



UNIVERSIDAD DE GUADALAJARA
CENTRO UNIVERSITARIO DE LOS VALLES

Software Configuration Management Project

**System for the Inspection of a Photovoltaic Park with
Aerial Images in High Definition and Thermal**

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December 02, 2022

Ameca, Jalisco

About this document

This document has all the descriptions of the Software Configuration Management documents during all the semester. It will not have the information of each document to avoid repeating the information, but all they will be referenced. This will be a resume in detail of what and when the actions were taken.

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1. Introduction

This project describes all the documents and processes made during the software configuration management. But first of all, a brief description of the software related to the project is made. Then a description about software configuration management and the process applied to the project is described. What is show next, a report describing all the history of changes to each SCM document. At the end, the final versions for each document made are added.

The SCM process is important in every project because it determines how a change in a project that was already defined is to be managed. It is a determined flow chart that needs to be addressed during a process besides the software methodology. At the end of this process a description of the changes to the documentation and outcome for each change request needs to be displayed. So, the purpose is to make sure a good tracing was made for every change and to have a reference for future problems similar to the ones encountered.

2. Software configuration management process

A product that satisfies what a client needs is more likely to be a success than a failure. A software product also needs to have a documented and defined process for its creation. It has to meet the budget of the project as well as the time of delivery expected. There are a lot of parts that integrate a qualified software product, and the Software Configuration Management is one that helps assure a product has the quality expected. This discipline is responsible for identifying the configuration of a system at specific points in time to apply a methodological control of changes and make a tracing for the changes requested during all the system cycle. This section presents the definition of the four parts of the SCM process that are:

1. Software configuration identification
2. Software configuration control
3. Software configuration auditing
4. Software configuration status report

2.1 Software configuration identification

The beginning and one of the most important parts of the SCM process since its bad addressee will result in a disastrous outcome for the parts to come. The basic task in this phase is know which parts contained on the baseline can be affected by a change request (CR). The component that can change because of the implementation of the CR is identified as configuration item. The CIs actual state must be saved before making any changes to register the versions and compare the changes. Besides, if for any reason, the baseline must go back to a previous version, the versions have to be reachable. The baseline must have the present state of the project design.

2.2 Software configuration control

The main tasks for SCM are applied in here, where the evolution of the baseline of a software system is documented. This is the reason why the baseline should be finish or near finish, because there are times when some parts of the baseline have not yet been defined. The control is focus on the changes of the SCIs for every CR. This includes:

1. Documenting all the information regarding a CR to make a formal decision.
2. An organizational body for approving or disapproving the changes, named configuration control board.
3. Procedures for controlling changes to a software system.

An important aspect of the SCM is to note that the implementation of the CR is not part of the process or responsible for making the changes.

2.3 Software configuration auditing

The software configuration auditing process is to verify all the activities determined to

implement the CRs and have the history of each baseline created checked. It is intended to establish the traceability of throughout the software cycle. The benefit of implementing the auditing is to ensure the quality of the product based on the changes applied. It also helps double check that the requirements of the project have been correctly implemented. There is also an explanation between each baseline and also why some changes were not implemented. This phase also gives an overview of a CR status.

2.4 Software configuration status accounting

Finally, the SCM process is responsible of giving the final versions for all the documentation made. It also gives information of what was made during the process and references the activities done in the other stages. Here we also make an analysis of things made during the process to determine if they were followed as establish and present what issues were encountered and how they were resolve. The purpose is to have a final view of what the implementation of the CRs was needed.

3. History of changes

The tables shown below, are the descriptions of the changes to the documents made during this project. With the documents' versions, they are the evidence that the changes were made to the project. The tables contain the next items:

- **Date:** Date of the change made.
- **Document:** The name of the document that has the change.
- **Configuration items | Description:** Has the item from the document and what change was applied.
- **Documented on the repository of the project:** Check if the document is available at the project's repository.
- **Previous document version:** The name of the document's version that was modified.
- **Comments:** Specify what was seen about this change.

Table 3.1 Presentation of the first project baseline.

Date	08/26/2022	Document	Baseline SIPaF v0.1
Configuration items Description	Introduction		Initial release
	General description		Initial release
	Specific requirements		Initial release
Documented on the repository of the project			Yes
Previous document version		None	
Comments			
The date of the file creation was wrong.			

Table 3.2 Update for the project baseline.

Date	09/01/2022	Document	Baseline SIPaF v0.2
Configuration items Description	Design		Initial release
	Code		Initial release
	Tests		Initial release
Documented on the repository of the project			Yes
Previous document version			Baseline SIPaF v0.1
Comments			
No comments.			

Table 3.3 First change request added.

Date	09/01/2022	Document	Change Request Control v0.1
Configuration items Description	CR Policies		Initial release
	CR Priorities Manifest		Initial release
	CR-01		Documented
Documented on the repository of the project			Yes
Previous document version			None
Comments			
No comments.			

Table 3.4 Addition of 3 change requests.

Date	10/07/2022	Document	Change Request Control v1.1
Configuration items Description	CR-01		Analyzed
	CR-02		Documented and analyzed
	CR-03		Documented and analyzed
	CR-04		Documented and analyzed
Documented on the repository of the project			Yes
Previous document version		Change Request Control v0.1	
Comments			
The CR-01 was analyzed on September 9 of 2022, but there was no CRC version with this change only.			

Table 3.5 Modification to the CR Priorities request.

Date	18/10/2022	Document	Change Request Control v1.2
Configuration items Description	CR Priorities Manifest		Updated
Documented on the repository of the project			Yes
Previous document version		Change Request Control v1.1	
Comments			
The priorities manifest was missing some information about the priority score and it was ambiguous, so this value was explained better and change it to risk factor instead.			

Table 3.6 Decision for each CR shown.

Date	21/10/2022	Document	Change Request Control v2.0
Configuration items Description	Added decision made for each CR.		Show decision for CR-02, CR-03, and CR-04.
Documented on the repository of the project			Yes
Previous document version		Change Request Control v1.2	
Comments			
No comments.			

Table 3.7 Updated status for the CR-03.

Date	28/10/2022	Document	Change Request Control v2.1
Configuration items Description	Updated the status for each CR.		Status for CR-03 updated to 30%.
Documented on the repository of the project			Yes
Previous document version		Change Request Control v2.0	
Comments			
No comments.			

Table 3.8 Updated the baseline of the project based on the CR-03.

Date	03/11/2022	Document	Baseline SIPaF v1.0
Configuration items Description	Design		Changed modules definition.
	Code		Added the variables and methods needed to implement the CR.
	Tests		Added the test cases required to check the CR implementation.
Documented on the repository of the project			Yes
Previous document version			Baseline SIPaF v0.2
Comments			
No comments.			

Table 3.10 Updated status for the CR-03 when finished.

Date	03/11/2022	Document	Change Request Control v2.2
Configuration items Description	Updated the status for the CR-03 when finished.		Status for CR-03 updated to 100%.
Documented on the repository of the project			Yes
Previous document version		Change Request Control v2.1	
Comments			
Date of the status update on the document is doesn't match.			

Table 3.11 Updated the baseline of the project with the CR-03 finish.

Date	04/11/2022	Document	Baseline SIPaF v 1.1
Configuration items Description	Design		Updated the use case diagram of the project.
Documented on the repository of the project			Yes
Previous document version		Baseline SIPaF v1.0	
Comments			
This what it missed during the first version.			

Table 3.12 Status accounting report is made.

Date	17/11/2022	Document	StatusAccountingReport v1.0
Configuration items Description	Status accounting report		Initial release.
Documented on the repository of the project			Yes
Previous document version		None	
Comments			
This is the first document made.			

Table 3.13 Auditing document made.

Date	01/12/2022	Document	AuditingDocument v1.0	
Configuration items Description	Status accounting report		Initial release.	
Documented on the repository of the project			Yes	
Previous document version		None		
Comments				
This is the first document made.				

4. Configuration identification & configuration control

In this section is where all the final versions of the baseline made for this project during the SCM implementation is shown. The first and most important one is the baseline, then we have the CRC documents that include the configuration items, the policies for the CRs, the analysis made, and the outcome for each CR.

4.1 Baseline

This document contains a scope of all the project, where we can see the purpose of the project, the description of the project, the specific requirements, the design, the code and the tests. The latest version of it is added to this document, but a link to the first versions will be left on the References section on an online Github repository. This document contains the next sections of the project that can be considered as possible configuration items.

- 1) **Introduction:** This part of the baseline is made to introduce the context of the project to have an idea of where the project will be used and for what.
- 2) **General description:** In this section there are some rules the client or a standard is specifying for the project.
- 3) **Specific requirements:** This part has the functional requirements the software must have and is an important part to make a great design. This subsection has also the nonfunctional requirements for the project.
- 4) **Design:** In this subsection, the all the design of the software is shown, almost before making the coding of the project.
- 5) **Code:** In this subsection, the code of the project is presented and also explained to relate it with the design and requirements section.
- 6) **Test:** This subsection contains all the tests designed and the implementation of the tests, as well as the environment to apply them.



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Software Configuration Management

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SCM-SIPaF-V1.1

November 04, 2022

Ameca, Jalisco

Change control

Revision	Description	Author	Date	Version
0.1	Preliminary version	Raúl Romero	08/26/2022	SCM-SIPaF-V0.1
0.2	Design, code and test sections added	Raúl Romero	01/09/2022	SCM-SIPaF-V0.2
1.0	CR-03 applied	Raúl Romero	03/11/2022	SCM-SIPaF-V1.0
1.1	Updated after revision of CR-03 implementation	Raúl Romero	04/11/2022	SCM-SIPaF-V1.0

Revision

Version	Responsible	Date	Status
1.0	Phd. Omar Zatarain	04/11/2022	Update all the CI of the CR-03

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1. Introduction

With the purpose of simplifying and making more efficient the process of detecting failures in solar panels within photovoltaic plants, thus testing the system within CUValles in Ameca, Jalisco; It is proposed to develop this project for the analysis of high-definition images and thermal images taken from a drone.

Fault detection tracking without software for analyzing the status of solar panels within the plant is a problem because of the way the electrical interconnections of the solar panels are made. The process is time-consuming and may be subject to human error. This process is carried out as follows:

1. Select the sector of interest within the plant.
2. Send a drone to obtain images of the panels in that place.
3. Analyze the data or images obtained with the software.
4. Identify the position of the damaged panel.
5. Deliver the validation document to the team in charge of repairing the damage.

1.1 Purpose

The objective of this document is to define the specification of the functional and non-functional requirements, as well as the objectives that need to be done for the acceptance of the system that will help to inspect the state of the solar panels using aerial images taken by a drone. The design of the system, as well as some code and tests will be provided in this document.

1.2 Scope of the system

Develop a system that can analyze images taken by a drone in order to identify damaged cells using the infrared spectrum. There should be a report generated by the software with special information about the analysis. The system must have a trained model that can analyze infrared images and orthomosaic images, specifying where the damaged cells are located.

1.3 Acronyms details

Table 4.1 Acronyms description.

Term	Definition
SIPaF	System for the Inspection of a Photovoltaic Park
SCM	Software Configuration Management
MIS	Master Degree in Software Engineering
CUValles	Centro Universitario de los Valles

1.4 Document overview

In order to guide the reader, this document is organized into the following sections:

The introduction provides background information and important factors to consider in the solar panel inspection process.

The second section offers a general description of the system, where the general factors included in the product and its requirements are described. The stakeholders to whom this section of the document is addressed are the users involved and the system development team. Users will be able to identify the functionalities of the system and developers will be able to understand the software and communications restrictions under which development will proceed.

In the third section, the specific requirements of the system and the follow-up that they will have during the development of the project are described. The elements are grouped into functional and non-functional requirements, in such detail that it facilitates the work of the development team using a natural and simple language, in order to integrate all the stakeholders of the project within the process of building the software product.

2. General description

This section specifies the factors of interest and the functional requirements of the SIPaF system. To achieve this, it will be necessary to make a detailed description of the environment where the system will be implemented, and the factors involved in the application space. In this way, this collected information will provide the guidelines for the development and implementation of this software.

2.1 Product perspective

The desktop application of System for the Inspection of a Photovoltaic Park(SIPaF) aims to be a tool to improve the current process of inspection and detection of production failures of photovoltaic panels in a solar plant for the university campus of Valleys located in Ameca, Jalisco.

2.2 Product features

The SIPaF system intends to make use of technological tools to achieve the objective set by the client, in this case, the project director, Dr. Himer Avila George. For this they are necessary: the analysis, design of the system, as well as the database and the user interface.

Broadly speaking, the product will allow the following functionalities:

1. Enter aerial images in high definition and thermal images.
2. Make an orthomosaic of the place with the two types of images.
3. Identify each of the solar panels in the orthomosaics.
4. Determine which panels have faults and give them a priority level.
5. Make a report with the data obtained.
6. Help to better visualize the data obtained from the plant in each report.

2.3 User

This section describes the type of user that will make up the system. A single user is contemplated who can share this information with other people through emails.

Table 4.2 Users of the system description, privileges, technical experience and frequency of use.

Type of users	Description	Privileges	Technical Experience	Frequency of use
User	User who has permissions to create projects, upload images, make reports and view information. Also, he must be able to share the information using an email. The images cannot be shared, but the results of the reports can.	Access all the functionalities of the system.	Advanced Basic system administration skills with significant application knowledge are required.	Whenever required.

2.4 Restrictions

- The SIPaF system will be designed in python and as a desktop application.
- The application's operating system will be Windows 11 64-bit and its code will be in Python with version 3.9.7.
- Users will need to have the program installed on their hard drive.
- The response speed is determined by the computer's processor and graphics card.

- Access to the system will not be restricted, but a password will be requested when registering an email for sending files.

2.5 Assumptions and dependencies

- The system requirements can change during the development of the application only if they follow the SCM policies.
- Availability of development team work.
- Time availability of project stakeholders.
- It will be necessary to validate the operation of the software with an expert for its full implementation.

3. Specific requirements

In this section you will see all the client's needs to accept the product as a quality product.

3.1 External interfaces

3.1.1 User interfaces

The user interface will have a set of windows with buttons, lists and text fields. The user interface will be displayed when the program is run. To access the interface, you must have the program installed on your hard drive.

3.1.2 Software Interfaces

- Desktop Application: Windows 11 64-bit.

3.2 Functional requirements

This section will describe the system requirements in detail as shown in the following tables:

1. User: Create project
2. User: Delete project
3. User: Modify project
4. User: Search file
5. User: Create report
6. User: Delete report
7. User: Set email account
8. User: Change email account
9. User: View reports
10. User: Create orthomosaics
11. User: Share obtained reports
12. User: Print reports
13. User: View data from project
14. User: Save the graphs created
15. System: Identify the faults from the images
16. User: Open project
17. User: Create a monthly report of the drone usage

3.2.1 Functional requirements tables

Functional Requirements Specification			
Code	Name		Degree of need
RF-01	Create project		High
Description	The user needs to create a project in which he can have the information obtained from that analysis.		
Inputs	Source	Outputs	Restrictions
+Project name +Address +Images for processing	User	>Project display in the organization bar.	*If the project already exists, a notification will be sent to the user to know if they want to replace it.
Process	New project must be selected in the file menu or in the project display area. Then you must choose the location to save the project. Next is to select the images for analysis.		

Functional Requirement Specification			
Code	Name		Degree of need
RF-02	Delete project		High
Description	The user needs to delete the files created by the system of a project already created so that it does not appear in the system.		
Inputs	Source	Outputs	Restrictions
+Project	User	>Deletion of the project from the organization bar.	*Choose a project that has been created.
Process	Must select an already created project and then select the delete option. The image analysis file will be deleted, but the created reports will not be deleted.		

Functional Requirements Specification			
Code	Name		Degree of need
RF-03	Modify project		Medium
Description	The user can select an existing project and remake the process changing the images used.		
Inputs	Source	Outputs	Restrictions
+Project Parameters	User	>Redoes the project replacing all the information it had.	*Requires a finished or failed project.
Process	Must select an already created project and then select the start option after checking the parameters for the process are correct. The products of the project will be deleted to create the new ones.		

Functional Requirements Specification			
Code	Name		Degree of need
RF-04	Search file		Medium
Description	The user searches for a project or report in the display bar where the files of the working directory are displayed.		
Inputs	Source	Outputs	Restrictions
Project name Report name	User	>Displays the project that matches with the search and is found in the project folder.	*The project must have the characters specified on their name.
Process	Must select the search bar above the display bar and type the characters of the name that are on the project.		

Functional Requirements Specification			
Code	Name		Degree of need
RF-05	Create report		High
Description	The user can create a report of the information gathered by the project in a PDF format.		
Inputs	Source	Outputs	Restrictions
+Project	User	>PDF file of the report	*The report will be created

Name of the report.		on the display bar.	in the same directory as the project..
Process	Must select a finished project and then select the make report option. The display bar is updated when the process finishes and a message is displayed..		

Functional Requirements Specification			
Code	Name		Degree of need
RF-06	Delete report		Medium
Description	The user can delete from the project's folder a report created.		
Inputs	Source	Outputs	Restrictions
+Report	User	>PDF file of the report on the display bar is removed.	*The report will no longer exist..
Process	Must select a report and then select the delete report option. The display bar is updated when the process finishes and a message is displayed..		

Functional Requirements Specification			
Code	Name		Degree of need
RF-07	Set email account		High
Description	Configure an email on the system.		
Inputs	Source	Outputs	Restrictions
+Email +Password	User	>Message displaying the status.	*Can only have one email configured at the time.
Process	Provide a valid account and wait for the system to verify it.		

Functional Requirements Specification			
Code	Name		Degree of need
RF-08	Change email account		High
Description	Change to another email account.		
Inputs	Source	Outputs	Restrictions
+Email +Password	User	>Message displaying the status.	*Can only have one email configured at the time.
Process	Must select the settings and then change the email account option. Then provide the last email and password account. If valid, must provide a new valid account and wait for the system to verify it.		

Functional Requirements Specification			
Code	Name		Degree of need
RF-09	View reports		Medium
Description	Open a report created by selecting it.		
Inputs	Source	Outputs	Restrictions
+Report	User	>Opens the report on	*Won't be able to see it on

		another application that visualizes PDFs.	the system.
Process	Must select a report and select the option to open it. Then a PDF reader application will be open with the report.		

Functional Requirements Specification			
Code	Name		Degree of need
RF-10	Create orthomosaics		High
Description	Create an orthomosaic if selected with the images for the analysis.		
Inputs	Source	Outputs	Restrictions
+Images RGB Thermal	User	>Shows the orthomosaic on the display bar.	*Can only do it if selected during the analysis..
Process	Must select the option when creating a project and start the project. The orthomosaic will be made in the RGB and Infrared images if selected. They will be displayed on the view tab.		

Functional Requirements Specification			
Code	Name		Degree of need
RF-11	Share obtained reports		High
Description	The reports obtained can be shared through email.		
Inputs	Source	Outputs	Restrictions
+Report +Email account(s)	User	>Displays an image after sending the report.	*The system will not check if the email was received. *The system won't verify if the destination account is valid. *A valid email must be active on the system.
Process	Must select a report and select the option to share it. Then the destination emails must be entered.		

Functional Requirements Specification			
Code	Name		Degree of need
RF-12	Print reports		Medium
Description	Be able to send the report to a printer.		
Inputs	Source	Outputs	Restrictions
+Report +Printer	User	>Displays a message after sending it to the printer.	*Won't verify if it was printed already.
Process	Must select a report and select the option to print it. Then a printer must be selected and send it print.		

Functional Requirements Specification			
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Code	Name		Degree of need
RF-13	View data from project		High
Description	Let the user select multiple projects to compare the data from them and visualize them.		
Inputs	Source	Outputs	Restrictions
+Projects	User	>Displays a graph with the data obtained on the data bar.	*There will be a limit of 20 projects.
Process	Must select multiple projects and select the option to compare their data. The graph will be displayed on the data bar and some options will be available to modify some parameters of the graph.		

Functional Requirements Specification			
Code	Name		Degree of need
RF-14	Save the graphs created		High
Description	Let the user save the graph created.		
Inputs	Source	Outputs	Restrictions
+Graph +Address	User	>Displays a message after saving the graph.	*The graph won't be linked to a project.
Process	Must select a graph and select the option to save it. The graph will be saved on the address specified and can be opened from there.		

Functional Requirements Specification			
Code	Name		Degree of need
RF-15	Identify the faults from the images		High
Description	Must be able to locate the faults in the images selected from the user.		
Inputs	Source	Outputs	Restrictions
+Images +Trained model	User	>Displays all the data of the process using images and text labels in the system.	*The data must be displayed in a good way in the system.
Process	After creating a project and starting the process, the system must be able to identify the faults within the images presented and display them in an organized form within the system screen.		

Functional Requirements Specification			
Code	Name		Degree of need
RF-16	Open project		High
Description	Must be able to load a file of a project already created to watch the information.		
Inputs	Source	Outputs	Restrictions
+Project	User	>Displays all the data of the project using images and text labels in the system.	*The data must be displayed in a good way in the system.

Process	After selecting a project the information about it should be uploaded and see it .
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Functional Requirements Specification			
Code	Name		Degree of need
RF-17	Create a monthly report of the drone		High
Description	Every information flight made by the drone should be retrieved in order to make a monthly report containing the information of the flying hours, zones in which the drone flew during the month and purpose for each flight.		
Inputs	Source	Outputs	Restrictions
+Flight information	System	>Report of information with the flights made by the drone.	*The purpose should be specified each time a project is made. *The process can be made automatic or manual.
Process	The process should be programmed and specify the folder where the projects of a drone should be taken. Every month the process would take the projects of the last 30 days made by each drone and save the pdf report generated.		

3.3 Nonfunctional Requirements

3.3.1 Performance requirements

The system must have a database manager.

The system must have an optimal response time.

3.3.2 Reliability Requirements

The system must be reliable.

The system must warn against possible erroneous operations or actions.

3.3.3 Availability Requirements

The system must be available 100% of the time.

The system must be able to identify the projects created and displaying them if they are on the same working directory.

3.3.4 Maintainability Requirements

The system must have parameterizable characteristics to allow future maintenance (source code).

The system should be created in such a way that modules or updates can be added in the future.

3.3.5 Portability Requirements

The system must be able to be installed and used on any Windows 11 system.

3.3.6 Design Restrictions

The system must be intuitive.

The system must have a logo.

The system must have text-type aids in the forms.

3.3.7 System Attributes

The system must be able to send emails.

3.3.8 Other requirements

The system does not interact with another external system.

The system must have an intellectual property and be registered in INDAutor.

4. Design

In this section, the design of the software is specified using UML diagrams to represent the whole system. First we will have some general diagrams to identify the components and the scenarios that are going to be addressed by the software, after that, we will explore in detail the modules of the system.

4.1 General design

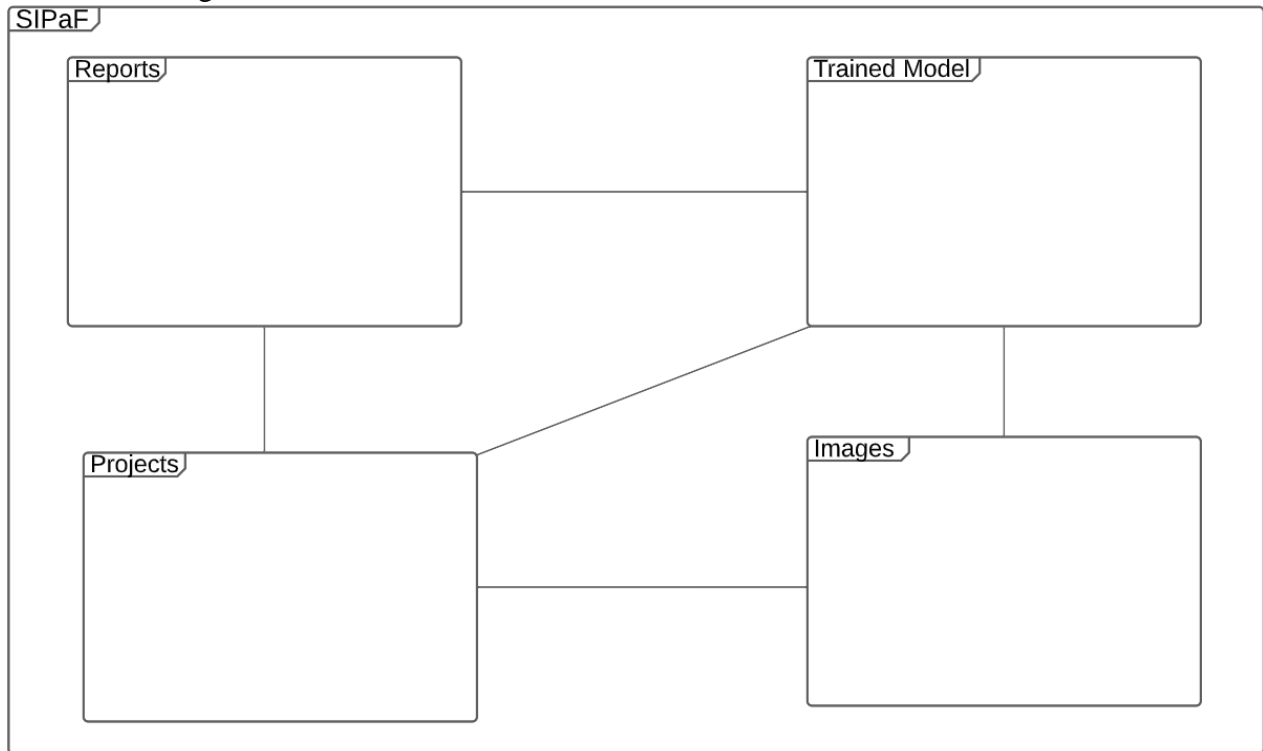


Fig. 1 General view of the system components.

In Fig. 2, the use case for the module more important of the system is shown, the project module. As we can see, this module is the one that contains the majority of the requirements. The second one with other requirements will be the reports module, and besides having less functional requirements, the trained model module is the second one more important because it is the one that will gather the information that will be displayed on the images and on the reports.



Fig. 2 Use case users with the projects module.

In Fig. 3 we will see the representation of the interface it is expected to be designed.

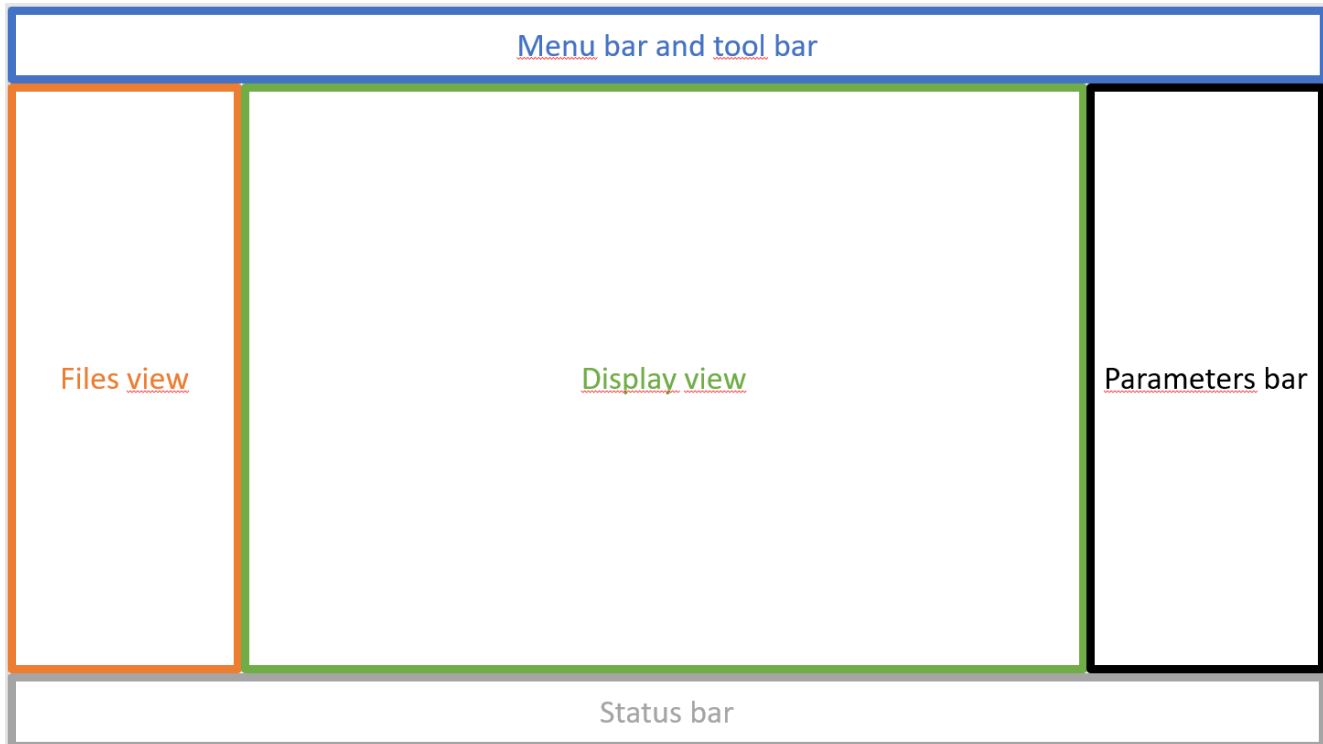


Fig. 3 Interface organization.

4.2 Modules

This system has 4 modules, the biggest and most important module is the project one. The next important module is the trained model module, that module contains the network that will be the one with the trained parameters to analyze the images. The third module is the one in charge to check the images and help process them to make the orthomosaics. Finally, the reports module will be able to save the information in a way they can be seen in a pdf document.

4.2.1 Project

This module will be the one that will interact with the other modules and should be the one to define the relationships with the other modules. It needs to be able to create a file that will contain all the information of the project. Here is where the process begins and where it ends. This module will be the one that will have the most interaction with the user. The other models will depend on the information this has so it must have all the information and methods they need in order to complete their tasks.

Besides, the project needs to receive the input of the zone, the flying hours, which drone was used and the purpose of the flight.

4.2.2 Trained model

This module needs to have pretrained neural networks to work with the different types of images and solar panels. But the first model must be able to find the hotspots of the solar panels that are in CUValles. There should be hyper parameters as some of their entrances depending on the type of solar panels to be analyzed on the images.

4.2.3 Images

The images module will be in charge of creating the orthomosaics and to have the information of the images that are being used. It will also have the directory where the images are saved.

4.2.4 Reports

This module will be the one that has to have the information and methods to create a report with all the data from the project. It will also be able to create the pdf file and be capable of sending it

through email or downloading it.

Additionally, this module will have more information, apart from the information found by the trained model, which needs to be used to create another report each month.

5. Code

In this section, we will have some of the most important functions by each module.

The new variables added to the project class are:

report_day: int # The day of the month to make the reports.

flight_purpose: String # The reason for doing this flight.

drone_number: int # The identifier for that drone.

flight_zone: String # Describe where the zone flew

flying_start: day, hour # Specify when the drone started flying

flying_end; day, hour # Specify when the drone stop flying

The new method added to the class report is:

create_flying_report(report_day): Report # Create the flying report and save it.

6.Test

Finally, this section will present the tests that must be performed for the software in order to assure the quality of the product. We first specify the hardware and software characteristics for the tests and then there will be some described tests per module.

6.1 Hardware specification

Table 4.3 Specification for the equipment where the tests will be taken.

Characteristic	Specification
Device name	LAPTOP-6OBLSTJL
Processor	Intel(R) Core(TM) i7-9750H CPU @ 2.60GHz 2.59 GHz
RAM	32.0 GB
Operating system	Windows 11 Home Single Language, 64 bits

6.2 Software specification

Table 4.4 Specification for the software where the tests will be taken.

Name	Version
Pytest	7.1.2
Python	3.10.5

6.3 Version control

Version control will be using GitHub, this lets us share the code through the internet and is easy to implement on the software of PyCharm, where the code will be developed. And we will also be able to have the reports saved and baselines of the project to have a version control of all the documents during the development of the project.

6.4 Test cases

In this subsection the intention is to present the module and the test cases that need to be tested for each module.

Table 4.5 Test cases specification for every module.

Module	Requirement	Test
Projects	1- Create project	1- Create project successful
Projects	2- Delete project	2- Delete project successful

Projects	3- Modify project	3- Modify the projects name
Projects	3- Modify project	3- Modify the projects images associated
Projects	4- Search file	4- Search a file using its name
Reports	5- Create report	5- Check that all the information of a report was displayed
Reports	5- Create report	6- Check that all the information created was saved
Projects	7- Set email account	7- Save the email account
Projects	7- Set email account	8- Use the email account to share a report
Projects	8- Change email account	9- Change the email account saved
Reports	6- Delete report	10- Check the reports can be deleted
Reports	9- View reports	11- Check that the report can be opened
Images	10- Create orthomosaics	12- Check that the orthomosaic image is created
Reports	11- Share obtained reports	13- Check that the reports can be send in a pdf file through email
Reports	12- Print reports	14- Check that the report can be send to the printer
Projects	13- View data from project	15- Be able to see the information of the selected project on the program
Projects	14- Save the graphs created	16- Check that the graphs can be downloaded as images
Model trained	15- Identify the faults from the images	17- Check that the program is able to identify the faults on the images and display them on the images as masks
Projects	16- Open project	18- Check that a project is loaded correctly
Reports	17- Create a monthly report	19- Check the report is done
Projects	17- Create a monthly report	20- Verified flying information is asked and saved

4.2 Change Request Control Document

The baseline is the first document that needs to be define in order to start with the configuration management. The reason as seen in the SCM process section, is that it shows all the description of the software development process and has the configuration items that get affected if a change appears. The change request control documents have the software configuration identification and the software configuration control of the SCM process. In this document we also have the policies established for a CR to be address. There is also another section added, where a CR priority manifest is made to determine a risk value for each CR to know if they could be implemented and know the risk it implies. The final decision for every CR is also presented in this document. First of all, a description of each item contained for each CR is presented.

- 1) **Policy rules:** The specific process to receive a change request.
- 2) **CR priorities manifest:** This is a document that specifies how to get a risk score that will help to make a decision for each CR based on the CIs and how much they are affected, as well as the time and budget impact.
- 3) **Change request X:** This is the name of the specific change request that will be treated in this document.
 - a) **Change request ID:** The change request identifier.
 - b) **Requestor:** The person that responsible for requesting this change.
 - c) **Date:** The date the change was requested.
 - d) **Project manager:** The name of the project manager for this project.
 - e) **Describe the requested change:** This is the description that the requestor gave for this change.
 - f) **Describe the reason for the request:** This is a further explanation for the change requested to have more context about it.
 - g) **Swot Matrix:** This is a table that will give different point of views in order to make an analysis for the CR.
 - i) **Strengths:** This part gives us what are the reasons this change request will be

easier to implement.

- ii) **Weaknesses:** This part gives us what are the reasons this change request will be harder to implement.
- iii) **Opportunities:** This part is identifying the benefits of implementing this change request.
- iv) **Threats:** This part is identifying the drawbacks of implementing this change request.
- h) **Budget impact:** Describe where and how the budget will be impacted.
- i) **Impact analysis:** This part has all the CIs identified and say how much they would be impacted between low, medium, high and too high.
- j) **CR risk score:** One of the most important parts of this document, since it gives a final value for the risk of implementing the change request that is considered to give a final resolution for the CR.
- k) **Risk identification/analysis:** This part documents the final analysis made for all what has been identified, the SWOT Matrix, the budget impact, the impact analysis where the CIs are identified, the CR risk score, and the policy rules.
- l) **Decisions:** In this part is where the final decision is specified, and the comments for this decision making is also place here.



UNIVERSIDAD DE GUADALAJARA

CENTRO UNIVERSITARIO DE LOS VALLES

Project Change Requests Control

System for the Inspection of a Photovoltaic Park with Aerial Images in High Definition and Thermal

Professor: Phd. Omar Ali Zatarain Durán

Author: Raúl Rubén Romero López

CRC-SIPaF-V2.2

November 03, 2022

Ameca, Jalisco

Proposed Change Requests

Change Request ID	Requestor	Date	Status
CR-01	Omar Ali Zatarain Durán	09/09/2022	Rejected
CR-02	Omar Ali Zatarain Durán	07/10/2022	Rejected
CR-03	Omar Ali Zatarain Durán	07/10/2022	Approved
CR-04	Omar Ali Zatarain Durán	07/10/2022	Rejected

Authorized Change Requests

Change Request ID	Owner	Date	Status
CR-03	Raúl Rubén Romero López	28/10/2022	100%

About this document

This document has all the requested changes of this project, as well as the policies for the implementation of a change request. Whether they have been approved or not, with the analysis and decision form. Here is where we can see why the project was approved or rejected. Each change request will have their change request ID, who requested it, the change request items, the description of the impact on every area with a SWOT table and the final decision explained.

Policy Rules

All system application changes regarding the baseline of the project should meet the next policies to ensure a correct control process for the changes proposed. They must be reviewed, authorized, tested, implemented and released base on the software configuration management plan.

1. The current baseline configuration of the system and its components shall be developed, documented and up to date.
2. Changes to the baseline should be authorized, documented and controlled by the use of a formal change control procedure.
3. The format for the proposed change request must be a detailed document explaining the change to the system, the reason for such change and who is asking for it.
4. The project owner must acknowledge the change request and document it in the change request document.
5. The project owner should share with all the members of the committee change board the change request.
6. The sum of the change request must not exceed 4 weeks of extra time for the project.
7. Every person on the committee board members should expose
8. Project owner should briefly present the CR at the beginning of the meeting with the committee board.
9. The members should make their own analysis, on a SWOT matrix based on their expertise and recommendations.
10. Only two people (1 researcher and a 1 developer) can be incorporated on the project.
11. The committee will vote about their approval or disapproval position regarding the CR, in case there is a tie in the votes, only the CEO can take the final decision.
12. The CEO must provide the rationale for the approval and disapproval of the CR.
13. The project owner should implement only the approved CRs.
14. If they require budget to implement a CR is greater than 15%, the client should pay the CR charge in order to fully approve the CR.
15. The CR must have a final decision in a maximum of no more than 3 days.

CR Priorities Manifest

This is the part in which a standard for choosing the CRs that must be prioritized is going to be detailed. There would be a table created to determine which CRs can be implemented by getting the better scores.

- A. The CRs with less risks are going to be prioritized first.
- B. The CRs with more strengths are going to be prioritized first.
- C. CRs with more strengths than risks are going to be prioritized first.
- D. CRs without strengths or opportunities should be ranked after those who contain strengths and opportunities.
- E. For the qualitative part, a number of importance for the total of the strengths and opportunities should be given between 1 and 3 to have a normalized factor and the number should be considered as negative.
- F. For the qualitative part, a number of importance for the total of the weaknesses and threats should be given between 1 and 3 to have a normalized factor.
- G. The CR that implies using less of the budget money; the normalized factor number should be the budget percentage times 3.
- H. The CR that has less days of implementation.
- I. Beneficial factor added to the software in order to give a product with more capabilities to the client than the one already designed from minus 1 to minus 10 with minus 10 representing a beneficial change and to normalized it should be multiplied by 3.
- J. The number of persons needed; this would be multiplied by 5 to normalize the factor.
- K. The CR risk score with the lowest number should be considered as a priority.

Risk score scales

Budget multiplied by 3 to normalize.

Strengths and opportunities need to be multiplied by: -3 high, -2 medium, -1 low

Weaknesses and threats need to be multiplied by: 1 low, 2 medium, 3 high

CI multiplied by 2 to normalize.

Days required will stay the same.

A beneficial factor should be multiplied by 3 to normalize.

Extra personal should be multiplied by 5 to normalize.

Change Request-01

Table 4.6 CR-01 introduction and specification.

Change Request ID	CR-01	Requestor	Omar Ali Zatarain Durán
Date	09/09/2022	Project Manager	Raúl Rubén Romero López
Describe the Requested Change			
Make the system analyze by sets the information gathered to have several orthomosaics and then perform a whole orthomosaic.			
Describe the Reason for the Request			
Sometimes there would not be enough time or necessity to make the whole analysis in the photovoltaic plant, but whenever an orthomosaic is made, it should be able to merge with another orthomosaic created that is located in the same place.			

Table 4.7 CR-01 SWOT matrix specification.

SWOT Matrix	
STRENGTHS (+)	WEAKNESSES (-)
<ol style="list-style-type: none"> 1. A clearer overview for the user over each section. 2. Help separate the area of interest by sectors and display the information obtained. 3. Make a faster process since different CPUs can make develop the process. 	<ol style="list-style-type: none"> 1. The software will take more time to perform a whole project. 2. Have more parameters into consideration to perform the process. 3. The machine should have more power consumption.
OPPORTUNITIES (+)	THREATS (-)
<ol style="list-style-type: none"> 1. Have a software that can perform the analysis in different days and have a final product at the end that can be more attractive. 2. Give a preview of a sector in less time that it will take to perform the whole orthomosaic. 3. Include a template for a project in each area. 	<ol style="list-style-type: none"> 1. The maintenance of the code will be harder to modify. 2. Tests will take more time to complete to assure quality, so we will need a 10% of the budget (\$35,000.00). 3. Time required is expensive the rule we should not exceed 1 month. 4. One more person should be hired because the team already has their own tasks assigned and will not have time to address the CR.

Table 4.8 CR-01's budget impact of the system.

Budget Impact			
New Deliverables Description	Pay description	Cost of New Deliverable	Percentage of budget
1. Make smaller orthomosaics.	Pay programmers.	\$20000	%5.7
2. Modify the tests made.	Redo tests.	\$15000	%4.3
Total cost is \$35,000 , represents a 10% of the budget.			

Table 4.9 CR-01's impact analysis, CR risk score and risk identification of the system.

Impact Analysis							
Configuration Items to be Modified	Version Number	Low	Medium	High	Too High		
1. Code	V 1.0						
2. SRS document	V 1.2						
3. Tests	V 0.3						
4. Schedule	N/A						
5. Budget	N/A						
Describe the impact of the suggested change to work that is already complete.							
CR Risk Score							
Budget %	CI Items	Days required	Strengths & Opportunities	Weaknesses & threats	Beneficial factor	Extra Personal	Risk Score
10*(3)	5*(2)	21	6*(-2)	7*(3)	7*(-3)	1*(5)	54
The numbers between parentheses are the ones considered as factors to normalize the parameters. The risk score indicates a level of risk for the CR.							
Risk Identification/Analysis							
There are very good strengths added to the project that will make a more commercial and faster product. There are also great opportunities that will position the application as one with some specialized skills. As in weaknesses, there would be some extra time and expertise needed to learn how to use in full potential the software with the new CR. Also, the point that the maintenance, the tests, the money needed and another person needed to attend this request must put in the limit the risk of failure and should it be implemented, there must be a good control on this request.							

Table 4.10 CR-01's decision taken for this CR and the comments for its resolution.

Decisions	
<input type="checkbox"/> Approved	<input checked="" type="checkbox"/> Rejected
<input type="checkbox"/> Approved with modifications	
Comments	
This could be approved if we need to approve 2 modifications.	

Raúl Rubén Romero López
 Approver's Printed Name

10/21/2022
 Date

Project Manager
 Title

Change Request-02

Table 4.11 CR-02 introduction and specification.

Change Request ID	CR-02	Requestor	Omar Ali Zatarain Durán
Date	07/10/2022	Project Manager	Raúl Rubén Romero López
Describe the Requested Change			
<p>The client asks for a change regarding to manage several locations with solar panels and having more than 1 drone for servicing the locations. For this purpose, a drone should be programmed with different areas per flight. The flight schedule should be optimized based on:</p> <ul style="list-style-type: none"> • Drone battery usage • Reduced time to cover a route • Number of solar cells to be checked 			
Describe the Reason for the Request			
<p>It is likely that the client wants to use different drones in an area to cover all the solar panels there. The change is to be able with the system to make a route taking in consideration there are different drones to cover all the area and it should be optimized depending on the battery of each drone, in an efficient flight and covering all the possible cells.</p>			

Table 4.12 CR-02 SWOT matrix specification.

SWOT Matrix	
STRENGTHS (+)	WEAKNESSES (-)
1. The system will help the client to make more efficient and faster flights using more than one drone.	<p>1. The system would be more complex in order to make a complete analysis to make the routes for each drone.</p> <p>2. The system can be made only for a specific brand of drone.</p>
OPPORTUNITIES (+)	THREATS (-)
1. is will open the market to make systems that can make routes using different drones.	<p>5. 1. Each drone has its own battery life and commands in case they run low of battery.</p> <p>2. The time to make learn about how to make the routes for each drone safely would be high.</p> <p>3. The budget needed to make an investigation would be high and a person expert in that area would be need to be hired or paid to give us feedback.</p>

Table 4.13 CR-02's budget impact of the system.

Budget Impact			
New Deliverables Description	Pay description	Cost of New Deliverable	Percentage of budget
Make routes for more than one drone.	Pay programmers and experts.	\$50,000	14%
Assure the quality of the product.	Pay testers.	\$20,000	6%
Total cost is \$70,000 , which represents a 20% of all the budget.			

Table 4.14 CR-02's impact analysis, CR risk score and risk identification of the system.

Impact Analysis							
Configuration Items to be Modified	Version Number	Low	Medium	High	Too High		
1. Code	V 1.0						
2. SRS document	V 1.2						
3. Tests	V 0.3						
4. Schedule	N/A						
5. Budget	N/A						
Describe the impact of the suggested change to work that is already complete.							
CR Risk Score							
Budget %	CI Items	Days required	Strengths & Opportunities	Weaknesses & threats	Beneficial factor	Extra Personal	Risk Score
20*(3)	5*(2)	44	2*(-2)	5*(3)	6*(-3)	1*(5)	112
The numbers between parentheses are the ones considered as factors to normalize the parameters. The risk score indicates a level of risk for the CR.							
Risk Identification/Analysis							
This has a high risk of failure and it is no too beneficial for the software. He can make different flights efficiently, but to coordinate different drones with different specifications would be too risky. Hiring a new person or paying someone to give us feedback is something to take into consideration. The time expend to learn and then implement this task plus the tests needed to say this system would perform in an appropriate way is also risky. Besides the budget is over the limit.							

Table 4.15 CR-02's decision taken for this CR and the comments for its resolution.

Decisions	
<input type="checkbox"/> Approved	<input checked="" type="checkbox"/> Rejected
<input type="checkbox"/> Approved with modifications	
Comments	
<p><i>This CR is not that risky in terms of schedule and budget but it needs a lot of work on the code and the tests.</i></p>	

Raúl Rubén Romero López
 Approver's Printed Name

10/21/2022
 Date

Project Manager
 Title

Change Request-03

Table 4.16 CR-03 introduction and specification.

Change Request ID	CR-03	Requestor	Omar Ali Zatarain Durán
Date	07/10/2022	Project Manager	Raúl Rubén Romero López
Describe the Requested Change			
<p>The client informs to the project manager about a new mandatory law that requires that a report of drone use is submitted monthly, the report must contain:</p> <ul style="list-style-type: none"> • Total flight hours • Places where the drone flighted • Purpose of the flights 			
Describe the Reason for the Request			
<p>There is a law that the client needs to give a report about the flying hours of the drone, places where the drone flew and the purposes of each flight. They must fulfill this requirement in order to be able to fly the drone.</p>			

Table 4.17 CR-03 SWOT matrix specification.

SWOT Matrix	
STRENGTHS (+)	WEAKNESSES (-)
1. Give feedback to the client about how much their drones were used.	
OPPORTUNITIES (+)	THREATS (-)
1. Fulfill with a law. 2. Help the client to generate the report automatically. 3. Add another functionality to the system to save the flight hours, places and purpose of each flight.	1. Not making it could impact the usefulness or legal consequences to the client if they don't make the report.

Table 4.18 CR-03's budget impact of the system.

Budget Impact			
New Deliverables Description	Pay description	Cost of New Deliverable	Percentage of budget
Monthly report with specifications of the drone.	Pay programmers extra hours to implement this CR and modified the CIs.	\$5,000	1.5%
<i>The total cost is \$5,000, and the percentage of the budget is 1.5%.</i>			

Table 4.19 CR-03's impact analysis, CR risk score and risk identification of the system.

Impact Analysis							
Configuration Items to be Modified	Version Number	Low	Medium	High	Too High		
1. Code	V 1.0						
2. SRS document	V 1.2						
3. Tests	V 0.3						
4. Schedule	N/A						
5. Budget	N/A						
Describe the impact of the suggested change to work that is already complete.							
CR Risk Score							
Budget %	CI Items	Days required	Strengths & Opportunities	Weaknesses & threats	Beneficial factor	Extra Personal	Risk Score
1.5*(3)	5*(2)	5	3*(-3)	2*(1)	7*(-3)	0	-8.5
The numbers between parentheses are the ones considered as factors to normalize the parameters. The risk score indicates a level of risk for the CR.							
Risk Identification/Analysis							
Based on what the client is asking and the analysis made, we can see there is a need to implement it and there is not much to do on each CI identified for this CR. The most important is that the budget is not compromised and the schedule is in time. The weight of the strengths is much more than the negative parts.							

Table 4.20 CR-03's decision taken for this CR and the comments for its resolution.

Decisions
<input checked="" type="checkbox"/> Approved <input type="checkbox"/> Rejected <input type="checkbox"/> Approved with modifications
Comments
<i>This is approved since it is the CR with less risk and more benefits.</i>

Raúl Rubén Romero López
 Approver's Printed Name

10/18/2022
 Date

Project Manager
 Title

Change Request-04

Table 4.21 CR-04 introduction and specification.

Change Request ID	CR-04	Requestor	Omar Ali Zatarain Durán
Date	07/10/2022	Project Manager	Raúl Rubén Romero López
Describe the Requested Change			
The client requests that he desires a new feature that describes automatically the damage of a solar cell by a kind of imagery technique that tells if the solar cell should be replaced or it can be fixed instead.			
Describe the Reason for the Request			
The client wants to know what should they do base on the system analysis about the cells the system detects as damaged cells.			

Table 4.22 CR-04 SWOT matrix specification.

SWOT Matrix	
STRENGTHS (+)	WEAKNESSES (-)
	<ol style="list-style-type: none"> 1. The system should be interacting with the monitoring system to be able to make a correct decision. 2. In order to give a correct solution, the electrical model should be taken into consideration. 3. The electrical system of the drone is fixed.
OPPORTUNITIES (+)	THREATS (-)
<ol style="list-style-type: none"> 1. The system would be able to interact and get information from the electrical monitoring system. 2. It would reduce the pay made to a person to check the panels' status and decide what to do. 3. It will make the maintenance process faster for the client. 4. The system will not only say which cell is damaged, but also it needs to describe how the cell is affecting the system. 5. It will also be able to check if the system is affected. 	<ol style="list-style-type: none"> 1. Maybe there is not a complete dataset to train the model. 2. An expert should work in the project to be able to interact with the system. 3. The time to add this can go up to 60 days more of work. 4. The budget needed would be of \$100,000. 5. The tests to make the CR work would be expensive and time consuming. 6. Another developer should be hired to be able to fulfill this CR.

Table 4.23 CR-04's budget impact of the system.

Budget Impact			
New Deliverables Description	Pay description	Cost of New Deliverable	Percentage of budget
A description of what the client must do with each cell.	Add a developer, pay an expert for assistance with the other system,	\$70,000	20%
Give a quality product.	Pay the testers to develop more tests and validate them with the expert.	\$30,000	8%
<i>The total cost is \$100,000, equivalent to a 28% of the total budget.</i>			

Table 4.24 CR-04's impact analysis, CR risk score and risk identification of the system.

Impact Analysis							
Configuration Items to be Modified	Version Number	Low	Medium	High	Too High		
1. Code	V 1.0						
2. SRS document	V 1.2						
3. Tests	V 0.3						
4. Schedule	N/A						
5. Budget	N/A						
Describe the impact of the suggested change to work that is already complete.							
CR Risk Score							
Budget %	CI Items	Days required	Strengths & Opportunities	Weaknesses & threats	Beneficial factor	Extra Personal	Risk Score
28*(3)	5*(2)	60	5*(-3)	8*(3)	10*(-3)	2*(5)	143
The numbers between parentheses are the ones considered as factors to normalize the parameters. The risk score indicates a level of risk for the CR.							
Risk Identification/Analysis							
Based on the CIs and the impact this have against the strengths the CR would give the project, I vote against it. Time for the project goes well beyond budget and investigate if we can guarantee the client what they should do with each cell can be a very tough task. Besides, the money to implement it goes well beyond the budget contemplated. Another thing against is that we would need 2 more persons to accomplish this goal and finding the expert and have him available could cost some time.							

Table 4.25 CR-04's decision taken for this CR and the comments for its resolution.

Decisions	
<input type="checkbox"/> Approved	<input checked="" type="checkbox"/> Rejected
<input type="checkbox"/> Approved with modifications	
Comments	
This could be approved if the client really wants to pay more for the investigation.	

Raúl Rubén Romero López
 Approver's Printed Name

10/18/2022
 Date

Project Manager
 Title

5. Status accounting

In this section, a detailed description of the CRs is made that contains certain information in order to know how well the CR was implemented. In this case, we had only one CR made, so the report contains only this CR. Some information relevant for future references are the CR's information, the CIs affected, how well was the estimation for the time, money and human resources for this CR, the issues encountered during the implementation of this CR and the outcome of the CR. All the information presented in this document is explained before showing the document.

- **Date of approval:** The date when the CR was approved.
- **Date implemented:** The date when the CR was implemented on the project.
- **CR ID:** The identification for the change request.
- **CR description:** The description of the CR asked by the client.
- **CI affected:** The configuration items that were affected by the implementation of this CR.
- **Estimated budget:** The budget in pesos initially planned for its implementation.
- **Estimated time:** The time in days that was initially planned for its implementation.
- **Estimated people:** The initial number of persons required for its implementation.
- **Performed budget:** The actual budget in pesos used to implement the CR.
- **Performed time:** The actual time in days required to implement the CR.
- **Involved people:** The name of the persons that were involved during the CR implementation.
- **Performance of human resources:** The way each person involved in the project made their tasks.
- **Issues:** The information about the issues presented during the CR implementation, like the time, the responsible, the one that detected the problem, the risks found, the solutions and outcome to overcome this issue.
- **Outcome:** The final resolution for the CR implementation.



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CENTRO UNIVERSITARIO DE LOS VALLES

Status Accounting Report

System for the Inspection of a Photovoltaic Park with Aerial Images in High Definition and Thermal

Professor: Phd. Omar Ali Zatarain Durán

Author: Raúl Rubén Romero López

SAR-SIPaF-V0.1

November 11, 2022

Ameca, Jalisco

Status Accounting Reports

Table 5.1. Status accounting report for the implementation of CR-03 to the SIPaF project.

Date of approval	October 18, 2022	Date implemented	October 28, 2022
CR ID	CR-03 Monthly report		
CR description			
There is a law that the client needs to give a report about the flying hours of the drone, places where the drone flew and the purposes of each flight. They must fulfill this requirement in order to be able to fly the drone.			
CI affected			
a. Requirements b. Code c. Tests d. Baseline SIPaf v0.2			
Estimated budget	\$5000.00		
Estimated time	5 days		
Estimated people	1		
Performed budget	\$6500.00	Difference	+\$1500.00
Performed time	6.5 days	Difference	+1.5 days
Involved people			
a. Raúl Romero			
Performance of human resources			
The programmer finished the CR on time, but 1.5 more days where needed to validate the implementation of the CR on the system and corrections to be updated on the baseline.			
Issues			
a. Time needed to validate the changes on the system i. There was a delay of 1.5 days of what was authorized because the tests were not applied on time and after running them on the system, there were some errors that implied another day of modifications and testing to the code. ii. Author: Programmer iii. Involved personal: Raul Romero iv. Risks: time and budget for the CR was exceeded. v. Solutions: 1.5 day was given to fully approve this CR. vi. Outcome: The CR was completely implemented and satisfied what the client wanted.			
Outcome			
It was finished and completed, but it took more time because the tests needed to be coded and tested before saying it was validated.			

6. Auditing

In this section, the auditing document is presented as the final view of the SCM process made to the SIPaF project. This is a checklist document that has some specific tasks to assure the quality of the SCM process and final product after applying it. The specific tasks are described before showing the document.

1. **Make sure that baselines and standards match the actual components of the product:** Check that the documents of the baselines match the final product.
2. **Verify that the product is built and documented as the standards:** Check that the product fulfills the standards and the documents made for it.
3. **Check if the CR and test cases were properly addressed:** Verify that the tests for the system were applied again to ensure the software is working appropriately.
4. **Check that the new test results added by the CRs and the other CRs give an acceptable result:** Check also that the results for each test is ensuring the software is behaving as it is intended to.
5. **If tests failed, do...**
 - a. **Look back to the status accounting report:** Check if the reason was detected on the accounting report.
 - b. **Look back to the configuration control document:** Check if the reason was detected on the configuration control document.
 - c. **Look back to the configuration identification part in the configuration control document for that CR:** Check if the reason was because of a bad configuration item configuration.
6. **Verify that the correct and authorized versions of any CI exist and is correctly identified:** This to ensure that the change was appropriately implemented as planned.
7. **Verify that every CR on the Change Request Control document has a resolved status:** This step is to double check every approved CR is finish.

- 8. Identify the main biases or mistakes produced in each task:** Identify in which parts of the SCM process a mistake was made.
- a. Configuration identification**
 - b. Configuration control**
 - c. Status accounting**
- 9. Check data quality for accuracy and completeness:** Verify all the information on the documents are correctly express and they are complete.
- 10. Initiate an incident for discovered unauthorized changes:** Document if there was a change that was made to the project that was not made.



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CENTRO UNIVERSITARIO DE LOS VALLES

Auditing Document

System for the Inspection of a Photovoltaic Park with Aerial Images in High Definition and Thermal

Professor: Phd. Omar Ali Zatarain Durán

Author: Raúl Rubén Romero López

AD-SIPaF-V1.0

December 01, 2022

Ameca, Jalisco

Audit activities

1. Make sure that baselines and standards match the actual components of the product.

The last version of the baseline is in accordance with the CR approved to this project and the design, code, and tests are as they are supposed to be with the changes for the CR-03 implementation and not taking in consideration the other 3 CRs that were also requested by the client since they were rejected.

2. Verify that the product is built and documented as the standards.

All the documents for the process were correctly made, so this product is leaning to having a high quality. We have the last baseline, the change request control document up to date, and there is also the status accounting report.

3. Check if the CR and test cases were properly addressed.

The CR-03 was correctly implemented as establish for all the SCM process and the test cases for this CR were applied and documented.

4. Check that the new test results added by the CRs and the other CRs give an acceptable result.

Every test that was already implemented, as well as the new ones designed gave a positive result, so there were no errors given by the implementation of CR-03.

5. If tests failed, do...

- a. Look back to the status accounting report.**
- b. Look back to the configuration control document.**
- c. Look back to the configuration identification part in the configuration control document for that CR.**

This was omitted since all the tests passed as expected.

6. Verify that the correct and authorized versions of any CI exist and is correctly identified.

For this project, the Change Request Control v2.2 has the CIs identified for the CR-03, so this part is correct.

7. Verify that every CR on the Change Request Control document has a resolved status.

This task is finish, as specified on the document, CR-01, CR-02, CR-04 were rejected

by the committee board, and the CR-03 was the only one that was approved.

8. Identify the main biases or mistakes produced in each task.

a. Configuration identification

A point of view for this product is more on to change the process, maybe it is a little too ambiguous the CI that is being specified, it should be more specific. But for this product, it is specified as it was supposed to.

b. Configuration control

This product is represented in a good way, only a rearrangement of information to the document should be done.

c. Status accounting

The report has a complete information for what was done during the SCM process, but an introduction or some information of the process should be done.

9. Check data quality for accuracy and completeness.

All the information within every document was check to verify it was clearly written and also that every task was completely expressed on each part of the SCM process.

10. Initiate an incident for discovered unauthorized changes.

During this SCM process, there is was no incident discovered that must be address besides what was reported during the Status Accounting report.

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