# Semi-Automatic Slice Extraction Tool:

## System Requirements:

- Install software requirements and toolkit as described in README.md
  Note: Recent matplotlib versions (tested with matplotlib 2.0.0) may slow down the tool!
- A three-button scroll mouse is needed for the navigation and slice extraction.

## Usage of Slice Extraction Tool:

### Start of Programme:

1) Run the Slice Extraction Tool:
   a) Via IPython

```
ipython
run -i vrpf_extract_stack_from_films.py \
--films path-to-film1.dcm ... path-to-filmN.dcm \
--stack path-to-extracted-stack.nii.gz \
--inplane-spacing initial-guess-in-plane-spacing \
--slice-thickness known-slice-thickness
```

   b) Alternatively, directly from the command line without IPython

```
vrpf_extract_stack_from_films \
--films path-to-film1.dcm ... path-to-filmN.dcm \
--stack path-to-extracted-stack.nii.gz \
--inplane-spacing initial-guess-in-plane-spacing \
--slice-thickness known-slice-thickness
```

2) Follow the steps as stated in the command line.

```
--- Help: List of Navigation Keys ---

General Handling
        h:              Print this information.
        p:              Switch mouse cursor type (select and move/zoom).
                        'Cross':   Zoom in/out with held right click.
                                   (Hit 'r' to zoom out entirely again).
                        'Arrow':   More precise selection possible.
        Middle click:   Click on image position to save its coordinates.
        d:              Delete most recent point coordinates.
        Esc:            Close figure and continue with next MR film (in case existing).
                        Selected coordinates and cropping window (offset and length) are stored.

Adapt Selection Window:
        b:              Choose among 7 bookmarks to define selection box dimension [left_circle].
        right:          Move up to switch between x-offset, y-offset, x-length and y-length.
        left:           Move down to switch between x-offset, y-offset, x-length and y-length.
                        up:         Increase chosen property by one pixel.
                        down:       Decrease chosen property by one pixel.
                        pageup:     Increase chosen property by 50 pixels.
                        pagedown:   Decrease chosen property by 50 pixels.
                        space:      Use keyboard to define value of chosen property.

Single/Double Mode:
        m:              Change between single and double selection mode [single].
```

## Proposed Strategy:

1) Maximize the window of the MRI film for more accurate processing
2) In case two slices are “merged”, i.e. printed immediately next to each other, switch to double mode (‘m’).
    - Single mode: One click generates a single selection window based on set offset and side lengths.
    - Double mode: One click generates two selection windows based on set offset and side lengths.
3) Start with the appropriate bookmark (‘b’); Look at the section ‘Choice of the Right Bookmark’ for further information on how to initialize the selection window.
4) Hit ‘p’ and change the cursor type to zoom in/out by moving the mouse while holding the right button in order to find the desired view. Switch back to the arrow-cursor by clicking again ‘p’. It will help to get more accurate clicks.
5) To extract the slices, click on the same common feature of each single scan on the MRI film first regardless the selection window accuracy. Try to be as precise as possible by clicking on the same position for each scan – different MRI films suggest a different common feature; see ‘Choice of the Right Bookmark’ for some examples. You can delete the most recent selection if desired via ‘d’. Then, adjust the selection window so that the selected window represents the desired field-of-view. It will adjust all windows simultaneously.
    - Use right/left arrow keys to select the desired value of (x-, y-) offset and (x-, y-) length of the cropping window for the slice extraction.
    - Use page-up/page-down keys for quicker (but rougher) adjustment
    - Use up/down keys to finely adjust the cropping window.
    - It is also possible to set the figures for each option directly via the ‘space’ key instead.
6) If you are happy with the selection and all images are selected hit ‘Esc’. The chosen dimensions of the slice extraction windows are stored, all slices get extracted and the next MRI film is opened for further extraction (in case existing).
7) On the subsequent MRI films, do not change the window dimensions anymore. Otherwise, the cropped slices across MRI films have different dimensions and cannot be stacked accordingly!
8) Using the same slice extraction window (as defined on the first MRI film), click on the same common feature on all subsequent MRI films belonging to the same stack acquisition.
9) After having finished the last MRI film, type in the slice-thickness in the command window as given on the MRI film scan when requested.

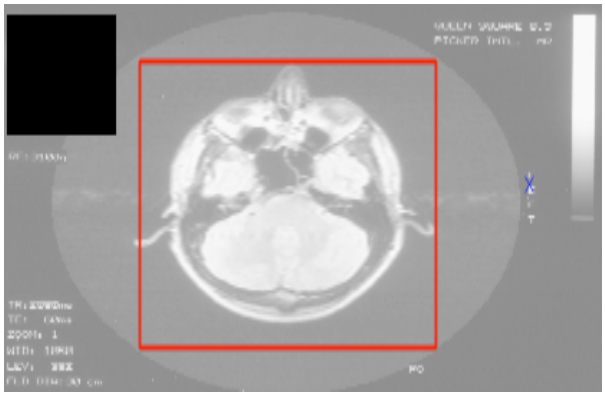
## Remarks:

- All the navigation keys are only recognized in case the image window as active. In case you have chosen an option where you need to type a value into the terminal (like for changing the bookmark via ‘b’) don’t forget to click back on the image window.
- You can abort the current run any time: Use ‘Ctrl+C’ in the terminal, close the image window, click back into the terminal and hit ‘Enter’.

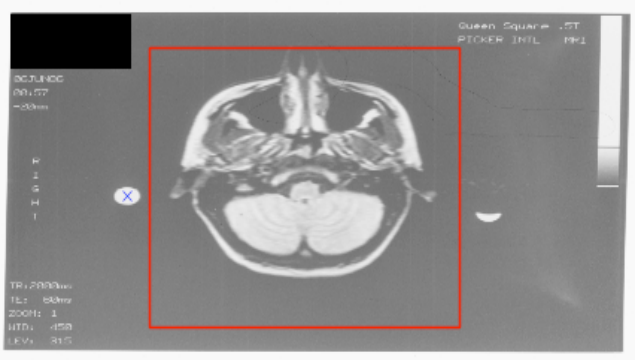
## Choice of the Right Bookmark:

### Single mode:

- "L-corner":

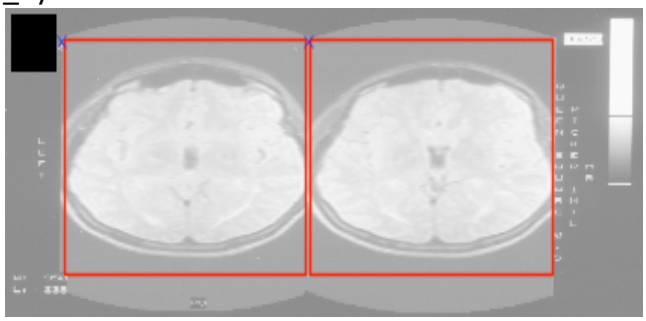


- "left_circle":

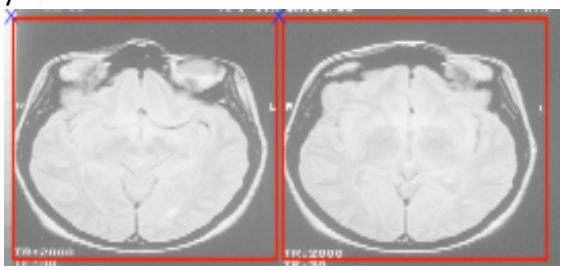


### Double mode:

- 'double_window_5yr':

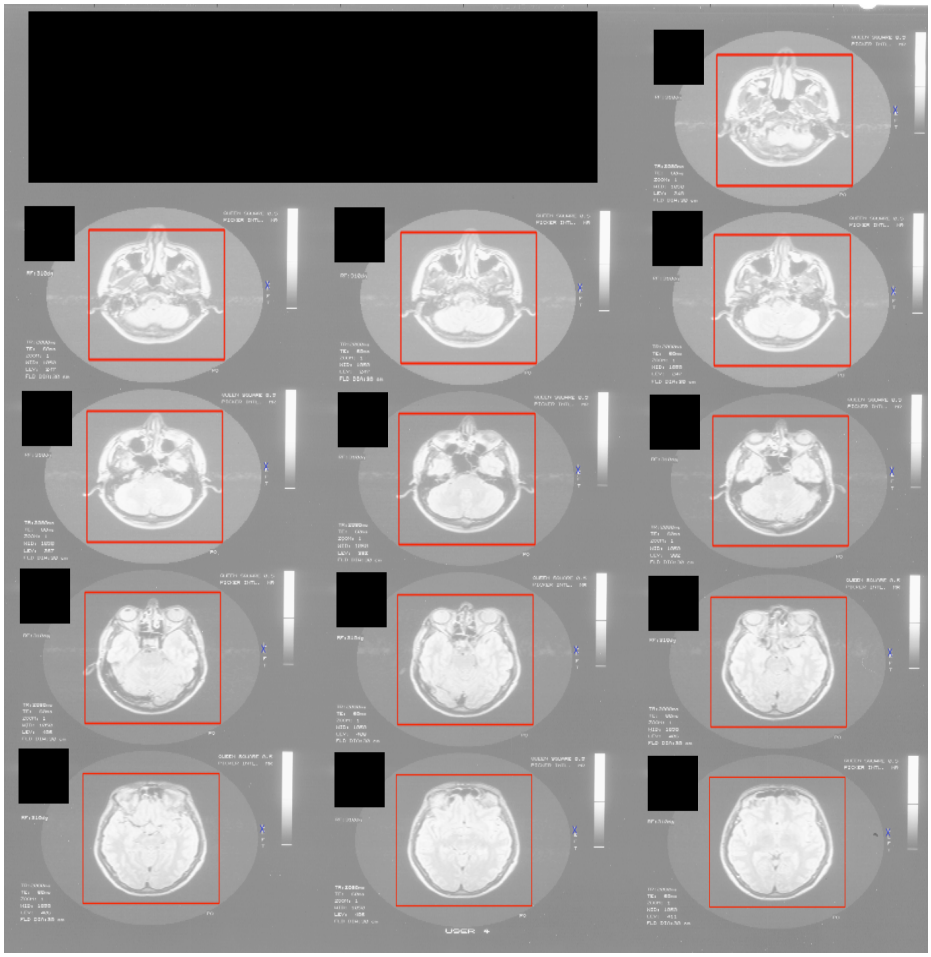


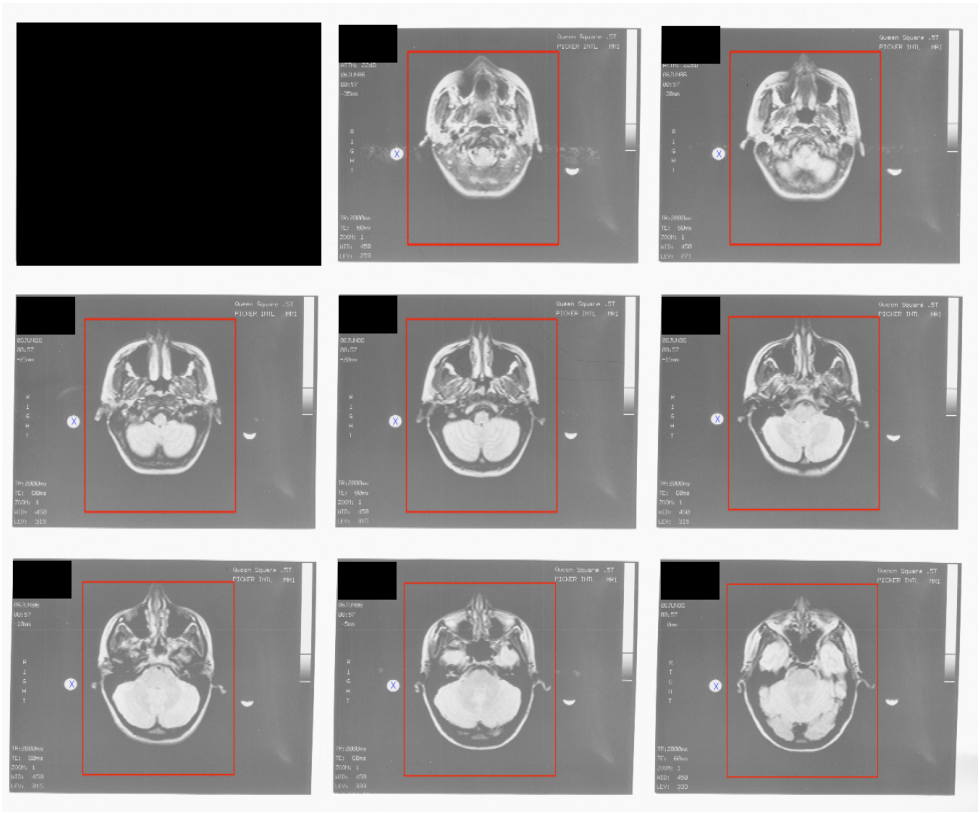
- 'double_window_10yr':



# Screenshots of Semi-Automatic Slice Extraction Tool:

## Single mode:





Double mode: