SNAPT ALGORITHM

The Sub-Nyquist Action Potential Timing (SNAPT) algorithms enable pixel-by-pixel determination of the timing of an action potential. The input is a movie of a neuron repetitively triggered to fire, where the neuron contains a high-speed fluorescent voltage reporter. The output is a movie at a higher frame-rate showing the propagation of the action potential through the neuron. For a detailed description of the algorithms, see: Hochbaum *et al.* "All-optical electrophysiology in mammalian neurons using engineered microbial rhodopsins", Nature Methods (2014).

The implementation given here is written for Matlab R2012a, and has been confirmed to run on a personal computer with 14 GB of RAM, running Windows 7 (64-bit). Several of the sub-routines are memory intensive. There are many adjustable parameters in the code, so it is important to run the code one piece at a time, looking at the output at each step and checking that it makes sense.

The top-level script is:
`SNAPT_PCA.m`
Run this script one section at a time (highlight a section, then press `F9` on a PC).

This code uses the following helper functions:

```
apply_clicky.m
clicky.m
extractV.m
mask_region.m
pcafilt.m
readTifFast.m
rem_pbleach.m
spatialfilt.m
spikefind.m
splinezeros.m
```

In addition, the code uses two sets of functions distributed on the MatlabCentral database:

`grs2rgb.m` (**Note: the function included with this distribution has been modified from the version distributed at MatlabCentral**)
`freezeColors.m`

You may need to modify the code to accommodate peculiarities of your data.