VSAS - Video Surveillance Alert System

Software Requirements Specification

Software version(s): 0.0 - 1.0

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Revision History

Date	Description	Author	Comments
2-19-13	Version 1	Team 4	First Revision
3-13-13	Finalize sections 3-4-5	Team 4	Revision of section 2, and addition of sections 3-4-5

Document Approval

The following Software Requirements Specification has been accepted and approved by the following:

Signature	Printed Name	Title	Date
	Stephen Hughes	Instructor CS2720	

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1. Introduction

1.1 Purpose

To establish the design and functionality of our video surveillance software. This document will be used by: developers, customers, managers, designers, QA testers and critics.

1.2 Scope

- Name of software: Video Surveillance Alert System (VSAS).
- Purpose of software: This system is built around detecting motion through a USB webcam provided by the user. When motion is detected, video is recorded and uploaded to an online hosting provider. E-mail notification is sent to the user containing a snapshot of the detected motion and a link to the recorded video, along with motion characteristics. These satisfy the customer's need for security.
- Software will provide continuous motion-monitoring surveillance of a remote location for personal security purposes.

1.3 Definitions, Acronyms, and Abbreviations

1. VSAS - Video Surveillance Alert System
2. Tolerance - Threshold above which motion is considered a security risk.
3. Expanse - A description of the size of the detected motion.
4. Duration - Describing the time of the detected motion.
5. Hosting Provider - Online storage base (see DropBox)
6. Dead Areas - Areas with continuous motion to be ignored by alert system.

7. PIL- Python Imaging Library
8. USB- Universal Serial Bus
9. URL-Uniform Resource Locator
10. SMTP-Simple Mail Transfer Protocol
11. DropBox - a hosting provider used in VSAS

1.4 References

To be provided as necessary.

2. General Description

2.1 Product Perspective

VSAS is a custom built stand-alone desktop application personalized for our dedicated customer to meet his own security needs. All software requirements from the user will be matched according to his/her specifications. VSAS development team has experience in user interface design, online hosting provider interaction, software API, and communication protocols to make the VSAS software team able to meet full needs of user.

VSAS is unique. This product is being made to satisfy a customer's security needs. The customer requires a product that can watch an area 24/7. It must be able to detect disturbances in the area being watched. Customer is worried about thievery and trespassing. Thus, the customer needs visual proof of these occurrences should they arise.VSAS is being created with these worries in mind. Motion detection, video and image capturing are all apart of VSAS. They are specific to the customer's need, and provide the security that is needed.

2.2 Product Features

This is a motion detecting product. VSAS offers customizable settings to suit the user's needs. These settings can be adjusted by the user. It can detect anomalous behavior and immediately start recording. This recording will then be saved and stored in an online repository for the user's access. Also, an email will be sent to the user elaborating on the recorded motion.

Below is a diagram that outlines the general usage of this product. Once motion is detected an image is taken immediately. This is to be sent in an email to the user. Simultaneously the disturbance is being recorded by VSAS. This will be saved as a video and uploaded to an online repository accessible by the user. A link to the video will also be included in the email. Once all of this is compiled, the system will send the email, or alert, to the user. This is the overview of the behavior VSAS will provide. VSAS will also allow the user to adjust threshold settings to fit their needs. If the user does not want smaller disturbances recorded, then that can be adjusted.
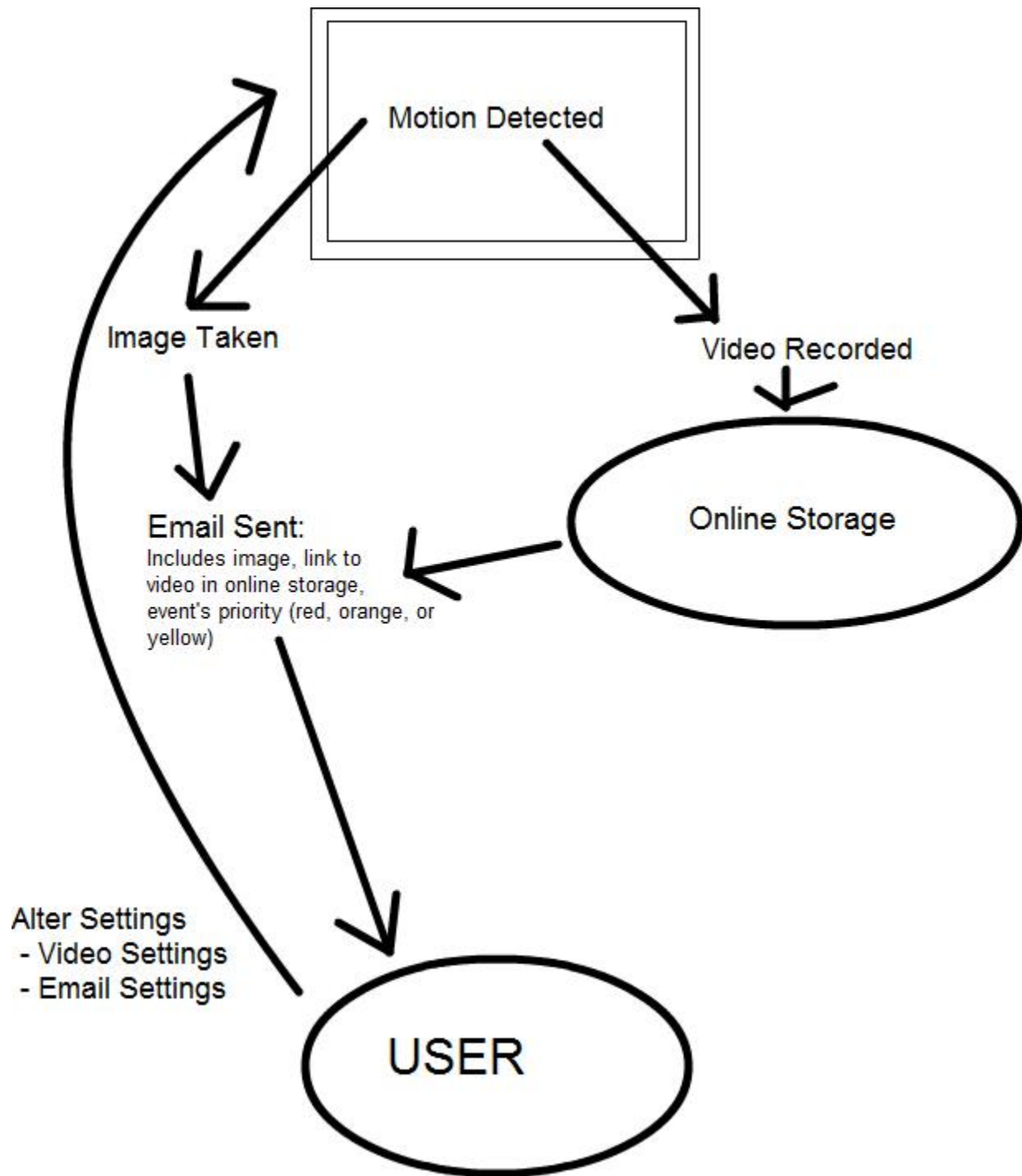
2.3 User Classes and Characteristics

VSAS is aimed at one moderately technical user. User will configure software specifications as frequently as 3 weeks. Software will run continuously between user interactions.

2.4 Operating Environment

VSAS is intended for use on a stand-alone desktop PC, which requires Python (automatically installed), appropriate webcam hardware, and an active local internet connection. VSAS will be aimed at operating on Windows 7 and Windows Vista PC's.

2.5 User Documentation

User manual documentation will be provided with software, along with access to a web resource.

All separate interactions in the VSAS software will include specific help documentation for that one task in front of the user. If a user needs help completing a task and they feel overwhelmed and do not want to go through an entire software documentation for help, this feature will provide them immediate help.

3. System Features

3.1 System able to detect motion

Priority: High
Description: Software is able to use a webcam camera to detect motion in sight of camera's view. System will react to motion of webcam with user specified events.

3.1.1 System shall use a USB webcam feed to detect motion (and subsequently decide when a trespasser is present), capture images of the motion, and record the motion.

System shall use a USB webcam feed for all motion detection. Webcam must be installed by the user prior to installing VSAS software. VSAS is not responsible for installing webcam software.

All motion detection will be processed in the backend without user administration. Software will monitor the webcam's view continuously when PC is idle. System will be responsible for deciding when motion is detected in the webcam's view. When this motion is discovered, system will record video footage of the motion and continue to do so until the motion has ceased.

3.1.2 System shall be able to detect motion with the images processed by the system retrieved from the USB webcam feed

Using image comparison, the system shall be able to detect motion through changes within the frame (pixels in the image).

3.1.3a System shall be able to detect motion.

System shall determine when motion has been detected based on tolerance level set by user. (see section 3.4.2 and 3.4.3 for tolerance definition).

3.1.3b System shall record video footage of detected motion until a limit is reached

User has ability to give system a threshold level (see section 3.4.2 and 3.4.3 for tolerance definition) that determines if motion is considered dangerous enough to record footage of. Footage will continue to be recorded until either the motion is below the threshold level again or a maximum recording limit has been reached. If the time limit becomes reached, system will halt and alert owner of system that system has stopped all motion detection. (more information may be found in section 3.1.6) The exact time limit is still being discussed amongst the group to figure out the most appropriate maximum time limit.

3.1.4 System shall save an image of initial motion capture.

The software will save an image taken from initial motion capturing video feed for inclusion in alert email.

3.1.5 System shall save video recordings to the web hosting service Dropbox

This recorded video footage shall then be uploaded to the online hosting service Dropbox, and then receive and save the designated URL of the page containing the video for access by the user.

3.1.6 System shall be able to shutdown when a motion continues after a specified amount of time

If a non-threatening continuous event happens in the camera's view (example: broken door swinging from wind blowing), system will record all of motions activity like normal and execute all instructed activities, but has ability to halt after a certain amount of time assuming that motion will never stop. This is to improve experience for user as they will not be receiving an overload of emails and videos being uploaded.

3.1.6.a If the system has to halt for reaching the excessive time limit, the system shall inform the user to manually restart the system.

System will email the VSAS owner informing them that software is experiencing difficulties and user needs to manually resolve issue and start system up again.

3.1.7 System shall take in parameters concerning extended periods of motion and their alert notifications.

The system shall set a maximum length of motion recording. The system will have a default time limit for recording continuous motion, at which point it will trigger the email alert process, and restart recording. This is to give the user an email in the most timely fashion possible. The system shall repeat this process up to a certain amount of times, as defined by the design team.

Once motion has stopped, subsequent video recording will stop, and user will be notified as usual.

3.2 All user and system interactions will be between software GUI interface.

Priority: High
Description: VSAS will have a GUI interface to interact with software components. Every feature of software will be presented to user in GUI form with buttons, text boxes, checkboxes and forms so software interaction is a simple click and type interaction.

3.2.1 User will access all available options concerning the software through a Graphical user interface

When software is booted up, user is presented with a main screen. The screen is going to include a live stream of the webcam's view along with all available options and features to the user.

The user will be presented with way in which they may change all of the settings the software can provide. This includes options to change the motion detection sensitivity, select "dead areas" where camera should ignore motion happening, email addresses that alerts will be sent to, along with an event log where user can view all previous recording information. The user will also be

able to quickly view the log details of the last video system detection. This previous recording information includes date and time of motion, length of time motion was detected, a URL to the recorded video footage online, and an event "flag". A flag is made up of three levels: red, orange and yellow. When the software tracks motion, depending on the length and size of motion, the software will label the motion as red (most serious), orange (moderately serious) and yellow (least serious). The labels will apply at specific, predefined levels of sensitivity, and when motion is detected, the software will report the alert level closest to captured motion level.

The last option that is available to the user is the ability to change the position of the camera. Anytime the user wants to move the webcam to face a different area, the user is able to select an option that tells the system to pause motion detection and allow the user to move the camera freely. Once user is satisfied with new position, user will tell system to begin motion detection again.

3.2.2 The system shall present an image of the webcam feed

This feature will help the user more easily adjust the position of the webcam.

3.2.3 The system shall provide a way to pause or start/stop recording

Anytime the user wants to move the webcam to face a different area, the user is able to select an option that tells the system to pause motion detection and allow the user to move the camera freely. Once user is satisfied with new position, user will tell system to begin motion detection again.

If the user decides that they want all motion detection to halt, simply exit the VSAS software and all program functionality will halt. This will stop the system from all motion detection and processing completely. To begin process back up again, user may start software back up again. This is the easiest way for user to start and stop software.

3.2.4 Anytime user does not feel able to complete a task, a "Help" option is always provided

On any screen that user is currently viewing, a "Help" feature is always available where the user may select and be given step-by-step instructions to help complete all features available to them. For example: If user is trying to edit the Email addresses list but not quite sure how, they may select the "Help" option and they are told exactly how to add, edit, and delete the email addresses from the system. This gives user direct access to help without having to hunt through the full software documentation to find an answer.

3.2.5 User will be given direct access to full software documentation.

Full documentation outlining every feature of software will be given with software package. User may navigate to this documentation (locally on machine and online via software website) and browse all of the available help articles explaining every feature in the VSAS software.

3.2.6 GUI main screen will display the details of the last recorded event.

The timestamp, alert level, and link to Dropbox URL log details from the very last system motion detection will be displayed on the main screen of the interface.

3.3 When motion is detected, user(s) are informed via Email

Priority: High
Description: User will be alerted about any motion detection through emails sent to user. These emails give user all information regarding the motion to make it a quick and easy reference to that specific motion detected by the system. In case user misplaces an email, system stores a log of all previously detected motion events (this is discussed in section 3.3.3).

3.3.1 Emails are sent to user defined list of email addresses

Via the VSAS software, the user has the ability to add, edit, and delete a list of email addresses that detected motion information will be sent to.

3.3.2 User(s) will receive details concerning the captured motion

All users listed inside of the VSAS user defined email list will receive an email with all of the following information:
1. Date and time motion was detected
2. Duration of how long in minutes/seconds motion was detected
3. URL link to recorded video footage of captured motion user may preview
4. System's threat level prediction flag (Red, Orange or Yellow flag demonstrating the system's guess on how threatening the detected motion is.
5. URL link where user may be able to unsubscribe from email alerts. This helps in case user mistypes an email address and it gets delivered to wrong recipient and also to have a lesser risk of emails being flagged as spam.

3.3.3 Software will be able to record a text description of an event whenever motion is detected

The system will create an event to be placed within a log that contains a timestamp of the event, the recorded threat level (red, orange yellow further explained in section 3.2.1), duration of motion, and the URL link to recorded video footage.

The log will be a list containing all previous motion detected events. User will have the ability to delete events from the log, or reset entirely.

User will be able to access this log through a link on the main screen of the GUI.

3.4 User able to adjust settings of software to customize software to his/her needs
Priority: Medium
Description: User should be able to tell system certain values to act upon in the system monitoring process so software is tailored for the customer as much as possible.

3.4.1 System shall allow user to add, edit, delete email addresses from system that will receive motion detection alerts

Via the VSAS software on designated PC, user will be able to add, edit, and delete list of email addresses in the software that will receive email alerts. There will be one email address designated as the admin user account that will receive all email alerts from VSAS. This includes alerts and system error reports (explained in section 3.1.6). Having this one email address makes sure that the software always has one email address to send alerts to.

VSAS would like to include another feature to software that allows user to define exactly type of information each email address receives from VSAS motion detection alerts. If user would like one email address receive all motion detection information except the video link, they may do so. If two email addresses should receive only the motion snapshot, user may also configure software to do this.

3.4.2 User may adjust a tolerance that determines when to record based on how much motion is detected

This threshold is on a scale from 0-10. This ranges from a small disturbance, such as a cat or squirrel, to medium such as a dog, to high which will detect vehicles. Each disturbance level will capture any larger disturbance as well.

3.4.3 User may adjust a tolerance that determines when to record based on the length of disruption seen

This threshold is also on a scale 0-10. This ranges from a small amount of time, such as 5 seconds, to medium such as 30 seconds, and then high such as 2 minutes. This means that nothing will be recorded until motion has been detected for 'threshold' amount of time.

4. External Interface Requirements

4.1 User Interfaces

4.1.1 All screens provide a "Help" function

At any screen, at any time, user is able to access help if they are in need of it. User may not understand how to complete a task or use a specific function, so help is provided to user to explain each task and function.

4.1.2 The main screen will contain a webcam feed and options to edit system thresholds, emails, and initial image will be on the main screen

Clicking any button on the main screen will produce a menu on top of the main interface that will contain all options available to edit through the selected button.

4.1.3 All screens subsequent to the main interface will contain a 'save' and 'close' button.

At any subsequent menu beyond the main screen, the user will have the ability to save changes to their preferences and return to the main menu, or to close out of their edits and return without effect.

4.2 Hardware Interfaces

4.2.1 USB-only webcams are required to run VSAS.

VSAS was designed to be used by USB webcams only. All webcam functionality needs to be done by user before VSAS software execution. This includes but is not limited to, webcam drivers, webcam software suite either from hardware manufacturer or third-party. Make sure webcam is compatible with preferred Operating System before installation.

4.2.2 VSAS designed to run on 32bit or 64bit PC

VSAS is designed to run on a 32bit or 64bit PC computer. PC computers with different architectures may run VSAS software normally, but it will be up to user to test for himself/ herself. VSAS is not tested on any other architecture PC.

4.3 Software Interfaces

4.3.1 Windows Vista or Windows 7 are required to run the software

VSAS is developed on and tested to execute on Windows 7 and Vista operating system PCs. Other PC operating systems may be compatible with VSAS software, but that is up to user to test upon. VSAS is only confirmed to work on Windows Vista and 7 operating systems.

4.3.2 PIL will be the library used to modify/access images

PIL - Python Imaging Library - will allow us to use other Image manipulation libraries. PIL gives access to pixels, size, and also allows you to save an image. These features will be used to determine Motion thresholds. Also it will be used to store an image and send it in an email to the user. PIL is also a prerequisite to the other libraries that VSAS uses.

4.3.3 VideoCapture library will be used to capture images from a webcam

VideoCapture adds functionality for retrieving a webcam's images. PIL images will be returned from VideoCapture. PIL images are the default way Images will be handled in VSAS.

4.3.4 cv2 library for Python will be used to convert stored PIL images to video format (.avi format?)

PIL images captured from a webcam with VideoCapture will be converted to cv2 images. This is done because cv2 will be used to output these converted images into a specified video format.

4.3.5 numpy Python library will be required to run cv2

The numpy Python library will solely be used to allow cv2 to run. It is a requirement for cv2.

4.4 Communications Interfaces

4.4.1 VSAS uses SMTP protocol for all Email related communication

SMTP (Simple Mail Transfer Protocol) is the protocol used with all email communication so it is natural to be using this method of communication. Python includes a built in SMTP library giving developers easy access to email functionality.

VSAS sends all email through system constant email address: team4.cs2720@gmail.com Having this one designated email address that may not be changed hides some complexity from user. User simply wants to receive email alerts, they do not care where it comes from. GMail account addresses require some special authentication when sending email via SMTP compared to some email providers. All transfers are done through SSL encrypted port 587. Some security risks arise as email account password is in bz2 encryption. Bz2 is a poor method of security for storing passwords, but when using Python, there really is no way to fully secure a password from reverse engineering. For the scope of the project, this is the best our team can do. Our team does not have worries that software will be used for malicious activities.

4.4.2 All video recording footage uploading done through Dropbox hosting provider

Communication security is no issue as all Dropbox activity is executed with user permission. Dropbox account all footage is uploaded to has given VSAS permission via Dropbox authentication procedures.

Uploading content has no security threat as data is all stored in Dropbox's encrypted Amazon Simple Storage Services volumes. Only persons with decryption key (held by select Dropbox employees) has direct access to raw video footage inside of the account.

Only security threats through Dropbox functionality is Dropbox authentication keys are stored in VSAS source code where they may be called to upload and link to content without permission. VSAS will create Dropbox account and give account full authentication prior to software delivery to give user easiest possible experience through software. User may not be able to use different Dropbox account. All interactions to Dropbox service happens in background so user does not even know that Dropbox is even being used.

Anyone with URL link to video footage has ability to view and download recorded video footage of VSAS software. Generated links are completely public and available for anyone who has access.

5 Other Nonfunctional Requirements

5.1 Performance Requirements

The minimum RAM requirement for VSAS is 2GB for Windows Vista. This limit is set in place to make sure that VSAS can record events that last for long periods of time. When motion is detected the system starts saving each image that contains the motion. This can last for quite a while until the system decides to stop recording, save the video, and then resume recording. The saving of images can take quite a bit of memory depending on time, and thus 2GB is required for optimal performance.

5.2 Safety Requirements

The system does not provide a safety lock. The user shall lock his/her computer when he/she is going to be away from the computer. Leaving the computer unlocked can result in unauthorized individual changing VSAS settings thereby compromising VSAS' integrity.

The user shall safeguard the provided Dropbox URL link to the video(s). Anyone with access to the URL link can view and/or download the video footage. Generated links are completely public and available for anyone who has access. Safeguarding the URL link will reduce the potential for unintended or unauthorized use of the recorded video(s).

5.3 Security Requirements

The only user information that will be entered into VSAS will be the user's email. No passwords or other credentials will be required to run VSAS.

5.4 Software Quality Attributes

The system incorporated modern tools such as Dropbox and webcam. The system is designed in python. Since python is platform independent, running the system on platforms other than Windows will require minimal modifications thereby making the system portable and reusable.

Appendicies

Appendix A: Analysis Models

List all analysis models used in developing specific requirements previously given in this SRS. Each model should include a brief description. You should provide a different subsection for each class of diagram, e.g. use case diagrams, data flow diagrams, class diagrams, state-transition diagram or entity-relationship diagrams. It can be useful to reference specific

diagrams to clarify your descriptions throughout the SRS.

Appendix B: Issues List

This is a dynamic list of the open requirements issues that remain to be resolved, including TBDs, pending decisions, information that is needed, and conflicts awaiting resolution.