

# INFO-H500

## Module 3 project report

### Tumour segmentation

Franck TROUILLEZ  
Matricule : 000459766

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## 1 Introduction

The goal of this project is to segment a tumour on a brain MRI. It should also give the area of this tumour.

## 2 Pre-process

Before trying to segment the tumour, a good practice is to do some pre-processing, in order to facilitate the execution of the algorithm. In this project, a gamma correction is applied, in order to darken the more dark regions. Knowing that a tumour looks brighter on a MRI, the contrast between the tumour and the rest of the image is increased.

## 3 Process

The algorithm works in 2 phases.

### 3.1 First phase

The first phase consists in applying an Otsu threshold on the value channel of the HSV image version, to get the brightest parts of the images. However, although this single step gives the right result with the example image, it is not robust at all. Indeed, if the bones, which composed the skull, are as bright as the tumour, which is not an impossible case, the algorithm does not work. A way to handle that could be to use an opening, in order to remove the bones. However, it reduces the area of the tumour, which is not desirable.

### 3.2 Second phase

In order to solve this problem, the algorithm uses a second phase. This phase makes a new version of the mask given by the Otsu threshold by applying an erosion. It will get the mask with only a few points. Knowing that the tumour looks like a disk and that the bones are more like lines, the erosion will first remove the bones. Knowing that, the few points in the eroded version are part of the tumour. With those points, the watershed method can be used. Indeed, this method will use the points of the masks as its markers. Thus, the regions generated from the points of the eroded mask corresponds to the tumour. Taking the image descriptor of each region gives us a segmented image with different colors. A final Otsu threshold gives a mask containing the tumour, which allows to segment the tumour on the initial MRI.

**Note :** The example files used are attached to the report and notebook. This algorithm works fine on every example file provided.