RICE

Summer Research Project
Video Based Mouse Seizure Detection

Juarez Sampaio

Rice University

July 14, 2015

Content

- ▶ A few concepts in image processing and computer vision:
  - ▶ Code Vectorization
- ▶ Results of the week
  - ▶ Collecting Labeled Sequences
  - ▶ Filtering Flow

Background Concepts: Code Vectorization

Motivation

When dealing with matrix data we might be tempted to write for loops after for loops. However, most operation on an element of the matrix are independent of the others. Those independent operations could take place in parallel. Writing parallel code is troublesome due to memory access conflicts. However, your code can run in parallel if you are able to use methods already implemented in parallel.

▶ Part of code vectorization is the art of written for loops as matrix and vectors products and dot products.
▶ Other techniques are useful: you might want to generate all index of a matrix that are going to be modified and then modify them all at once.

Background Concepts: Code Vectorization

▶ In order to learn code vectorization you need to get familiar
  with the tools provided by the library(in this case, numpy)

```
flowNorm = np.linalg.norm(newP - oldP, axis = 1)
valid = np.where(np.logical_and(flowNorm >= self.low_th, \
                      flowNorm <= self.upper_th))
```

Collecting Labeled Sequences

Results of the Week: Collecting Labeled Sequences

Motivation

On Supervised Machine Learning we need to train the classifier with labeled samples. The samples collected should be independently draw and be representative of the space of possible samples.

- ▶ The previous data available had resolution of minutes
- ▶ We plan to detect seizure within sequences of seconds(Is there a seizure in this 3(or 5) seconds video)
- ▶ We got together with an expert on this experiment and asked him to precisely point the seizures

Collecting Labeled Sequences

Results of the Week: Collecting Labeled Sequences

- ▶ Because we wanted this made as quickly as possible two programs were written:
  - ▶ One to crop the video around the minute indicated in the currently available data
  - ▶ One to open the cropped video and with sliders to help select the seizure sequence.
- ▶ For the first program it was important that the videos were names with the initial time and also that the frame rate is constant along the video
- ▶ Example of data collected:
  - ▶ `video 2014-07-16_08-55.avi seizure from frame 01075 to frame 01210`
- ▶ Run demo

Results of the Week: Filtering Optical Flow

Motivation

Previously it was noted that spurious optical flow is often present on the data. However, true movement differs from spurious flow on magnitude and connectivity of the flow.

- ▶ A filter was implemented using the first idea: a low pass filter in magnitude will reduce the amount of spurious data.
- ▶ Because we wanted to study the performance of the filter being implemented, the problem was first reproduced on another environment.
- ▶ Run demo on camera
- ▶ Run demo on main program