UNIVERSITAT POLITÈCNICA DE CATALUNYA
BARCELONATECH
E scola Tècnica Superior d'Enginyeria
de Telecomunicació de Barcelona

Work-flux optimization for the use of GRASP algorithm in quasi-real-time

Master Thesis
submitted to the Faculty of the
Escola Tècnica d'Enginyeria de Telecomunicació de Barcelona
Universitat Politècnica de Catalunya
by

Mireia López Barrón

In partial fulfillment
of the requirements for the master in
(Write the name of your Master) **ENGINEERING**

Advisor: name of the advisor
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Revision history and approval record

Revision	Date	Purpose
0	10/12/2025	Document creation
1	dd/mm/yyyy	Document revision

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Abstract

Every copy of the thesis must have an abstract. An abstract must provide a concise summary of the thesis. In style, the abstract should be a miniature version of the thesis: short introduction, a summary of the results, conclusions or main arguments presented in the thesis. The abstract may not exceed 150 words for a Degree's thesis.

1 Introduction

An Introduction that clearly states the rationale of the thesis that includes:

1. Statement of purpose (objectives).
2. Requirements and specifications.
3. Methods and procedures, citing if this work is a continuation of another project or it uses applications, algorithms, software or hardware previously developed by other authors.
4. Work plan with tasks, milestones and a Gantt diagram.
5. Description of the deviations from the initial plan and incidences that may have occurred.

The minimum chapters that this thesis document should have are described below, nevertheless they can have different names and more chapters can be added.

1.1 Gantt Diagram

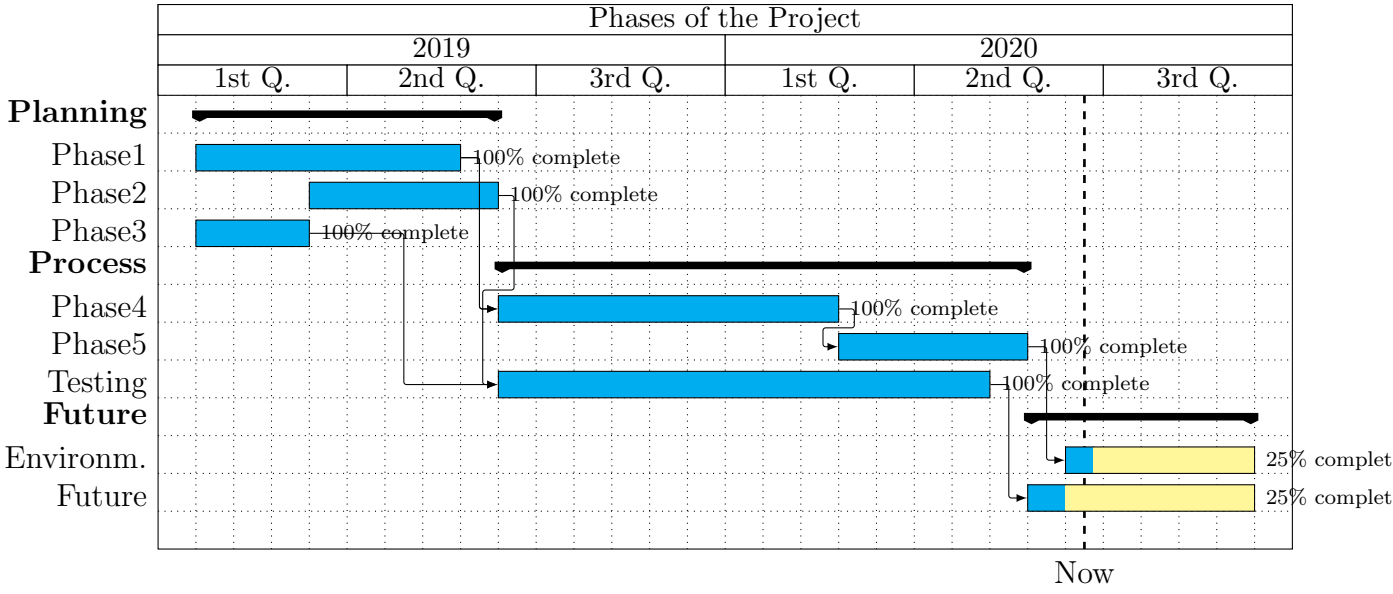

Figure 1: Gantt diagram of the project

For more information read the manual [1] of Skala.

1.2 Topic

2 State of the art of the technology used or applied in this thesis:

A background, comprehensive review of the literature is required. This is known as the Review of Literature and should include relevant, recent research that has been done on the subject matter.

2.1 Topic

Here you have a couple of references about LaTeX [3] and electrodynamics [2].

2.2 Topic

3 Methodology / project development:

In order to create a new application , it is necessary to follow the following steps, in order to create a strong foundation. This will help not only the maintanence of the corresponding developemnt, but to make the application more flexible and easier to update, even for new developers.

- Create a list of requirements
- Research and plan
- Design the architecture
- Desing the graphical user interface (GUI)
- Set up development environment
- Implement
- Test
- Deployment
- Maintenance

3.1 List of requirements

This first step is crucial for the correct result. It is needed to define a clear and well defined list of requirements. This defines the main scope of the project, the different futures to be implemented and prevents from building something that is not desired. This project, need to be able to fulfill the following requirements:

1. Download measurements from the internet
   (a) Download measurements from a defined date range
   (b) Download measurements from a defined location
   (c) Download measurements from the Actris-Earlinet Data Portal [5]
      - Download ELPP products
      - Download Optical products
   (d) Download measurements from the Aeronet web [6]
      - Download Raw Almucantar Sky Scan Radiance measurements
      - Download Raw Hybrid Sky Scan Radiance measurements
      - Download Raw Principal Plane Sky Scan Radiance measurements
      - Download Raw Polarized Principal Plane Sky Scan Radiance and Degree of Polarization measurements

- Download Raw Polarized Almucantar Sky Scan Radiance and Degree of Polarization measurements
- Download Raw Polarized Hybrid Sky Scan Radiance and Degree of Polarization measurements

(e)

2. Filter Earlinet measurement files depending on the the data type
   (a) 002, 008
   (b) 007
3. Execute full GRASP algorithm sequence:
   (a) Preprocessing:
   -
   -
   -
   -
   -

   (b) Retrieve aerosol optical depth
   (c) Retrieve aerosol extinction
   (d) Retrieve aerosol single scattering albedo
   (e) Retrieve aerosol Ångström exponent
4.
5.
6.
7.
8.
9.

3.2 Research and plan

This second step helps optimize both time and resources by preventing unnecessary work. Since this project builds upon a previous one, it is not required to develop new code for certain application requirements. Furthermore, the availability of APIs for downloading measurements from the ACTRIS–EARLINET Data Portal [5] and AERONET web application [6] provides a convenient and efficient solution that can significantly reduce development effort.

3.2.1 Web services development

3.2.2 Matlab controller development

3.3 Design the architecture

3.3.1 Why is architecture needed

3.3.2 Tools

- MVVM
- SOLID principles

3.3.3 Project architecture

3.4 Design the graphical user interface (GUI)

3.5 Set up development environment

3.6 Implement

3.7 Test

3.8 Deployment

3.9 Maintenance

4 Results

This should include your data analysis and findings

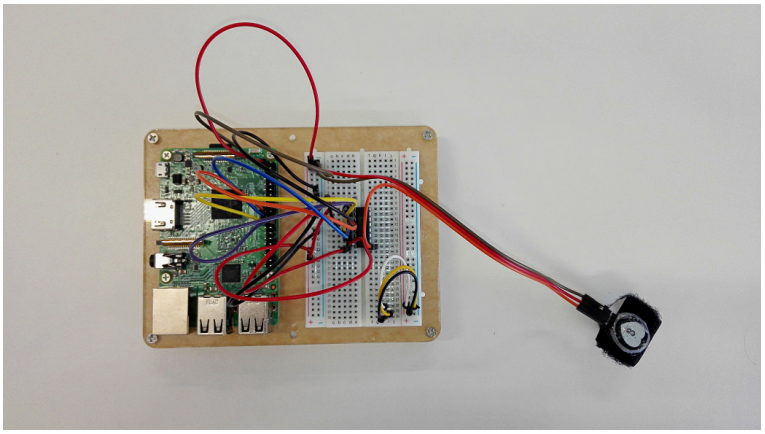

Figure 2: Prototype setup.

Table 1: This is the other caption. Since the trial size of the experiments showed is one second, the number of *Target* and *Impostor* data corresponds to number of trials or seconds

Dataset	**Label**	**Train**	**Validation**	**Develop**	**Test**
First	Target	135	45	30	30
	Impostor	5,220	1,740	1,890	2,880
	#Subjects		31		12
Second	Target	144	80	48	48
	Impostor	2,014	1,119	1,343	1,545
	#Subjects		15		5

Algorithm 1 Temperature-Distributed algorithm

procedure TEMP-SPREAD($GN_i, HN_j, temperatures$) ▷ Lowest temperature priority
  $temperature\_list \leftarrow short(temperatures)$
  $max_temperature \leftarrow max(temperature_list)$
  $ThresHold \leftarrow 0.5$
  $temperature\_impact \leftarrow 0.2$
  for GN_i in $i = 1, 8$ **do** ▷ Iterate every hardware node on the given GN
    $it\_temperature \leftarrow temperature\_list(GN_i)$
    $temp\_weight \leftarrow \frac{max\_temperature - it\_temperature}{max\_temperature} * temperature\_impact$
    $\omega(Master - GN_i) \leftarrow ThresHold * temp\_weight$
    for HN_j in $j = 1, n$ **do**
      if $available\_accel_{i,j} > busy\_accel_{i,j}$ **then**
        $policy_\omega = \frac{AvailableHW}{TotalHW} * ThresHold$
        $\omega(GN_i - HN_{i,j}) \leftarrow ThresHold + policy_\omega$
      else
        $\omega(GN_i - HN_{i,j}) \leftarrow 1$
  $node \leftarrow find\_djistra\_shortest\_path(Master\_Node, aux\_node)$
  $returnnode\ b$ ▷ The gcd is b

5 Budget

Depending on the thesis scope this document should include:

6 Environment Impact (Optional)

Whether the tasks that have led to the realization of this thesis, as if its results have identifiable environmental impact, describe it in this section.

7 Conclusions and future development:

This should include your summary, conclusions and recommendations.

References

[1] Wolfgang Skala. Drawing gantt charts in latex with tikz.

[2] Albert Einstein. Zur Elektrodynamik bewegter Körper. (German) [On the electrodynamics of moving bodies]. *Annalen der Physik*, 322(10):891–921, 1905.

[3] Michel Goossens, Frank Mittelbach, and Alexander Samarin. *The LaTeX Companion*. Addison-Wesley, Reading, Massachusetts, 1993.

[4] Donald Knuth. Knuth: Computers and typesetting.

[5] C.N.R. IMAA. Actris-earlinet data portal. Web Application available at `https://data.earlinet.org/earlinet/desktop.zul`, 2024.

[6] NASA. Aerosol robotic network (aeronet). Web Application available at `https://data.earlinet.org/earlinet/desktop.zul`, 2025.

Appendices

Appendices may be included in your thesis but it is not a requirement.