

# **Cervical amplitudes recording with a virtual reality device Oculus Rift for a therapeutic purpose**

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# Cervical Amplitudes Recording

- ▶ Introduction
- ▶ Project Management
- ▶ Technical Implementation
- ▶ Conclusion

# Introduction

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# Project Overview

Presentation of the project

## Subject

### Means :

Access to an Oculus Rift

### Stakes :

Analyze cervical amplitudes in order to detect illnesses

Compare data before and after treatment

## Stakeholders

### Clients :

Denis Ducommun, ITO

Jérôme Ermont, IRIT

### Supervisor :

Patricia Fuilla-Weishaupt, Apsys

## Team

Project Executive Order

Implementation Responsible

Configuration Master

Test Supervisor

Quality Manager

# Project Overview

Presentation of the main tools

## Visual Studio 2015

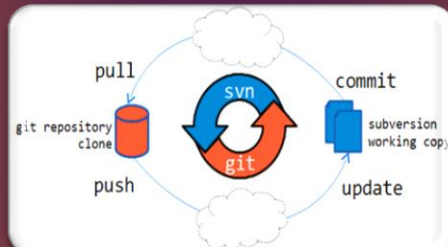
C++ IDE for developers

Debug tool

Git Plugin

## GitLab ENSEEIHT

For us to modify the same code on different workspaces



## Oculus Runtime

Allows the simulation of HMD

Necessary to run the Oculus Rift

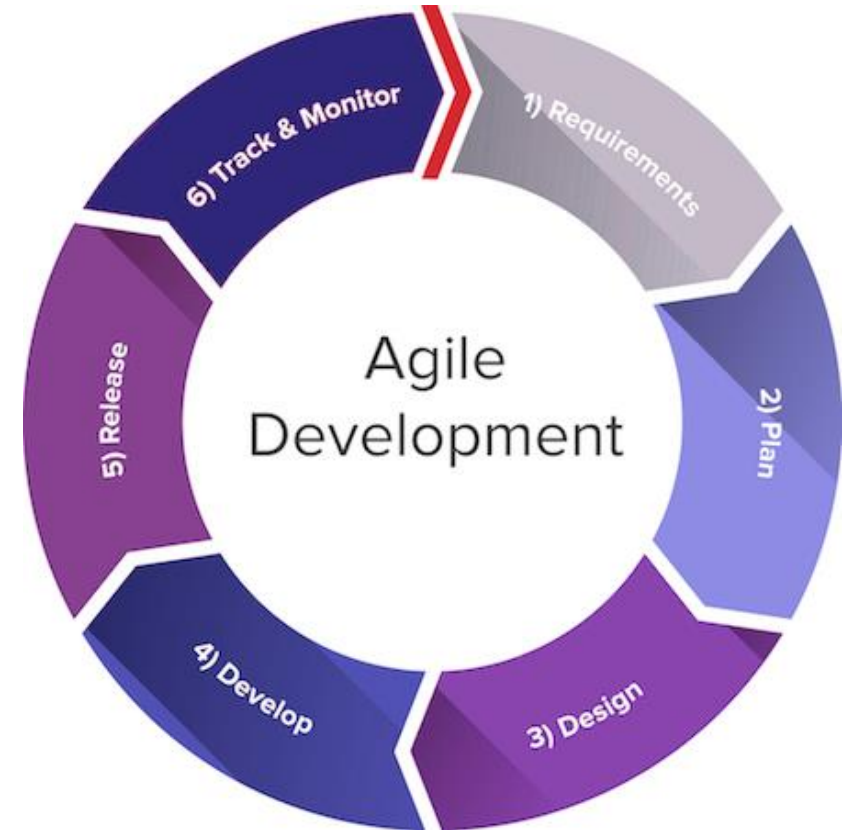
Compatibility issues with the latest SDK

## Google Drive

Sharing documents like specifications, risk table...

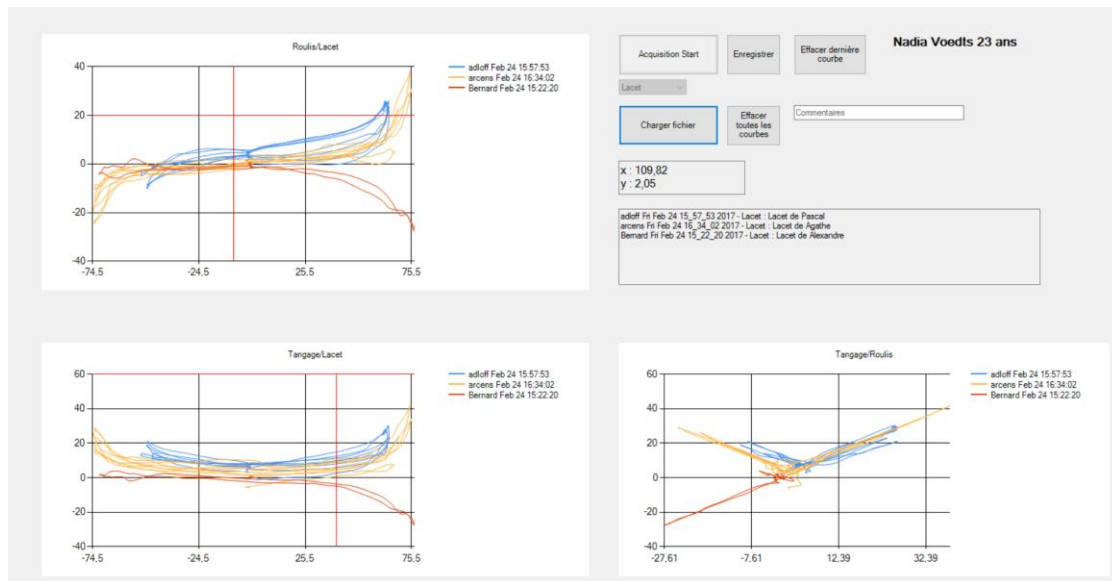
# Project Management

Development Process



# Deliverables

## ► Windows Application



## ► Specifications :

- Human computer interface
- Data record and storage
- Comparison between patients at different dates
- Launchable when vestibulus is running
- May be plugged in another data recorder

## ► User guide

## ► Developer guide

## ► Sources of the application



	16/01	23/01	30/01	06/02	13/02	20/02	27/02	06/03
<b>Beber</b>	Specifications	Implementation	Implementation	HMI	HMI	HMI	Implementation	Report
<b>Jim</b>	Technologic researches	Test Prep	Test Prep	Data studies	Stats	Stats	Implementation	Report
<b>Nadia</b>	Specifications	Implementation	Implementation	HMI	HMI	HMI	Implementation	Report
<b>Lucile</b>	Specifications	Test Prep	Tests	Tests	Tests	Tests	Tests	Report
<b>Victor</b>	Technologic researches	Implementation	Implementation	Implementation	Implementation	Implementation	Implementation	Report

# Planning

## Gantt Chart and Overall Planning



27/01 => Acquisition in the console  
30/01 => First window, display of the acquisition  
Retour\_t type for the intermediate variable of storing  
02/02 => Array dynamisation and text file storing  
Function which create a text file from a Retour\_t  
03/02 => Function which plots curves from a text file  
04/02 => Plot is no longer in the acquisition function  
File charging now converts text file in Retour\_t and then plots  
06/02 => Add of cursors on curves  
07/02 => Truncature of decimales on the curves and in the display of coordinates  
08/02 => File explorer for saving and loading files  
09/02 => Cursor improvement, window size increased, add of «clear last curve»  
button  
15/02 => Add of profiles, automated saving  
16/02 => AcqForm now launches from Home  
18/02 => Profile loading  
21/02 => Acquisition blocked if not movement selected, AcqForm not available if no  
profile is loaded  
23/02 => Add a dialog so we don't lose acquisition without meaning to  
28/02 => Add of curves commentary



# Actual versioning

Historic of pushes

# Meetings

With the supervisor and  
the client

- ▶ Meetings with supervisor :
  - Weekly meetings
  - Project Management
  - Methodology
  - Advices on how to satisfy the Client
- ▶ Meetings with the client :
  - Weekly meetings
  - Show our progress
  - Ensure we are on the right way
  - Specify expectations

Risk	Probability	Seriousness	How to avoid the risk/react if it happens
Bad relationships in the group	2	3	Cohesion Burger King Monday's ChocoMorning
Lack of resources or difficulties to get them	4	4	Be ready when we get the OR
Bad understanding of client's expectations	2	4	Keeping in touch with the client Review of the cahier des charges
Weak planification	1	3	Do a Gantt Chart
Incompatibility with other pieces of software	4	2	Show what the client needs
We don't succeed the development in C++	1	5	Learn C++, ask for help from our teachers

# Risks Analysis

Risks and solution found

# Problems encountered

And solutions found

Problems

Use of Visual Studio and C++

Oculus Rift wasn't always available

Our app doesn't work on the computer's client

Can't run 2 applications in the same time

Find tutorials and documentation on what we need

Find a runtime which can simulate the HMD

Download the good DLLs and change the SDK

Display of a grid in the Oculus Rift

Solutions

# Technical Overview

Historic of application

- ▶ Data capture
- ▶ First human machine interface
- ▶ Data saving
- ▶ Data loading
- ▶ Profile management

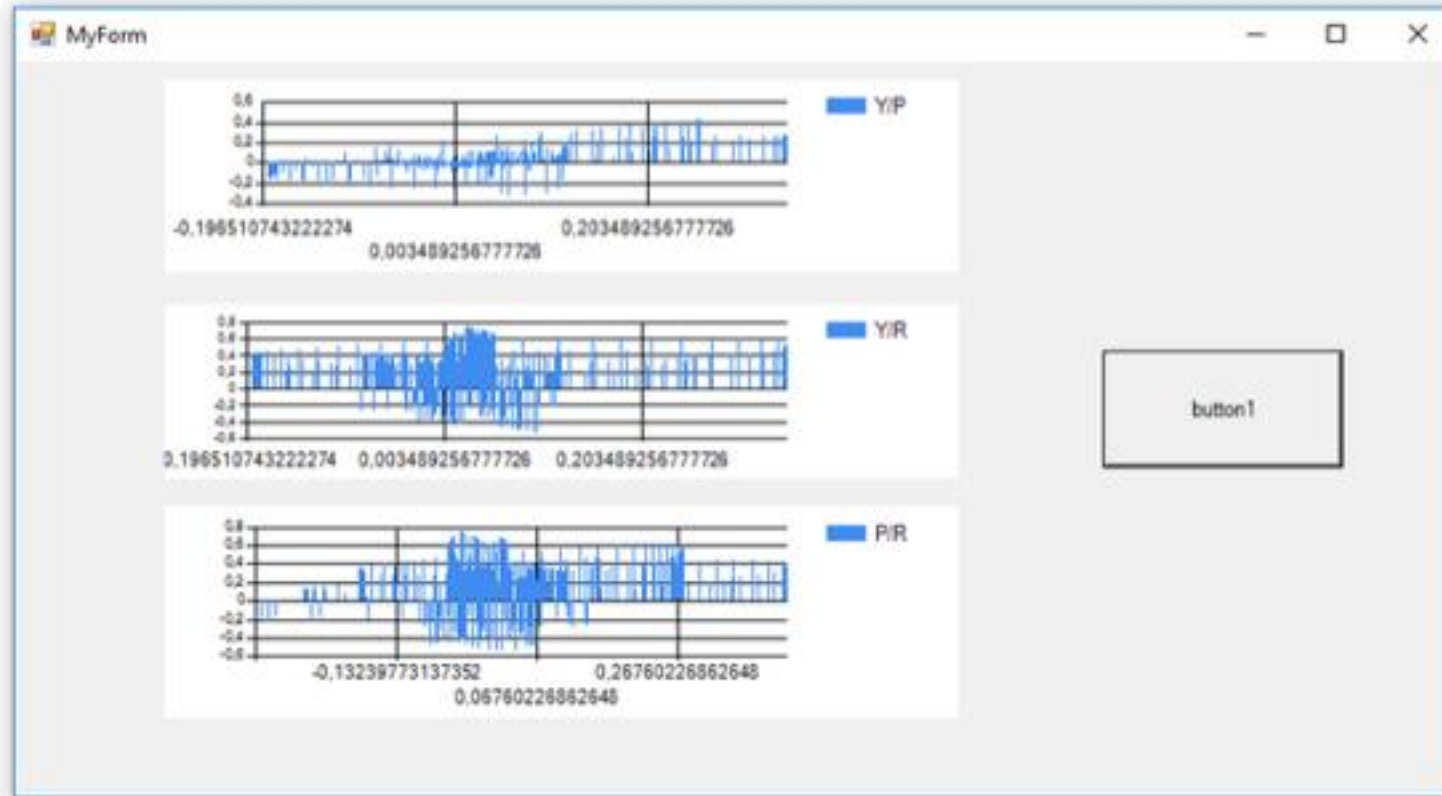
The screenshot displays the Visual Studio IDE with a C++ project named 'ConsoleApplication2'. The code in the main editor defines an `ovrTrackingState` and a `while` loop that continuously updates and prints orientation data. A command prompt window titled 'C:\windows\system32\cmd.exe' shows the output of the program, which is a series of orientation values (x, y, z) printed in a tabular format. The Output window at the bottom shows the build logs, indicating that the build was successful.

```
30 ovrTrackingState ts;
31
32 while (true)
33 {
34     ts = ovr_GetTrackingState(session, 0, true);
35
36     //if (ts.StatusFlags & (ovrStatus_OrientationTracked | ovrStatus_PositionTracked))
37     //{
38         ovrPosef pose = ts.HeadPose.ThePose;
39
40         ovrVector3f pos = pose.Position;
41         ovrQuatf orient = pose.Orientation;
42
43         cout << "Orientation (x,y,z): " << COLW << orient.x << ", "
44              << COLW << orient.y << ", " << COLW << orient.z
45              << endl;
46
47         std::this_thread::sleep_for(std::chrono::milliseconds(100));
48     //}
49 }
50
51 ovr_Destroy(session);
52 ovr_Shutdown();
53
54 return 0;
55 }
```

Output window content:

```
1>----- Build started: Project: ConsoleApplication2, Configuration: Debug Win32 -----
1> ConsoleApplication2.cpp
1> ConsoleApplication2.vcxproj -> G:\users\delvic\documents\visual studio 2015\Projects\ConsoleApplication2\Debug\ConsoleApplication2.exe
***** Build: 1 succeeded, 0 failed, 0 up-to-date, 0 skipped *****
```

# Data capture



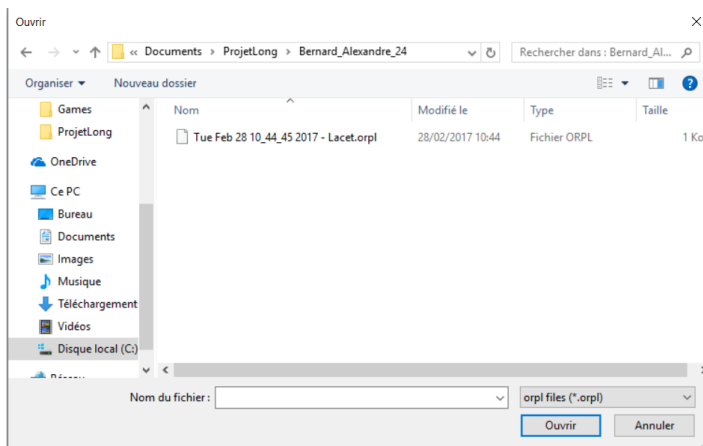
# First HMI

# Data loading and saving

Data loading

Data saving

- ▶ Windows explorer
- ▶ Can only open files \*.orpl



- ▶ First the same explorer as the loading
- ▶ Then automatic recording
  - Date
  - Movement type
  - Subject name folder

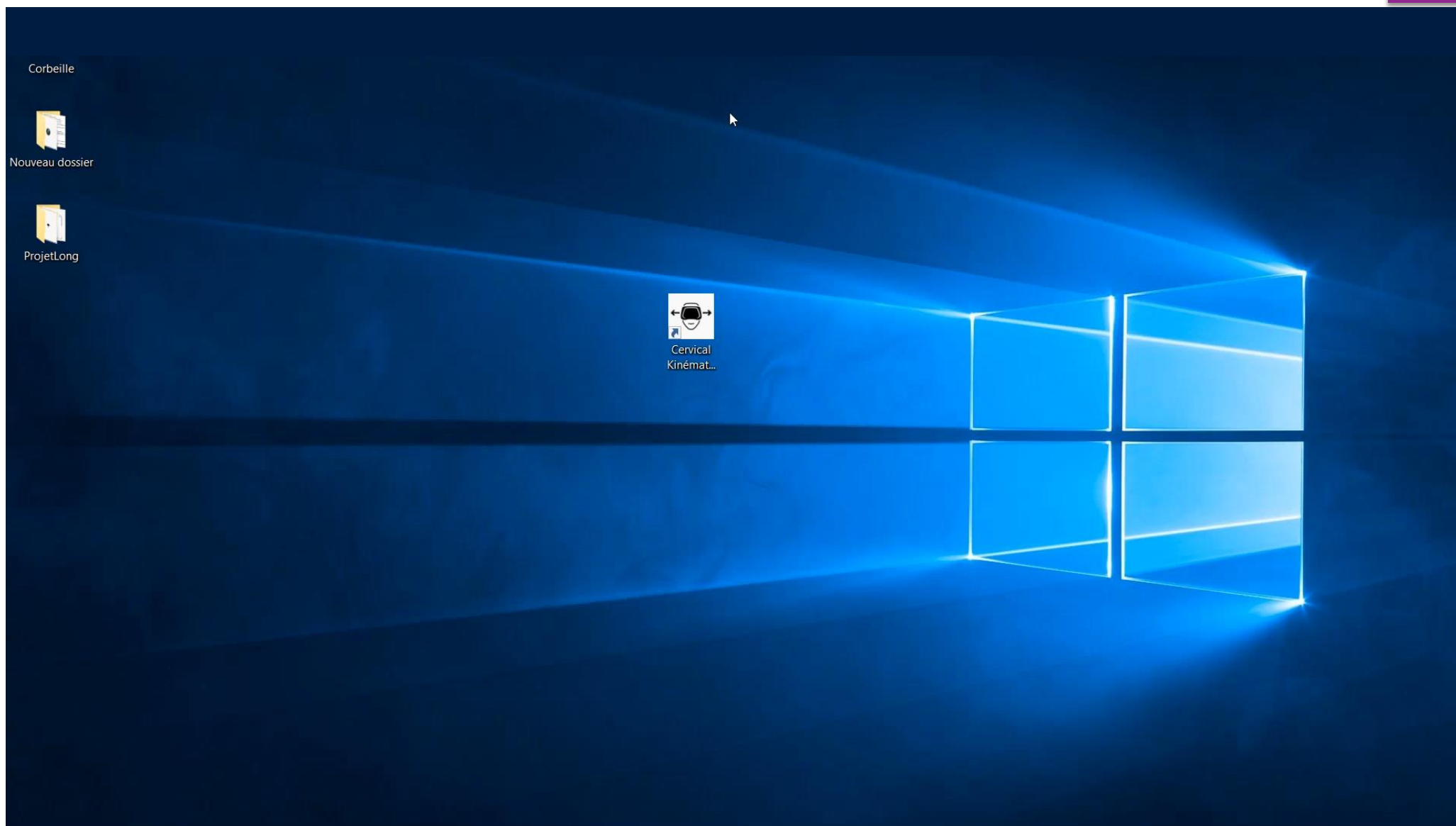


# Profile management

- ▶ Creation of a folder with first name, last name and age of subject
- ▶ Possibility to load a pre-existing subject
- ▶ Creation of a comments file where you can find all comments related to the records

# Presentation of the final product

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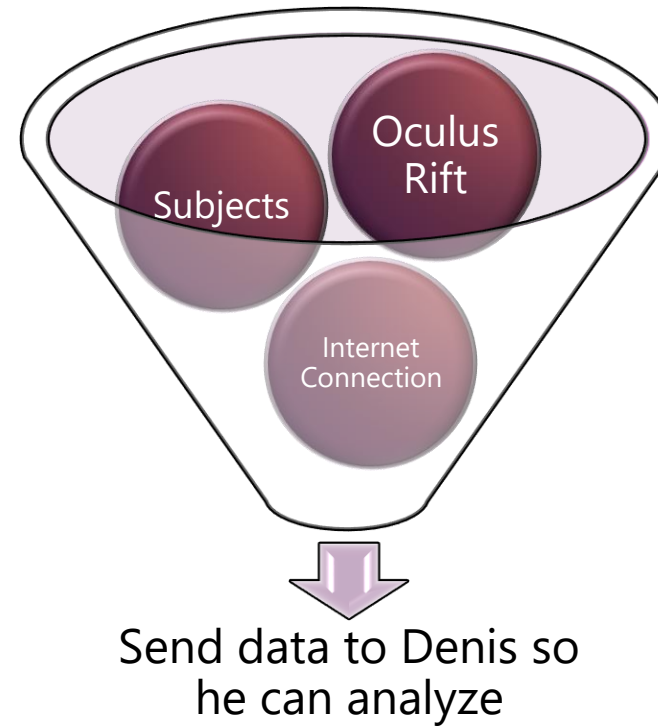
# **Last meetings with the client**

- ▶ Presented our application to him and his coworkers
- ▶ Detected anomalies in Alexandre's yawning
- ▶ Tried some infructuous therapy
- ▶ Left some testing advices

# Some issues the client found

- ▶ While he was testing, he recorded a lot of patient data
- ▶ He asked to add the age of the subject
- ▶ He wanted to add comments on curves
- ▶ He found some bugs occurring when the application wasn't use properly

- ▶ Anyone with an oculus can download and use the application
- ▶ Any osteopath can analyze data sets and detect issues in head movements
- ▶ Everyone can send their measures to Denis (30 records weight 500 Ko)



## How it can be used

By any osteopath in the world

# Axis of amelioration

For the future  
developers





**Thank you for your attention**