Musical instrument identification system based on a neurally inspired sound onset modelling

Gabriel Reinés March

Project Proposal and Work Plan

REVISION HISTORY AND APPROVAL RECORD

Revision	Date	Purpose
0	15/07/2013	Document creation
1	15/07/2013	Document revision

DOCUMENT DISTRIBUTION LIST

Name	E-mail
Gabriel Reinés March	bielreines@hotmail.com
Dr. Michael J. Newton	michael.newton@ed.ac.uk
Dr. Josep Salavedra	josep.salavedra@upc.edu

WRITTEN BY: Gabriel Reinés March		REVIEWED AND APPROVED BY: Josep Salavedra, Michael Newton	
Date 15/07/2013		Date 15/07/2013	
Name	Gabriel Reinés March	Name	Josep Salavedra
Position	Project author	Position	Project Supervisor

0. CONTENTS

1. PROJECT OVERVIEW AND GOALS

The project is carried out at the Acoustics and Audio Group, from the University of Edinburgh, Scotland, United Kingdom.

The purpose of this project is to design and implement a musical instrument classification system, based on the modelling of the sound onset. This model is obtained through a simulation of the Human Auditory System. The onset model defines a sound descriptor, which is used to feed a classification system.

The project main goals are:

1.- Understanding the fundamentals of the HAS's physiology and implementing a simulation of the cochlea and auditory nerve.

2.- Designing and implementing various classification systems in order to perform a classification over a sound database.

3.- Validating the model and comparing the success rate and computing times with other onset-based classification systems.

2. PROJECT BACKGROUND

This project is a continuation of the research work performed by the project supervisor Dr. Michael J. Newton (University of Edinburgh) and Dr. Leslie S. Smith (University of Stirling). Their research scope is focused on the detection and modelling of the sound onset using a biological model, inspired in the Human Auditory System.

The aim of this project is to implement in MATLAB the theoretical onset model proposed by M. J. Newton in his Acoustical Society of America's paper, and investigate different classification schemes using the obtained onset models as sound descriptors.

3. PROJECT REQUIREMENTS AND SPECIFICATIONS

Project requirements:

- The implementation has to be able to deal with a database of real-sound recordings, with the corresponding time and memory constraints.
- Software has to be coded in MATLAB computer language.

Project specifications:

- The functions used should be self-implemented, from the built-in MATLAB package or from an open-source code, avoiding the use of MATLAB extended toolboxes.

4. WORK PLAN

4.1. *Work Breakdown Structure*

4.2. *Work Packages, Tasks and Milestones*

Work Packages: (copy the box if there are multiple Work Packages)

Project: Instrument classifier based on onset modelling	WP ref: 1	
Major constituent: Bibliography	Sheet 1 of 6	
Short description: Study of the M. J. Newton's paper, which is the starting point of this project. Read further information about the Human Auditory System and analyse different published methods for onset detection and modelling. Review the concepts of the "Pattern classification" subject.	Planned start date: 18/02/13 Planned end date: 01/03/13 Start event: Obtain the project information End event: End the reading of the related papers	
Internal task T1: Read Newton's paper. Internal task T2: Read other papers or thesis related with the onset detection and modelling. Internal task T3: Review classification concepts	Deliverables: (none)	Dates: (none)

Project: Instrument classifier based on onset modelling	WP ref: 2
Major constituent: Project planning	Sheet 2 of 6
Short description: Elaborate and discuss with the project supervisor a project plan, stating the requirements and the final goals.	Planned start date: 04/03/13 Planned end date: 08/03/13 Start event: End bibliography stage

	End event: Approval of the planning	
Internal task T1: Meeting with the supervisor for discussing the project goals. Internal task T2: Elaborate a project plan	Deliverables: Project plan	Dates: 08/03/13

Project: Instrument classifier based on onset modelling	WP ref: 3	
Major constituent: Code auditory system model	Sheet 3 of 6	
Short description: Write the source code in MATLAB for simulating the auditory system and test the performance. Write the source code for the classification stage and test the performance.	Planned start date: 11/03/13 Planned end date: 03/05/13	
	Start event: Approval of the planning End event: End of writing the 1st part of the source code	
Internal task T1: Write the source code for simulating the auditory system Internal task T2: Test its performance and compare with other implemented models Internal task T3: Update/adjust the source code	Deliverables: Partial source code with first results	Dates: 03/05/13

Project: Instrument classifier based on onset modelling	WP ref: 4	
Major constituent: Code classification system	Sheet 4 of 6	
Short description: Write the source code in MATLAB for the classification stage and test the performance.	Planned start date: 06/05/13 Planned end date: 07/06/13	
	Start event: Verification of the auditory simulation code End event: End of writing the 1st version of the complete source code	
Internal task T1: Write the source code for the classification process Internal task T2: Test its performance	Deliverables: Complete source code with first results	Dates: 07/06/13

Project: Instrument classifier based on onset modelling	WP ref: 5
Major constituent: Validation and comparison	Sheet 5 of 6
Short description: Test the performance of the whole source code with a large	Planned start date: 10/06/13 Planned end date: 21/06/13

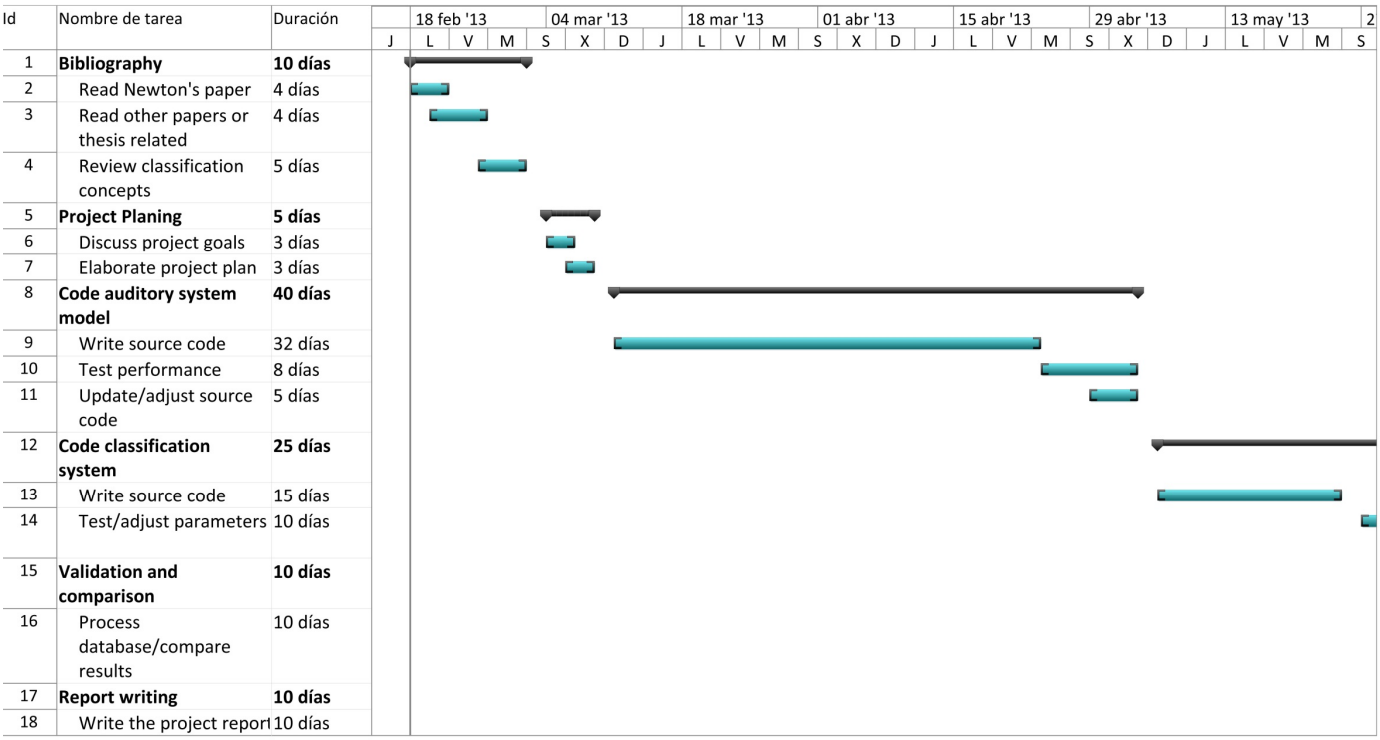
database of real sounds, and compare it with the performance of other onset-based implementations.	Start event: End of writing the source code End event: End of the performance tests	
Internal task T1: Process the whole database and compare the classification results with other implementations	Deliverables: Testing results	Dates: 21/06/13

Project: Instrument classifier based on onset modelling	WP ref: 6	
Major constituent: Report writing	Sheet 6 of 6	
Short description: Write the project report with the methods used in the project and the results obtained, as well as the conclusions.	Planned start date: 24/06/13 Planned end date: 05/07/13	
	Start event: End of performance tests End event: Deadline for submitting the report	
Internal task T1: Write the project report.	Deliverables: Report	Dates: 05/07/13

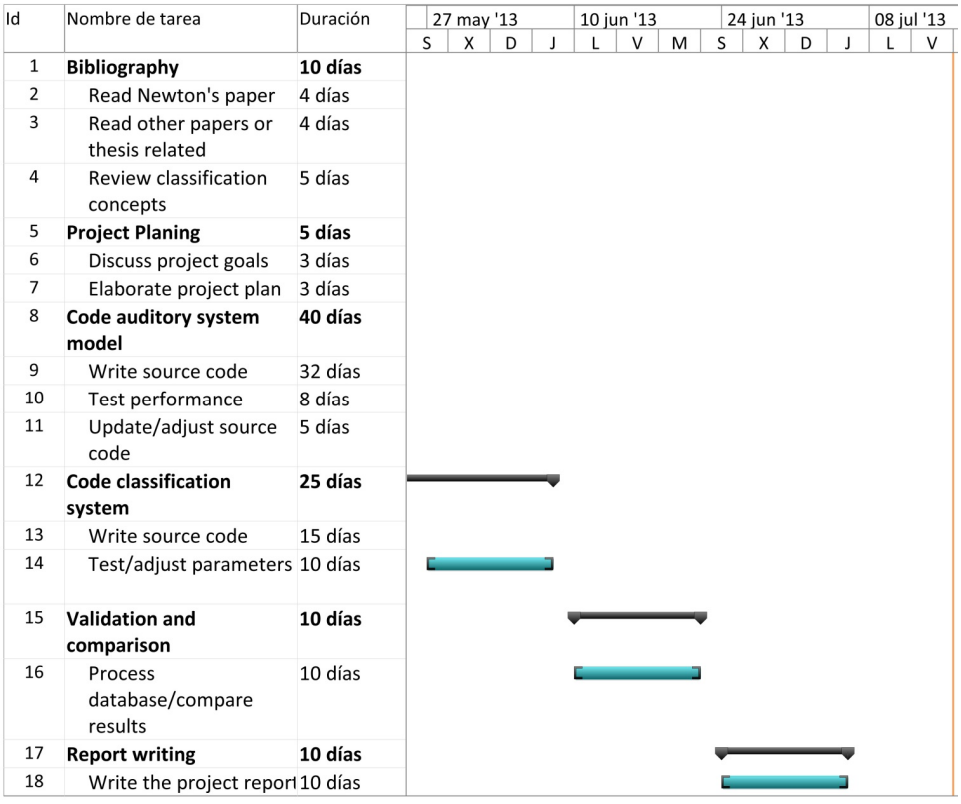
Milestones

WP#	Task#	Short title	Milestone / deliverable	Date (week)
1	3	Bibliography	Background knowledge	01/03/2013 (2)
2	2	Project planning	Project Plan	08/03/2013 (3)
3	3	Code HAS model	Partial source code	03/05/2013 (11)
4	2	Code classification system	Whole source code	07/06/2013 (16)
5	1	Validation	Testing results	21/06/2013 (18)
6	1	Report writing	Project report	05/07/2013 (20)

4.3. *Time Plan (Gantt diagram)*



Id	Nombre de tarea	Duración
1	**Bibliography**	**10 días**
2	Read Newton's paper	4 días
3	Read other papers or thesis related	4 días
4	Review classification concepts	5 días
5	**Project Planing**	**5 días**
6	Discuss project goals	3 días
7	Elaborate project plan	3 días
8	**Code auditory system model**	**40 días**
9	Write source code	32 días
10	Test performance	8 días
11	Update/adjust source code	5 días
12	**Code classification system**	**25 días**
13	Write source code	15 días
14	Test/adjust parameters	10 días
15	**Validation and comparison**	**10 días**
16	Process database/compare results	10 días
17	**Report writing**	**10 días**
18	Write the project report	10 días



Id	Nombre de tarea	Duración
1	**Bibliography**	**10 días**
2	Read Newton's paper	4 días
3	Read other papers or thesis related	4 días
4	Review classification concepts	5 días
5	**Project Planing**	**5 días**
6	Discuss project goals	3 días
7	Elaborate project plan	3 días
8	**Code auditory system model**	**40 días**
9	Write source code	32 días
10	Test performance	8 días
11	Update/adjust source code	5 días
12	**Code classification system**	**25 días**
13	Write source code	15 días
14	Test/adjust parameters	10 días
15	**Validation and comparison**	**10 días**
16	Process database/compare results	10 días
17	**Report writing**	**10 días**
18	Write the project report	10 días

4.4. *Meeting and communication plan*

- Planned meetings with the supervisor:

It is planned to have a 1-hour duration weekly meeting with the supervisor for discussing the problems and progress of the project. The following table shows the milestone meetings scheduled:

Meeting	**Date**
Project Proposal and WorkPlan approval	05/03/2013
1st version of the auditory model code	17/04/2013
Critical Review (ETSETB supervisor)	06/05/2013
1st version of the whole source code	27/05/2013
Final Review	25/06/2013
Final Review (ETSETB supervisor)	03/07/2013

5. GENERIC SKILLS

The following generic skills will be promoted and assessed during the development of the project: (mark at least three, being GS4 one of them)

#	Generic Skill	Assessed
1	Innovation and entrepreneurship	
2	Societal and environmental context	
3	Communication in a foreign language	X
4	Oral and written communication	X
5	Teamwork	
6	Survey of information resources	
7	Autonomous learning	X
8	Ability to identify, formulate and solve engineering problems	X
9	Ability to Conceive, Design, Implement and Operate complex systems in the ICT context	
10	Experimental behaviour and ability to manage instruments	