VTK HW01

Zhewei

1 Dataset

The dataset used in this project is from ADNI: *http://adni.loni.usc.edu/*.
Basically each fMRI image contain 140 time frames. In the data preprocessing we discarded the first 10 frames. And for each of the rest 130 frames
we separate the whole brain as 120 zones according to a canonical template.
We calculate the mean of each zone. We can think it means the activity
of the brain. Then we do feature selection for these 120 zones and select
20 zones as the final fetures. So at the end for each fMRI image we have a
matrix of 20×130.
We plan to show the matrices via VTK. The basic idea is to use a cylinder
for each zone, and use the value of the zone as the height of the cylinder.
So in the 130 time sequence, we can see the data change.
After data prepcoressing, we have 180 subjects. And they can be separated
as two classes: Alzheimer and Normal. The assumption is that the brain
activity for these two groups are not the same. So the purpose of this project
is to show two subjects at the same time and observe the brain activity.

Besides the 20×30 matrix signals, we also have age and weight for each
subject. So we have four dimentions: Group Label(Alzheimer or Normal),
Signals (20×130 matrix), Age and Weight. For Group Label, we use different
colors. Red for Alzhieimer and green for Normal. For Age we use darkness
to express it. So the Age larger, the color will be darker. For Weight we use
the radius. The larger the weight, the larger the radius.

2 Code

This project is done by python. For the VTK part, we set renderer, mapper
first, and define a function of callback. In the callback function we define actors and from actors to set the properies of cylinders. The problem is there
is a bug about time callback in VTK. After we use the vtkRenderWindow-
Interactor().CreateRepeatingTimer() the camera will rotate and leave the

center of world space further and further. Some materials about this bug is at *http://www.vtk.org/pipermail/vtkusers/2016-January/093786.html.* So I changed my method and build a static model. In this model all the cylinders of all the time steps are shown. That means we have to show $2 \times 20 \times 130$ cylinders. Because for all the cylinders the renderer and mapper are the same, so it's not so slowly to show them.

3   Improvement in the future

Firstly should find a way to fix the bug. And also it's kinde of difficult to find the parterns in these two groups. That's why we are trying to use machine learning method to separate them. If we are successful, we can come back to use this project to show the learned parterns.