# Development Plan

*Project Manager:*

Tristan SORIANO

*Supervisor:*

Laurent BEUGNET

*Client IRIT:*

Ronan GUIVARCH

Sandrine MOUYSSET

# Contents

# 1   Abstract

It is a research project on image processing. It produces clustering creation among point sets and images. A such treatment can be used for pattern recognition, image filtering or image segmentation.

Figure 1: Example of clustering on the colors

# 2   Presentation

## 2.1   Name

New clustering methods integration into a parallel code.

## 2.2   Sponsort

IRIT : Ronan Guivarch, Sandrine Mouysset.

## 2.3   Presentation

The purpose of the project is to add new clustering methods into an existing piece of software. The clustering method are used on dense and sparse matrix which involve heavy computing calculus and time processing. In order to solve such issue, the existing code run on a master slave architecture. The original image is split among different slaves that compute initially a single clustering method : spectral clustering.
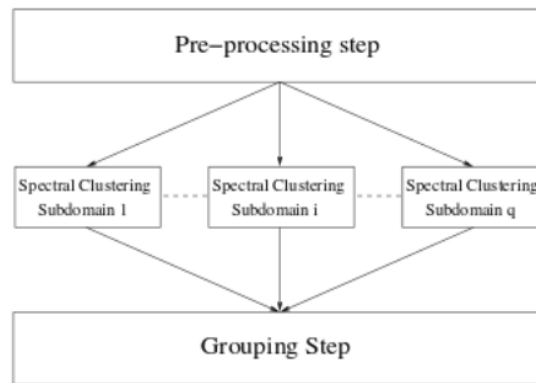
Figure 2:

The objective is first to add two methods : Kernel K-means and Mean shift in such structure then to refactore/clean the existing code.

## 3   Documentation

The following reference can be used for any theoretical understanding of the algorithm. It also provides references on the minimum interface the different method must follow.

- The Global Kernel k-Means Clustering Algorithm Grigorios Tzortzis and Aristidis Likas

- The Variable Bandwidth Mean Shift and Data-Driven Scale Selection Dorin Comaniciu Visvanathan Ramesh Peter Meer

- Mean Shift Analysis and Applications Dorin Comaniciu Peter Meer

# 4 Domain

## 4.1 Included domain

The project includes clustering method understanding, Fortran implementation, MPI.

## 4.2 Excluded domain

We won't consider the parallel code optimization through libraries like OpenMP.

# 5 Deliverable

1. The team will produce spectral clustering, Kernel K-means and Mean Shift methods implemented in Matlab with test validation : cible, croix, bouquet.

2. The team will provide configuration document for all the lab machine of Enseeiht : how to set up the environment, how to compile and run the program.

3. The team will produce new tests for spectral clustering : 2D and 3D generated autogenerated tests.

4. It will be provided the existing Fortran code enhanced and cleaned :

   - the quality of the code will be highlighted using a static analyzer
   - the new modules Kernel K-means and mean shift

5. Doxygen documentation will be provided : dependency graphs, method and parameters description.

6. The client will receive new tests for all the methods showing the interests of each method : advantages and drawbacks plus non regression tests comparing elapsed time and result quality.

7. The client will receive a PowerPoint presentation to explain the way the methods work.

8. The client will receive a test report with the test specification and result.

# 6 Communication

## 6.1 External communication

The following schedule has been decided : Weekly meeting with the client (IRIT) Sandrine Mouysset, Ronan Guivarch  Weekly meeting with the supervisor Laurent Beugnet

## 6.2 Internal communication

Biweekly meeting with the team to check the evolution of the project the possible issues and change of the planning depending on the progression  The text documentation can be found on Google Drive  The code and the examples can be found on GitHub

# 7 Development Management

## 7.1 Project organisation

### 7.1.1 Team

The team is composed of five people :

- Project manager :  Tristan Soriano is responsible for the communication between the team and the clients. He has to supervise the progress and the synchronization between the different parts

- Quality manager : Simon Prieul ensures that the content produced by the team reach the quality standards expected by the client.

- Specification manager : Simon Aubeneau. He ensures that each piece of code produced match the specifications.

- Validation manager : Quentin Duval is in charge of defining and running the tests.

- Technical manager : Jremy Santina manages the different technical and theoretical issues the team encounter.

## 7.2 Work breakdown structure

Each of the following step represents the schedule for the different point expected by the client to be complete. It check the good evolution of the project and the respect of the desired specifications.

**Step 1**
- 1. Bibliography study (the reference can be found in the documentation section)
- 2. Existing parallel code set up on lab machines , new example creation : 2D examples 3D exemples
- 3. The three following methods must be implemented in matlab : spectral clustering, Kernel Kmeans et Mean Shift

**Step 2**
- 1. Code documentation (Doxygen) : dependency graphs, method and parameters description.
- 2. End of the clustering methods implementation in Matlab

**Step 3**
- This step provides specification of the new clustering methods interfaces FORTRAN and validation with the client.

**Step 4**
- 1. Code refactoring : the code will follow classical FORTRAN coding convention, the method and variables will be renamed for better understanding.
- 2. Implementation of the new clustering methods interfaces FORTRAN

- 3. new tests generation

**Step 5**
- Validation of the new methods. Quality of the result on the different tests, time elapsed computing, non regression check.

- The refactored code will be tested and the validation will rely on statical analysis of the code

# 8  Risk management

| Description | Probability | Impact | Action |
|---|---|---|---|
| The product do not fit the client expectation. | light | heavy | specification with the client |
| Resources inadequate | medium | heavy | lighter test creation, request access on computers |
| Insufficient knowledge | Heavy | Medium | increase the time dedicated to each risky task |

# 9 Gantt

| Member | Action | Begin | End |
|---|---|---|---|
| Tristan Soriano | Etude thorique | 01/18/15 | 02/04/15 |
| Simon Prieul | Installation & wikiHow | 01/18/15 | 01/30/15 |
| Simon Aubeneau | Installation & wikiHow | 01/18/15 | 01/30/15 |
| Quentin Duval | Etude thorique | 01/18/15 | 02/04/15 |
| Jremy Santina | | | |
| Tristan Soriano | Implementation Matlab | 02/02/15 | 02/11/15 |
| Quentin Duval | Implementation Matlab | 02/02/15 | 02/11/15 |
| Jremy Santina | Etude du code existant & Doc Doxygen | 02/02/15 | 02/11/15 |
| Simon Aubeneau | Etude du code existant & Doc Doxygen | 02/02/15 | 02/11/15 |
| Simon Prieul | Etude du code existant & Doc Doxygen | 02/02/15 | 02/11/15 |
| Tristan Soriano | Interface des nouvelles mthodes | 02/15/15 | 02/22/15 |
| Quentin Duval | Refactoring du code | 02/15/15 | 02/25/15 |
| Jremy Santina | Interface des nouvelles mthodes | 02/15/15 | 02/22/15 |
| Simon Aubeneau | Refactoring du code | 02/15/15 | 02/25/15 |
| Simon Prieul | Interface des nouvelles mthodes | 02/15/15 | 02/22/15 |
| Tristan Soriano | Implmentation des nouvelles mthodes | 02/22/15 | 03/08/15 |
| Quentin Duval | Implmentation des nouvelles mthodes | 02/22/15 | 03/08/15 |
| Jremy Santina | Implmentation des nouvelles mthodes | 02/22/15 | 03/08/15 |
| Simon Aubeneau | Refactoring du code | 02/22/15 | 03/08/15 |
| Simon Prieul | Refactoring du code | 02/22/15 | 03/08/15 |
| Tristan Soriano | Validation | 03/08/15 | 03/12/15 |
| Quentin Duval | Validation | 03/08/15 | 03/12/15 |
| Jremy Santina | Validation | 03/08/15 | 03/12/15 |
| Simon Aubeneau | Validation | 03/08/15 | 03/12/15 |
| Simon Prieul | Validation | 03/08/15 | 03/12/15 |