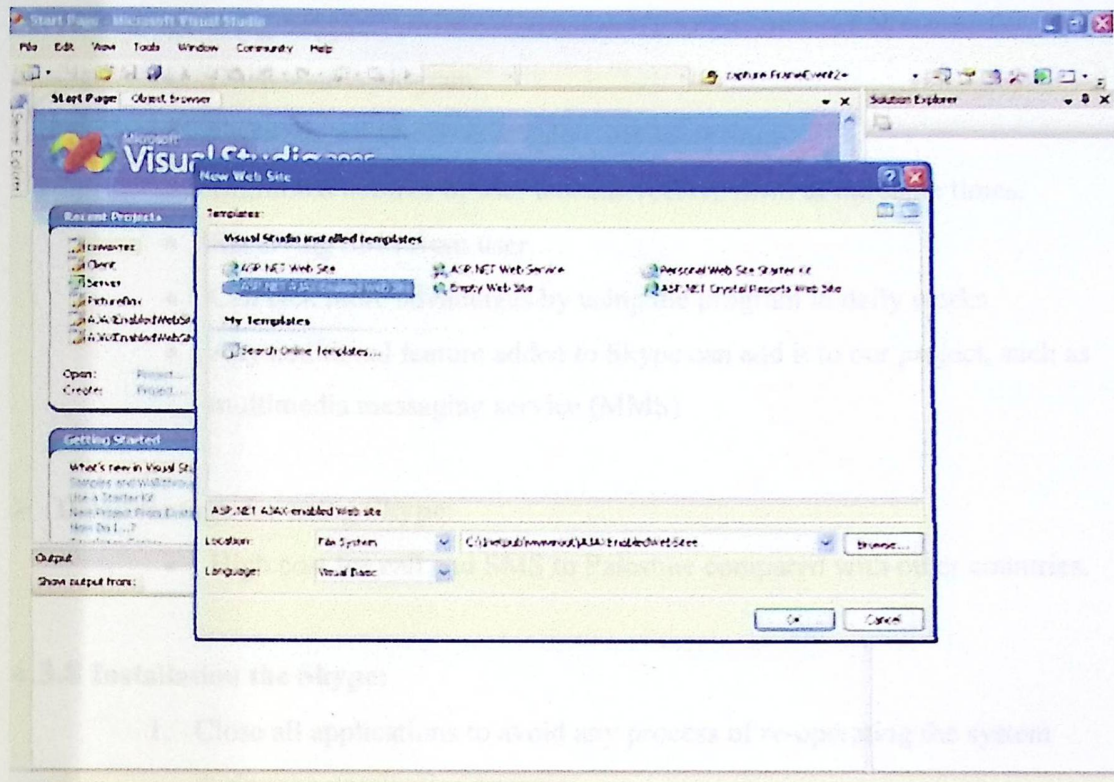Figure (4. 2) Begin installing ASP.Net 2.0 AJAX extension.

Figure (4. 3) Creating and naming ASP.Net 2.0 AJAX.

4.3.7 Skype:

Skype is an open source program created by a little piece of software that makes communicating with people around the world easy and fun. The Skype company supplies to the developers libraries, classes and plug-in to get the advantages of these program in their projects. [3]

Why do not use any hardware to make calls?

- The purpose of project is reducing any additional cost, such as any hardware that can be replacing it with any software.
- Can't send short messages (SMS).
- It's difficult to connect hardware with programming language.

Therefore, we used in our project "Skype", to make call's and send sms to customer when it's need.

> **Advantage using Skype:**

- Open source program.
- Up to 4 users can receive call at the same times.
- Unlimited number of user that can receive SMS at the same times.
- Receiving SMS from user.
- Can tack more advantages by using the program in daily works.
- Any additional feature added to Skype can add it to our project, such as multimedia messaging service (MMS).

> **Disadvantage for using Skype:**

- High cost for call and SMS to Palestine compared with other countries.

4.3.8 Installation the Skype:

1. Close all applications to avoid any process of re-operating the system during the nomination process.
2. Introduction of the CD Installing Skype connection and select any language.
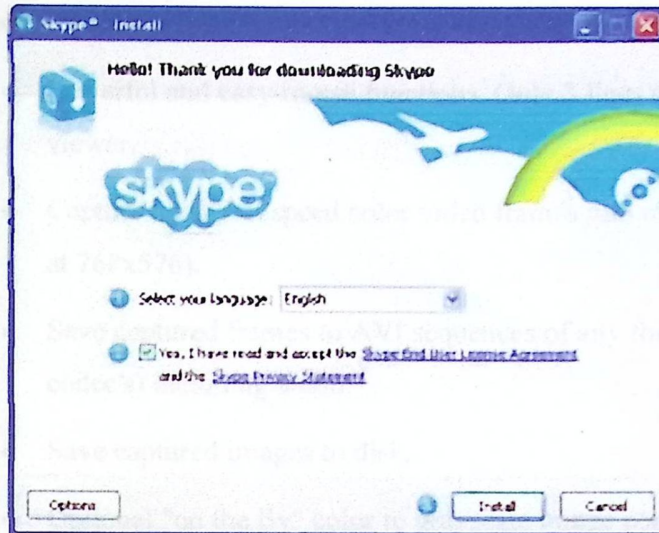3. After automation of the choose Setup.exe and then choose the manner known Setup.exe. [4]

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Figure (4. 4) Begin installing skype.

4.3.9 VideoOCX:

VideoOCX is an ActiveX control that allows programmers to easily integrate video capture and image processing capabilities into their software applications. Applications range from professional scientific image processing and surveillance to computer vision and general multimedia programs.

VideoOCX allows you to capture video in one simple step. Just drop VideoOCX into your application, change a few properties, add a few lines of code, and you are ready to go.

➤ **How VideoOCX work?**

1. VideoOCX works smoothly in most ActiveX(TM) hosting environments, such as Visual Basic(TM), Visual C++(TM), Borland C++(TM), Delphi(TM) and FoxPro(TM).

2. The control is compatible with most Video-for-Windows (VFW) devices, such as USB cameras (Webcams) and frame grabbers in conjunction with a CCD (Charge coupled device) camera or camcorder.

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➢ **VideoOCX powerful features:**

- Powerful and easy-to-use functions, Only 3 lines of code for a video viewer.

- Capture up to full speed color video frames into memory (e.g. 25 fps at 768x576).

- Save captured frames to AVI sequences of any format (installed codec's) including audio.

- Save captured images to disk.

- Optional "on the fly" color to grayscale image conversion.

- Full access to raw RGB pixel data.

- Supports most USB Cameras.

- Supports RGB AVI sequences (can be compressed).

- Change image sources (AVI, VIDEO) by adjusting only one control property.

- Applications range from multimedia, quality control, and surveillance to webcams and much more.

- Compatible with any programming language that supports ActiveX (TM) (Visual C++ (TM), Visual Basic (TM), Delphi (TM) etc.)

- Includes free VideoOCX Tools, which let you easily add image processing functions to your application.

> **VideoOCX tools:**

VideoOCX tools are automatically installed along with the VideoOCX.

> **VideoOCX tools include the following functions:**

- Insert date & time into your video images.

- Motion Detection (difference between last and current video frame).

- Difference between any two video frames.

- Normalization of gray values.

- Implementing these functions is just as easy as working with all the other VideoOCX features that you already know.

4.3.10 Installation the VideoOCX:

1. Close all applications to avoid any process of re-operating the system during the nomination process.
2. Introduction of the CD Installing VideoOCX and select any language.
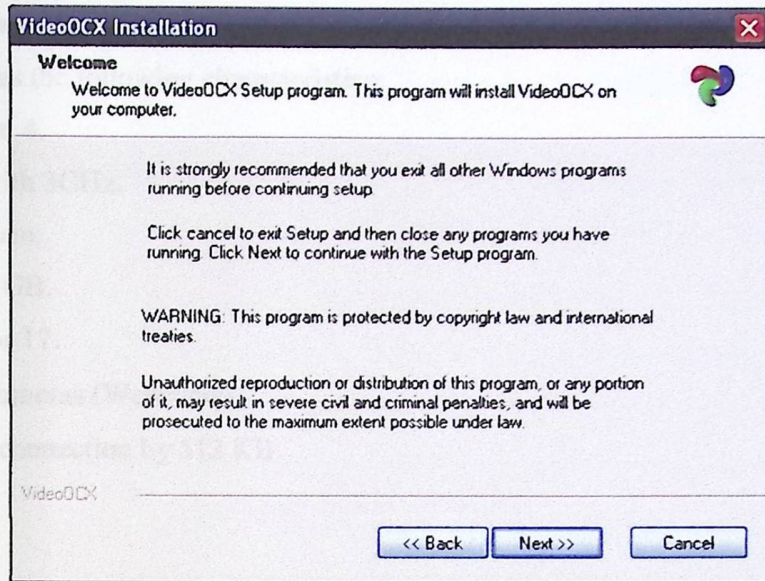3. After automation of the choose Setup.exe and then choose the manner known Setup.exe.[5]

Figure (4. 5) Begin installing VideoOCX.

4.4 Supporting software:

Many of software programs are used to support the system:

1. Photoshop that used to improve the appearance of the application software.
2. Skype that is used to make connection between the intermediate mobile and the computer.
3. Microsoft Visio that used to draw the flowchart, context diagram.
4. Macromedia flash.

4.5 Operating the system:

After completing the preparation of programmed and tools needed by the system and successfully completed, and writing code for each operation, the system is ready for its operation, and able to execute its tasks, and take the appropriate decision when any danger and risk.

➢ **Specifications necessary for operating the system:**

● Server has the following characteristics:

• Pentium 4.

• CPU with 3GHz.

• 1GB Ram.

• HD 40 GB.

• Monitor 17.

● USB –Cameras (Webcams).

● Internet connection by 512 KB.

Chapter Five

System Testing

> Introduction.

> System Unit testing.

> Sub-system testing.

> Integration testing.

> Snapshots.

5.1 Introduction:

In this chapter we will show the important step, and must before deliver the system testing it. Important of system testing to verify the reliability of each unit, each part of the system to achieve it serves, requirements, specifications, requirements, and work as what is expected.

➢ **The testing process includes three levels:**

- System unit testing.

- Sub-systems testing.

- Integration testing.

5.2 System unit testing:

At this level of testing the system is divided into subsystems, each one of them will be testing separately to ensure that each one is meet its requirement.

➢ **Specification of system unit testing:**

- Testing the function of each application from the system, testing each unit that is executing program such as: enable or disable the button that is operating the system.

- Testing the operations of each application links such as: find the histogram and mean square error (MSE).

- Testing the quality of each required image such as: detection time.

- Testing the operation of each technology such as: operation of Ajax.Net.

- Testing the operation of communication program: such as Skype.

5.3 Sub-systems testing:

In this level of testing, the system related units and components are tested with each unit such as:

1. Testing send SMS form the system that should send to office manager.
2. Testing image analyses form each function to application system.
3. Testing the system functions that operate through the monitor page to ensure they meet their specification.

5.4 Integration testing:

The testing process includes two levels:

1. **Alpha testing:**

   The test of an application when development is nearing completion, design changes may still be made as a result of such testing, typically done by programmers or testers.

a. **Test 1:**

A small different in Curtains made by wind, result do not discover this different.
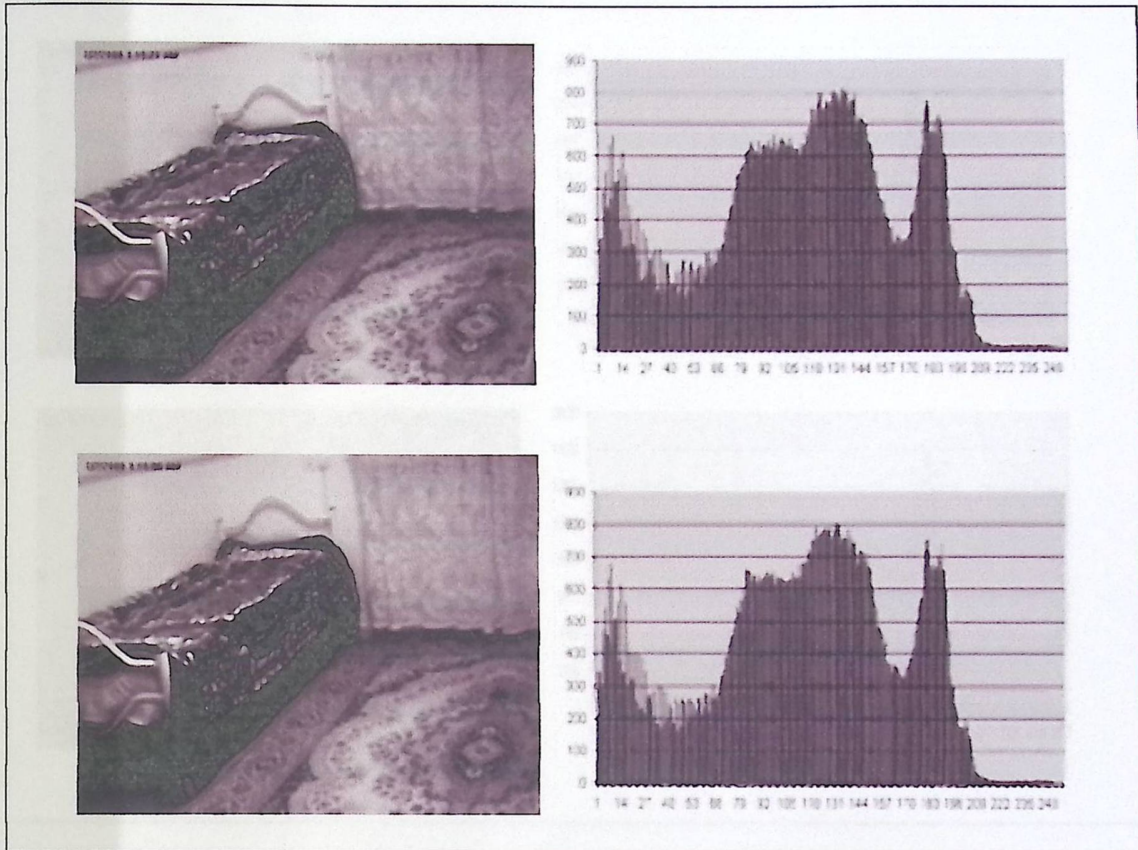

Figure (5. 1) A small different in Curtains made by wind.

b. **Test 2:**

A small fast object passes, the distance between it and camera medium, result do not discover it.
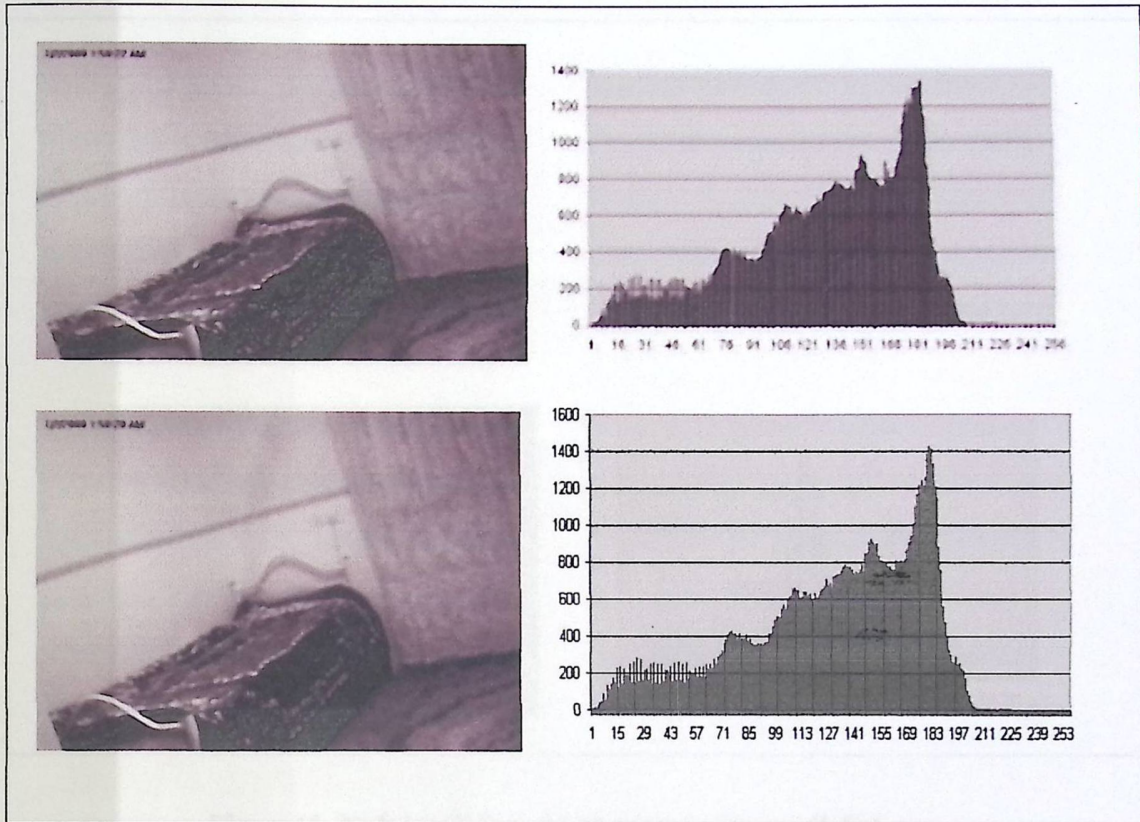

Figure (5. 2) A small fast object passes with medium distance.

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c. **Test 3:**

A small fast object passes, the distance between it and camera small, result discover it.
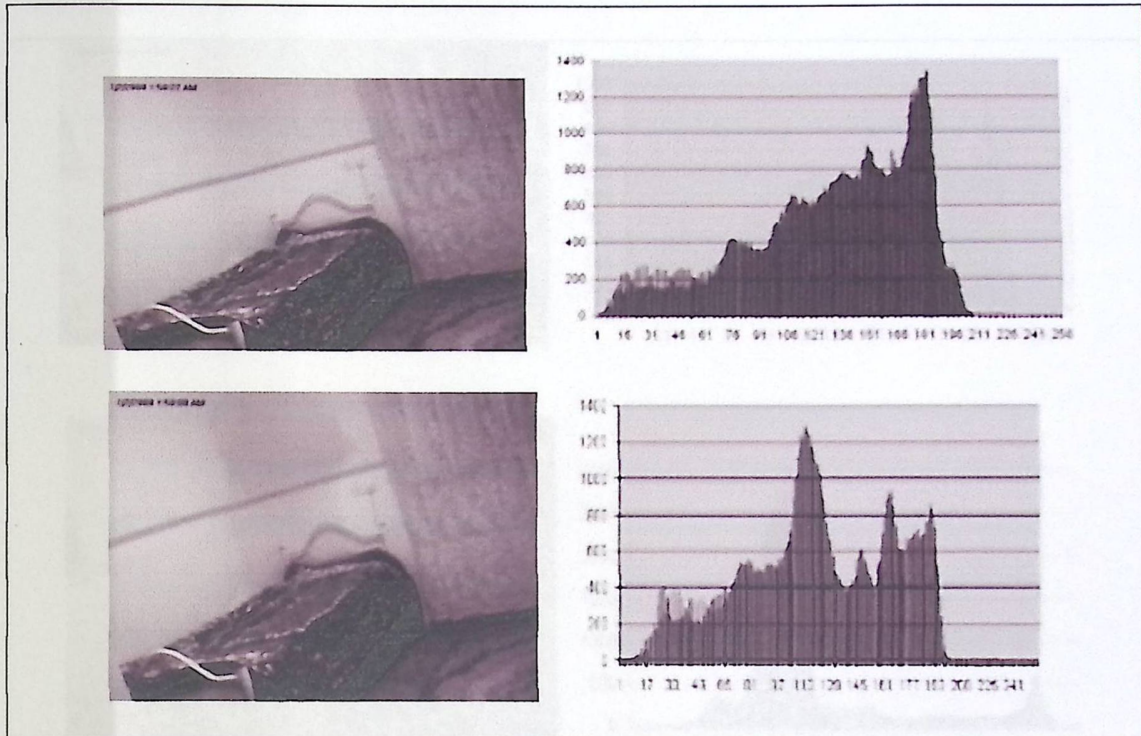

Figure (5. 3) A small fast object passes with small distance.

d. Test 4:

A big fast object passes, the distance between it and camera medium, result discover it.
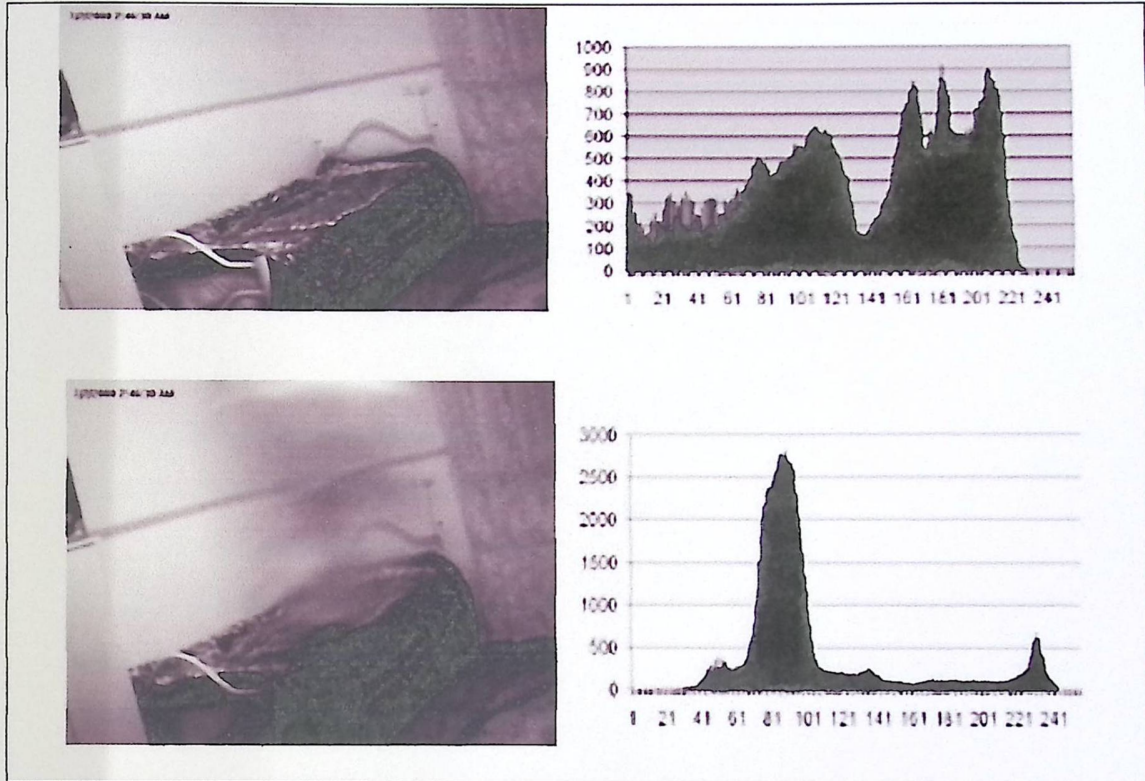
Figure (5. 4) A big fast object passes with medium distance.

Beta testing:

The test when development and testing are essentially completed and final bugs and problems need to be found before final release, typically done by office manager or others, not by programmers or developers.

5.5 Snapshots:

At this part we will take some snapshots from Office manager forms.

5.5.1 Office manager forms:

- Snapshot for office manager log form:
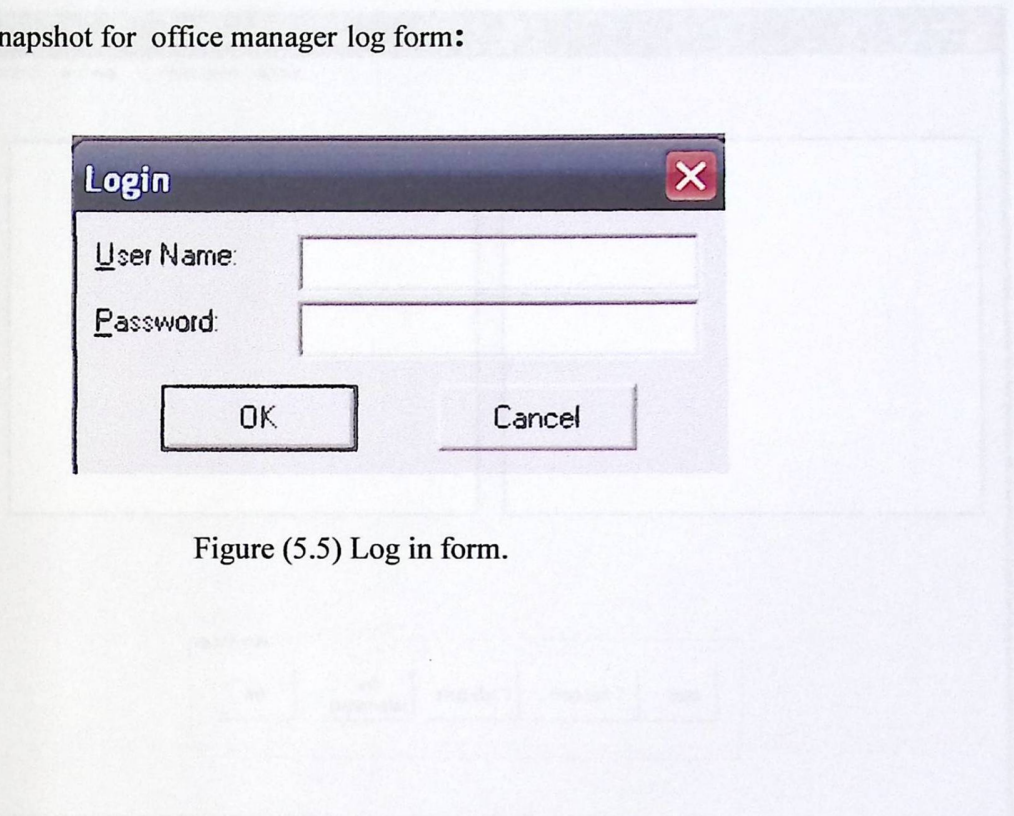
Figure (5.5) Log in form.

- Snapshot for office manager main form:

From this form can controlling and maintaining all system functionality.
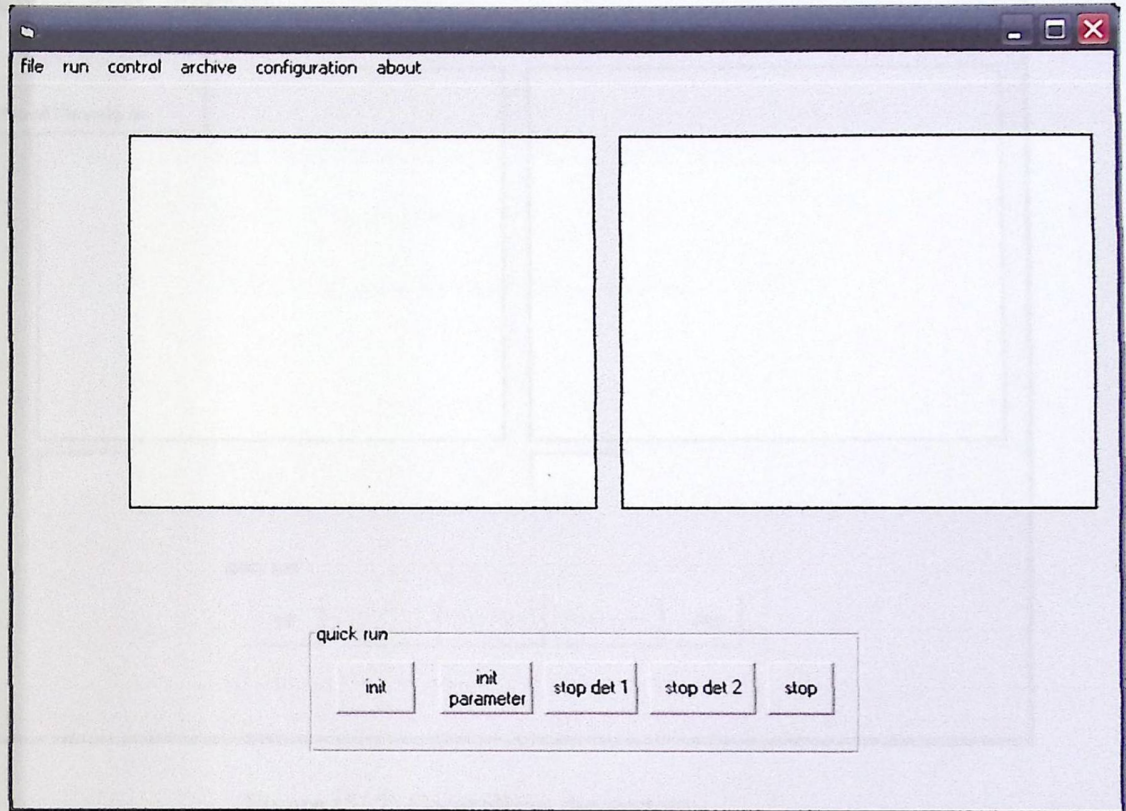
Figure (5. 6) Control form.

- Snapshot for controlling the detection:

  From this menu we can control start and stop detection.
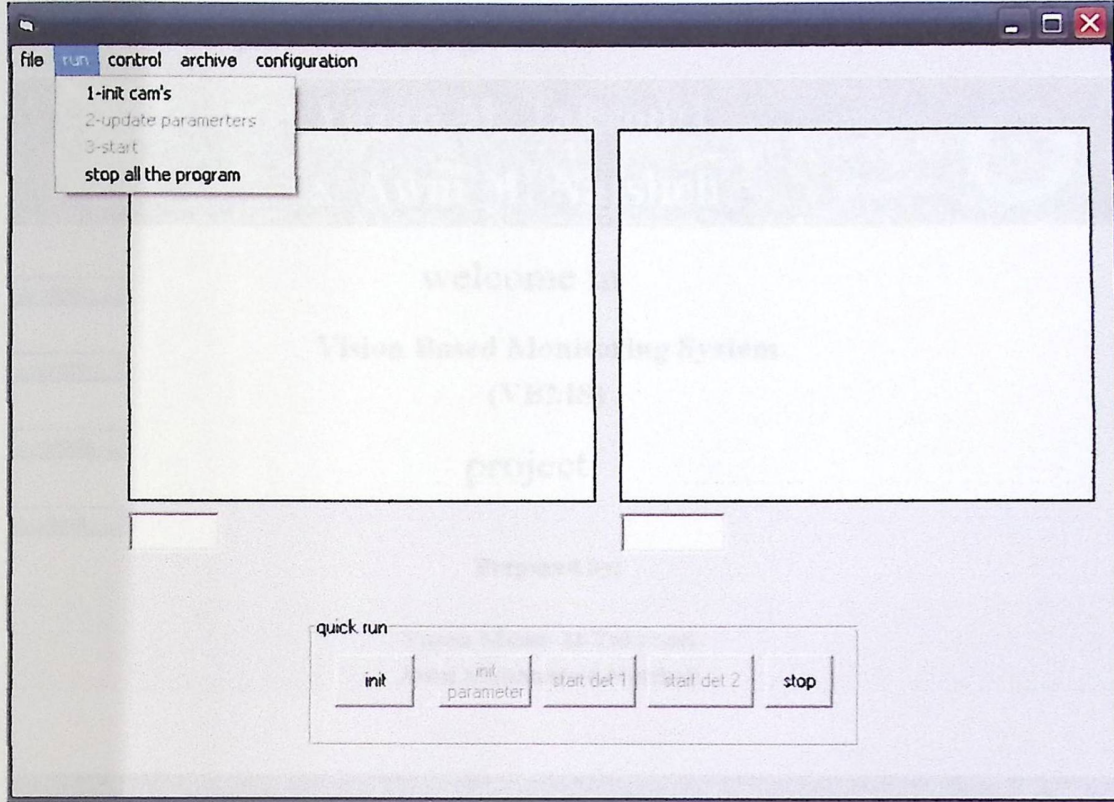
Figure (5. 7) Controlling the system.

5.5.2 Office manager web pages:

- Snapshot for main page:

Figure (5. 8) Main page.

- Snapshot for office manager log page:
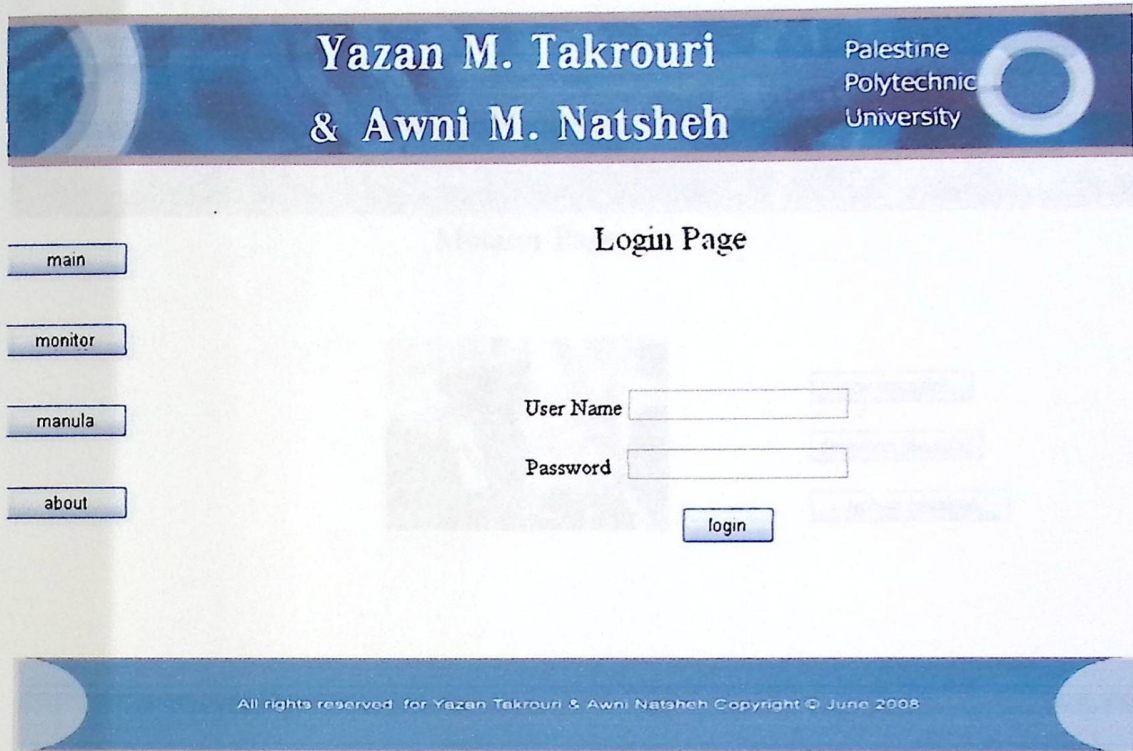
Figure (5. 9) Log in page.

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- Snapshot for monitor page:

Vision Based Monitoring System (VBMS) — Palestine Polytechnic University

Monitor Page

main

monitor

manula

about

view (disable)

detection (disable)

archive (disable)

view (disable)

detection (disable)

archive (disable)
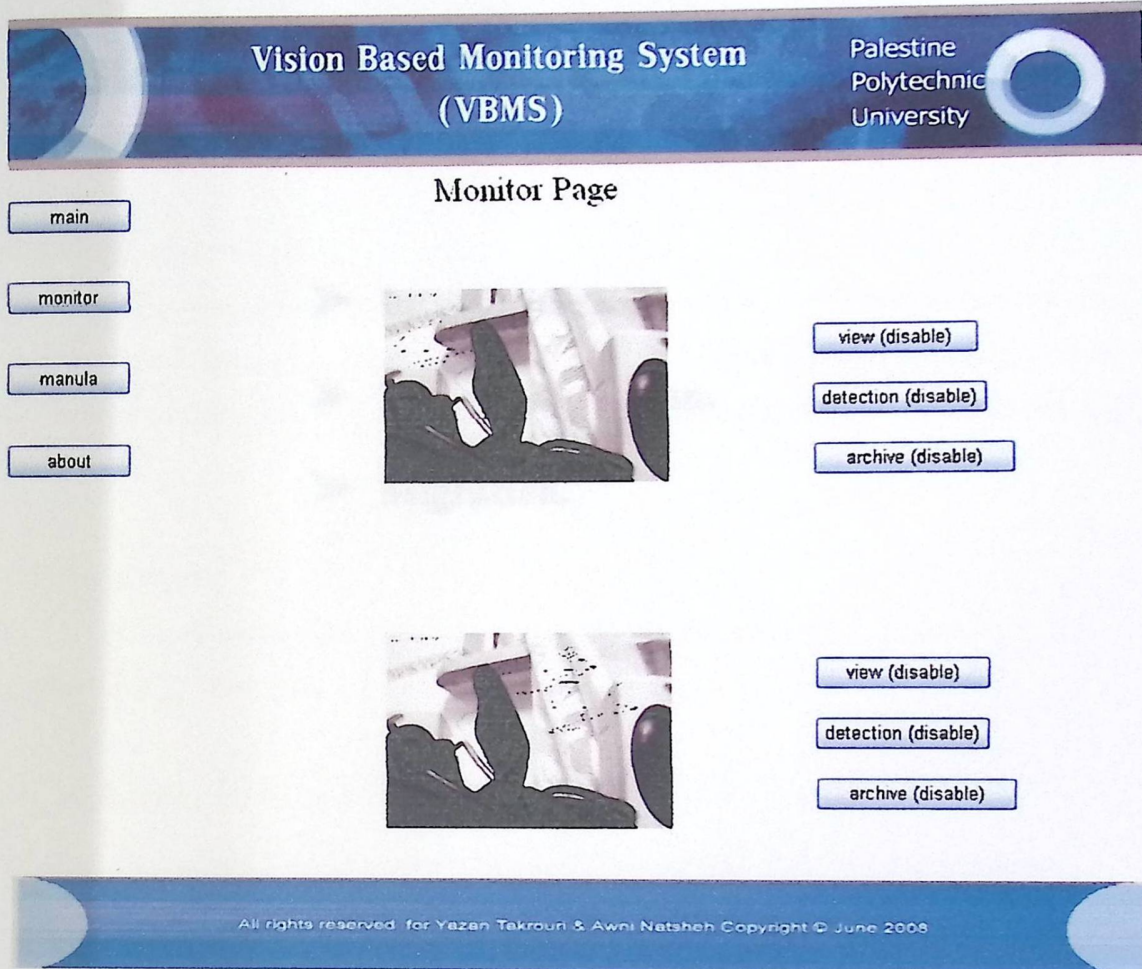
Figure (5. 10) Monitor page.

Chapter Six
System Maintenance

> ➤ **Introduction.**

> ➤ **Maintenance Plan.**

> ➤ **Migration.**

6.1 Introduction:

In this chapter we will describe the process that the system represents a final stage of the life cycle of the project, the system move to work in the real environment, and avoid any problems possible occurrence during transport the system in the real environment.

6.2 Maintenance plan:

When we run the system in the work environment, there are real probabilities of occurrence of some errors and problems that must be avoided; the office manager does not have the ability to solve problems, so necessary to develop a plan for maintenance of the system.

6.3 Migration:

In this section of the system be preparing to ensure that all operational sources explained in the past, and to make sure it works properly.

➤ **Migration process includes three steps:**

- Creation of the production environment: the system will not operate without visual basic 6.0 and communication program, so the company must have all elements required, and system must have the minimal requirement to running it.

- Deployment the new system: the system must be describe the steps that should follow to operate the system, then the minimal requirement to operate the new system, and new system cover all the functional requirement of the office.

- Run the system: after the end of tow step creation of the production environment and deployment the new system that it can run the system.

6.4 Mobile maintenance:

Must be check battery and credit (for send SMS), and each time should be maintained.

6.5 Communication program maintenance (Skype):

To maintain Skype it need to be update each period.

Chapter Seven
Conclusion and Recommendation

➤ **Introduction.**

➤ **Conclusion.**

➤ **Recommendation.**

7.1 Introduction:

After ending the process of developing the vision based monitoring system (VBMS) using SMS, a research team to points of results will be clarified in this section in addition to a set of recommendations that would improve the system in the future.

7.2 Conclusion:

➢ Build and develop a Vision Based Monitoring System (VBMS), so that direct interaction between system and office manager.

➢ The system Provides easy access for office manager page to control their monitor page.

➢ The system as a dynamic system, its can send SMS as a full automated system in the event of any threat or warning.

➢ Develop this application to allow office manager to change his status using SMS.

7.3 Recommendation:

➢ Develop MSE algorithm to solve light problem.

➢ Develop our system to support multimedia messaging service (MMS).

➢ Replace image to video stream in webpage display.

➢ We recommend operate the system in Hebron offices.

References:

1. http://webdesign.about.com/od/ajax/a/aa101705.htm

2. Programming ASP.NET AJAX: Build rich, Web 2.0-style UI with ASP.NET AJAX

3. http://skype.com/intl/en/

4. http://www.connectotel.com/sms/skype.html

5. http://www.videoocx.de

Appendix:

```
Private Sub initfun1()

        GVImage1 = 0
        ShowModes()

        'Initialize
        If (Not Video1.init) Then
            MsgBox(Video1.GetLastErrorString)
            c1 = False
            Exit Sub
        Else
            c1 = True
        End If
        GVImage1 = Video1.GetGrayImageHandle
        If (GVImage1 = 0) Then
            MsgBox("Initializing Image handle failed.")
        End If
        ShowModes()

        If Video1.mode = 0 Then
            Video1.SetPreview(1)

        End If

        'start

        If (Not Video1.Start) Then
            MsgBox(Video1.GetLastErrorString)
            Exit Sub
        End If

        ShowModes()

    End Sub


Private Sub firsthisto_Click()

        Erase i1
        Video1.Capture(GVImage1)
        matrix1 = Video1.GetMatrix(GVImage1)
        i1 = histo(matrix1, Video1.GetImageHeight(GVImage1),
Video1.GetImageWidth(GVImage1))
        Me.Timer5.Enabled = True
End Sub


Private Sub Timer4_Timer()
        Dim i4() As Double
        Dim b As Long
```

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```vb
        If (dit2) Then

            Me.Command3.Caption = "stop det 2"
            startd2.Caption = "stop det 2"
            If (Video2.Capture(GVImage2) > 0) Then
                Video2.Show(GVImage2)
            End If
            Video2.Capture(GVImage2)
            matrix2 = Video2.GetMatrix(GVImage2)
            i4 = histo(matrix2, Video2.GetImageHeight(GVImage2),
Video2.GetImageWidth(GVImage2))


            b = mse(i3(), i4())

            If (b > 5000) Then

                Text2.Text = b
                firsthistofun2()
                w.URL = ("1.mp3")
                w.Settings.volume = 100
                Me.Command6.Visible = True
                If (AXSkype1.ActiveCalls.Count = 0) Then
                    sendsms("00970599000000 cam2 alarm")
                    AXSkype1.PlaceCall("00970599000000")
                End If
            End If
        Else
            Me.Command3.Caption = "start det  2"
            startd2.Caption = "start det 2"

        End If

        Erase i4
        Erase matrix2
        b = 0
    End Sub
```

```vb
Public Function histo(matrix As Variant,h As Long, ByVal w
As Long) As Double()
        Dim x As Integer
        Dim y As Integer
        Dim e As Double
        Dim hi() As Double
        ReDim hi(256)
        Dim r As Integer
        Dim p As Integer
        For y = 0 To (h) - 1
For x = 0 To (w) - 1
                p = matrix(x, y)
                hi(p) = hi(p) + 1
        Next x
    Next y
        Dim size As Long
        size = h * w
        For r = 0 To 255
            hi(r) = (hi(r) / size) * 100000
        Next r
        histo = hi()
    End Function


Public Function mse(a() As Double,b() As Double) As Long
        Dim s, m As Long
        s = m = 0
        Dim i As Integer
        For i = 0 To 255
            s = s + ((a(i) - b(i)) * (a(i) - b(i)))
        Next i
        m = s / 255
        mse = m
    End Function

''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''

Private Sub smsreceive _Timer()

        Dim sender As String
        Dim phone As String
        Dim comm As String

        Dim a As Integer
        Dim b As Integer
        a = 0
        b = 0
        a = AXSkype1.ActiveChats.Count
     If (a > 0) Then
            For b = 1 To a
```

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```vb
            sender = AXSkype1.ActiveChats.Item(b).Name
            sender = Mid$(sender, 2, 12)
            phone = AXSkype1.ActiveChats.Item(b).Messages(1).Body
            phone = Right$(phone, 15)
            phone = Mid$(phone, 1, 12)
            comm = AXSkype1.ActiveChats.Item(b).Messages(1).Body
            comm = Mid$(comm, 2, 10)


            If (sender = "sms-to-skype" And phone = "972599000000")
Then


                If (comm Like "detenable*") Then
                    'Print ("1")
                    Open "C:\Documents and Settings\yazan\My
Documents\Visual Studio 2005\WebSites\project1\status\start1.txt" For
Output As #3

                    Write #3, "1"
                    Close #3

                    Open "C:\Documents and Settings\yazan\My
Documents\Visual Studio 2005\WebSites\project1\status\start2.txt" For
Output As #3

                    Write #3, "1"
                    Close #3
                    firsthistofun1()
                    firsthistofun2()
                    procaption()
                    Me.AXSkype1.ClearChatHistory()
                    w.URL = ("Nokia tons.mp3")
                    w.Settings.volume = 100
                ElseIf (comm Like "detdisable") Then
                    ' Print ("2")
                    Open "C:\Documents and Settings\yazan\My
Documents\Visual Studio 2005\WebSites\project1\status\start1.txt" For
Output As #3

                    Write #3, "0"
                    Close #3

                    Open "C:\Documents and Settings\yazan\My
Documents\Visual Studio 2005\WebSites\project1\status\start2.txt" For
Output As #3

                    Write #3, "0"
                    Close #3
                    procaption()
                    Me.AXSkype1.ClearChatHistory()
                    w.URL = ("Nokia tons.mp3")
                    w.Settings.volume = 100
                ElseIf (comm Like "arcenable*") Then
                    'Print ("3")
                    Open "C:\Documents and Settings\yazan\My
Documents\Visual Studio 2005\WebSites\project1\status\arcstat1.txt" For
Output As #3

                    Write #3, "1"
                    Close #3
```

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```
                              Open "C:\Documents and Settings\yazan\My
Documents\Visual Studio 2005\WebSites\project1\status\arcstat2.txt" For
Output As #3
                              Write #3, "1"
                              Close #3
                              Me.AXSkype1.ClearChatHistory()
                              procaption()
                              w.URL = ("Nokia tons.mp3")
                              w.Settings.volume = 100
                       ElseIf (comm Like "arcdisable") Then
                          ' Print ("4")

                              Open "C:\Documents and Settings\yazan\My
Documents\Visual Studio 2005\WebSites\project1\status\arcstat1.txt" For
Output As #3
                              Write #3, "0"
                              Close #3

                              Open "C:\Documents and Settings\yazan\My
Documents\Visual Studio 2005\WebSites\project1\status\arcstat2.txt" For
Output As #3
                              Write #3, "0"
                              Close #3
                              procaption()
                              Me.AXSkype1.ClearChatHistory()
                              w.URL = ("Nokia tons.mp3")
                              w.Settings.volume = 100
                       End If
                    End If
                Next b
         End If
         AXSkype1.ResetCache()
     End Sub
''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''

Public Sub sendsms(camnumber As String)

     Skype1.sendsms ("009700599000000", camnumber & "alarming")

   End Sub

Public Sub Call(Telnumber As String)

     Skype1.PlaceCall ( Telnumber)


   End Sub
''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''''

Private Sub archive_Timer()

     save1("c:\1\image" & Text3.Text)
     Text3.Text = Int(Text3.Text) + 1
   End Sub
```