Master's Thesis Proposal

General Information

Master's Thesis Title:	**Can we detect symptoms of hyperactivity looking at the neuroimages?**
Publication Date:	10/11/2010
Expiry Date:	
Modality:	☐ technological project
	☒ research work
M.Sc. Th. Advisor:	Laura Igual and Petia Radeva
M.Sc. Th. Advisor's Dept. & University:	Applied Mathematics and Analysis (UB)
M.Sc. Th. Advisor e-mail:	ligual@ub.edu, petia.ivanova@ub.edu
Observations:	
Student's Name: (if already known)	

M.Sc. Thesis Description

Brief Description: (a 4-5 lines long paragraph)

Recently, the diagnosis of certain brain disorders as Hyperactivity has been related with the analysis of anatomical structures in Magnetic Resonance Images (MRI) of the human brain.
The **automatic recognition of these structures** is essential to speed up the diagnosis and make it observer-independent. We propose to study computer vision techniques to localize and segment the structures of interest and give information about their volume and shape.

Detailed Description: (a half-page or one-page description, may include a brief task planning)

Multiple studies of neuroscience are focus on the hypothesis that brain disorders as Hyperactivity are related with different shapes of certain brain structures. To analyze these anatomical differences Magnetic Resonance Images (MRI) of the human brain are used.
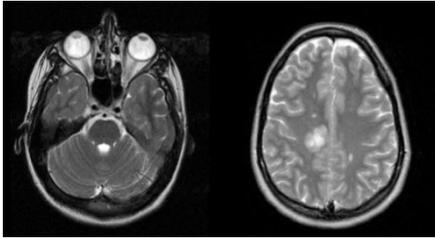
This research project is focused on the **automatic recognition of the areas of interest in MRI** which is essential to speed up the process of brain disorder diagnosis and to make the process observer-independent.

In order to localize structures, three well-known techniques can be compared: **Active Shape Models** (ASMs), which builds statistical shape models using a training data set and iteratively adapts to a new image, and **GraphCuts** and **Normalized Cuts**, which define the image segmentation problem as a graph-based partition problem using an image global criterion.

The project will be developed in collaboration with the Cognitive Neuroscience Group from Hospital del Mar who counts with experts in Cognitive Neuroscience. The project has promising results and great interest from the clinical community.

References: (bibliographical references, relevant web links, etc.)

[1] T.F. Cootes and C.J. Taylor and D.H. Cooper and J. Graham. "Active shape models - their training and application". (1995) Computer Vision and Image Understanding (61): 38--59.

[2] Y. Y. Boykov and M. P. Jolly. Interactive graph cuts for optimal boundary & region segmentation of objects in N-D images, ICCV 2001.

[3] J. Shi and J. Malik. "Normalized cuts and image segmentation", Trans. In Pattern Analysis and Maching Learning 2000.

[4] Cognitive Neuroscience Group: http://dpsiquiatria.uab.cat/en/grupRecerca_2.php

Minimal Requirements & Previous Knowledge: (optional)

- Programming experience in C++ and Matlab are compulsory.
- Written and verbal communication skills in English.

Additional comments: (optional)

Location and Date: Barcelona,

To the Academic Commission of the Master in Artificial Intelligence (CAIMIA)