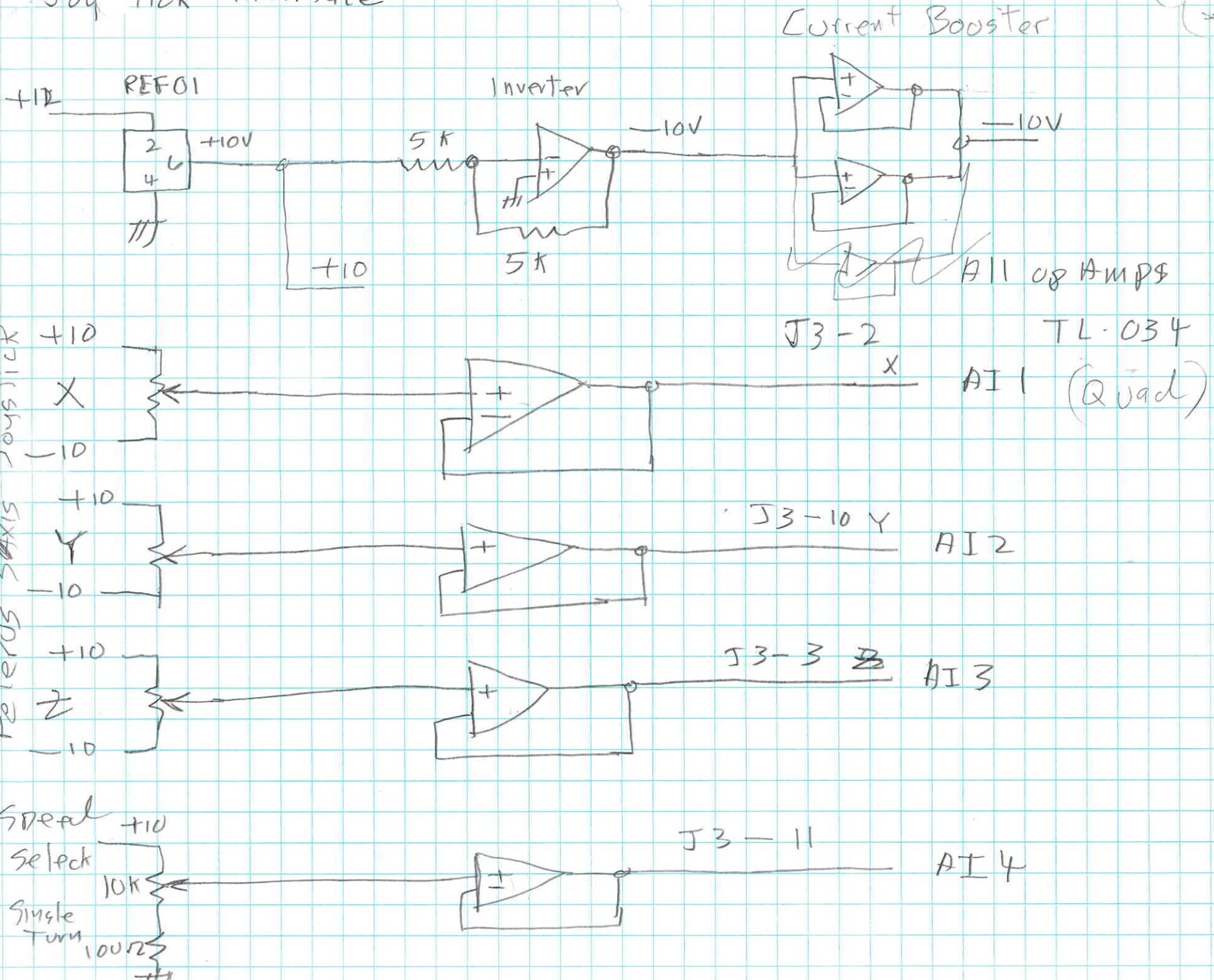
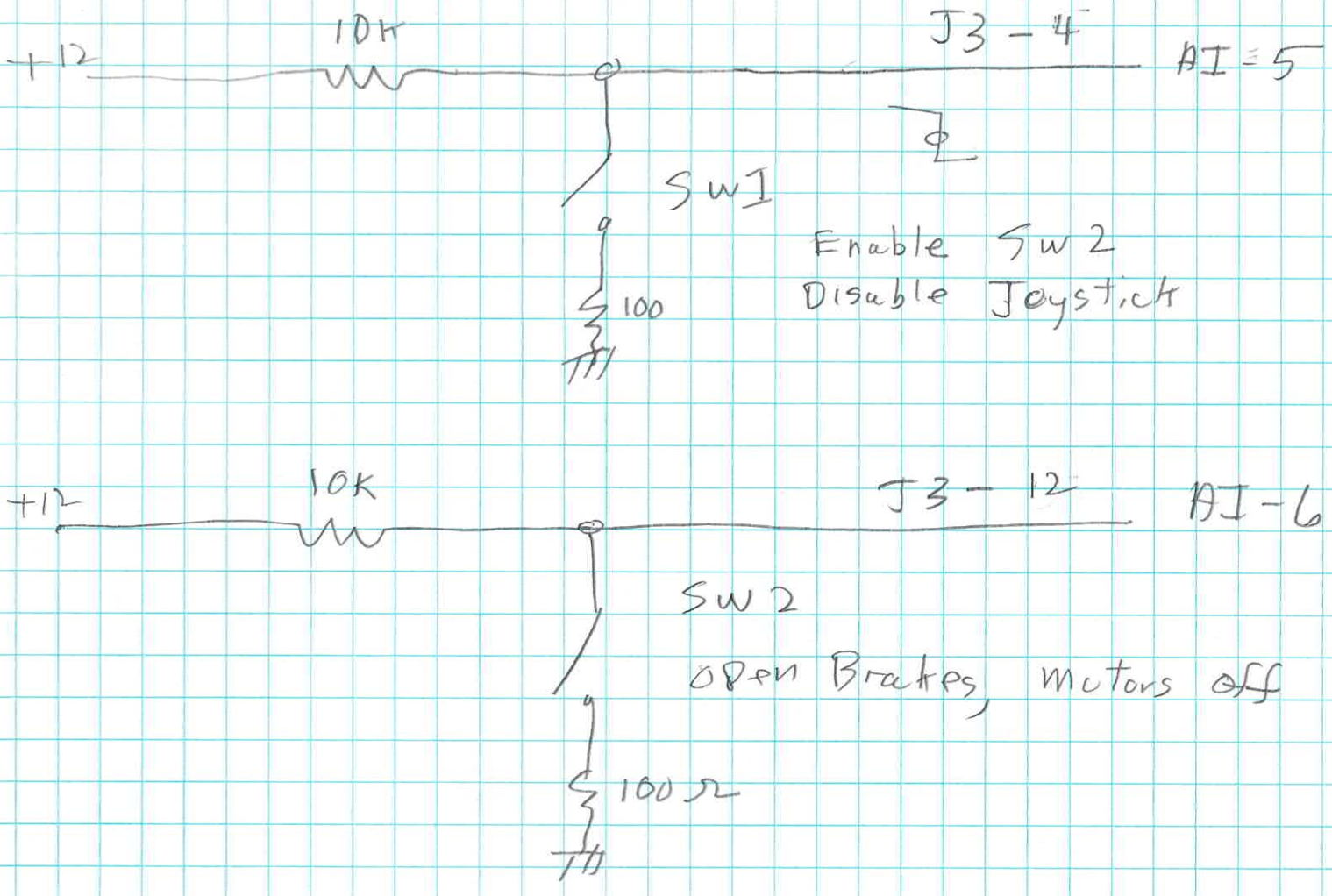
# Joy tick interface



Joystick, Cont.



Digital inputs are not available on the Joystick analog input, so AI5 and AI6 are used as switch inputs

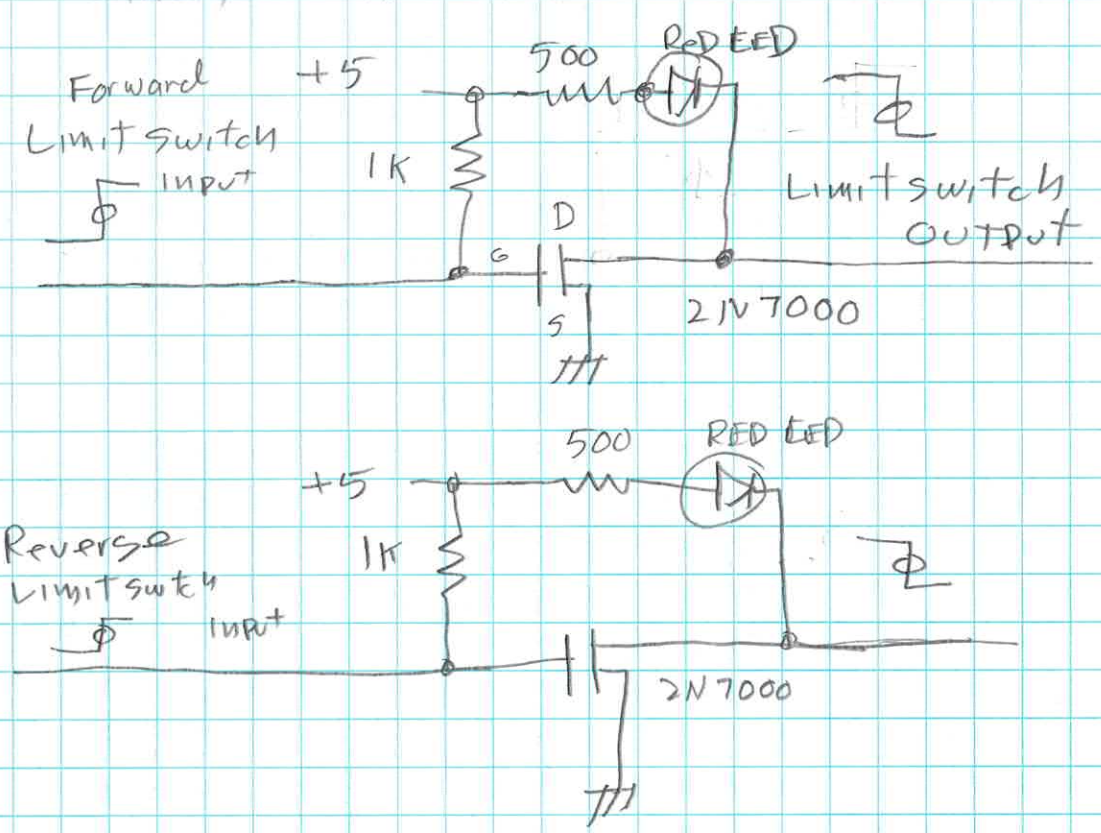


The Galil Digital I/O is handled by the 44 Pin External Driver. The Assignments are as follows:

| | | | | | |
|---|---|---|---|---|---|
| 1 | | 16 | | 31 | Ground |
| 2 | | 17 | | 32 | |
| 3 | | 18 | | 33 | |
| 4 | | 19 | | 34 | |
| 5 | | 20 | | 35 | Ground |
| 6 | LS Com (+5) | 21 | | 36 | For. Lim Sw (x) |
| 7 | | 22 | Rev Lim Sw (x) | 37 | For Lim Sw (Y) |
| 8 | | 23 | Rev Lim Sw (Y) | 38 | For Lim Sw (Z) |
| 9 | | 24 | Rev Lim Sw (Z) | 39 | |
| 10 | | 25 | | 40 | Ground |
| 11 | O-PWR (+5) | 26 | | 41 | DO-1 (Brake X) |
| 12 | DO-3 (Brake Z) | 27 | DO-2 (Brake Y) | 42 | |
| 13 | | 28 | | 43 | |
| 14 | O-Ret (gnd) | 29 | | 44 | |
| 15 | +5 | 30 | +5 | | |

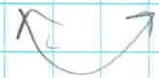
If optoisolation is not used, apply +5 to Pin (11) and ground Pin (14)

T Coil only allows Limit Switch Polarity to be selected as a group. If the stages are not all of the same type, an inverter circuit may be needed. The following simple circuit was used:

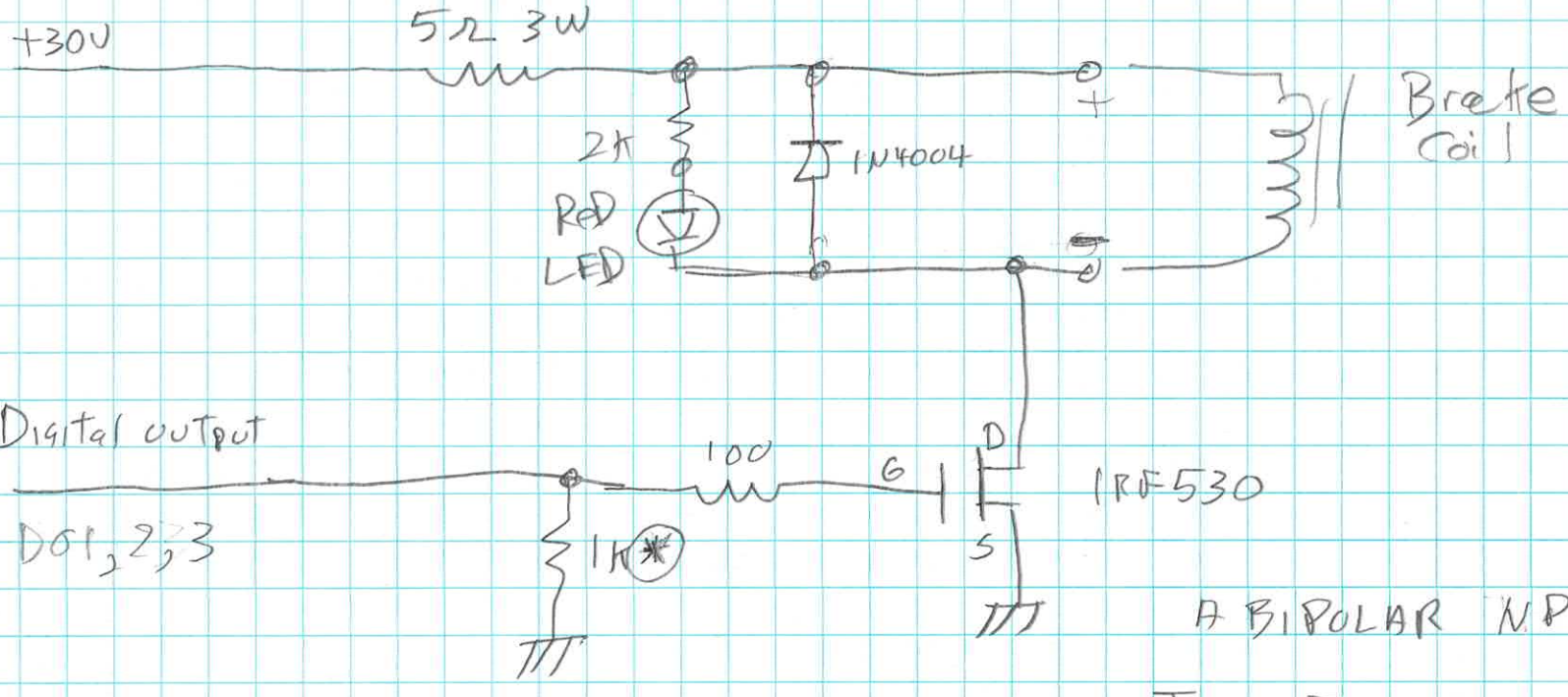


Encoder Connector 15 pin High Density JA1, JB1, JC1
on Stage

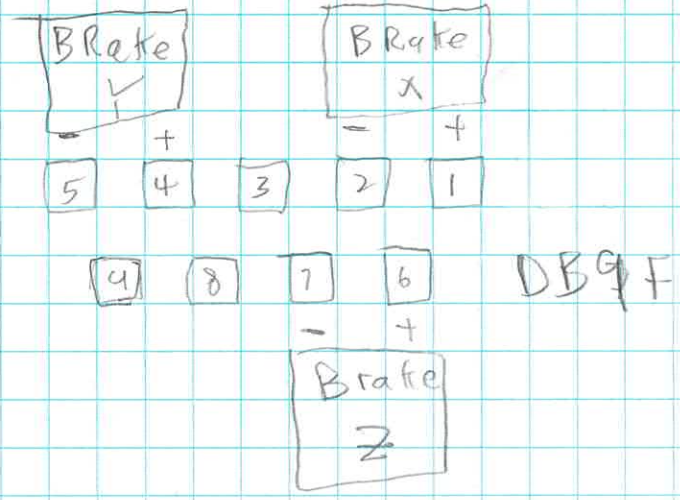
| | Galil | |
|---|---|---|
| A+ | 3 | Main Quadrature encoder |
| A− | 8 | |
| B+ | 2 | |
| B− | 7 | |
| +5 | 15 | Encoder Power Supply |
| GND | 5 | |
| AUX A+ | 11 | Auxiliary Quadrature encoder |
| AUX A− | 9 | |
| AUX B+ | 4 | |
| AUX B− | 12 | |



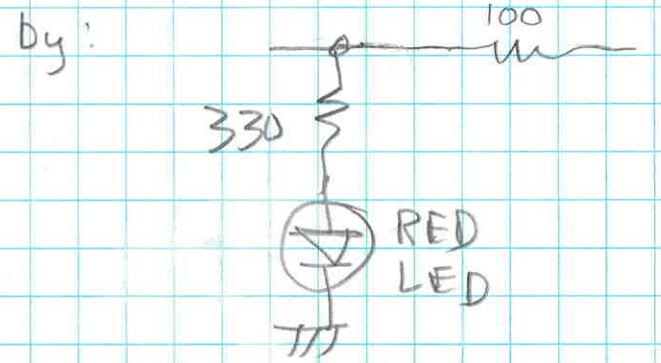
Typical Brake Circuit for X, Y, Z




A BIPOLAR NPN Transistor may also be used




* may be replaced by:



Inportant Files

**Run_analyze_velocity9.m**

- File that set parameter of the analysis and calls the function that performs the analysis. Also prompts for selection of objective.
- Winsize=500 – sets the size of the data to be processed at once. Bigger winsize gives worse resolution of velocity in time.
- Pix_down=75 – Determines the amount of overlap between data blocks. Less pix_down leads to more overlap, and more data points for velocity.
- Num_pts=200 – Number of points used to resample the input data. With winsize=500, and num_pts=200, this will give a matrix of 500rows by 200 cols , and this will be used to perform SVD.

**Analyze_velocity9.m**

- M-file that contains the function for analysis. Software flow:
    1. Ask user to select ROI
    2. Ask user to select range of angles to search through, how many angles to use within this range. And the same for 2nd pass
    3. Read the stimulus channel
    4. Initialize variables
    5. Enter while loop for processing.
    6. For each block, and each angle to examine, the data is resampled using a sampling grid that is sheared to the pre-determined angle. Then SVD analysis is performed on the re-sampled data.
    7. From the SVD analysis, we can build a function of seperability vs angle. The angle at which max seperability occurs corresponds to the velocity of the blood flow. The search for this angle on performed in two pass.
    8. Then stimulus information is used to separate the velocity over time into different trials. After that, % change in the velocity is calculated by diving the post-stimulus values by pre-stimulus values.
    9. saves the results

Important functions

- Getobjective
    - displays a list of objectives, let user select which one was used and returns TandemFactor. (written by Nozomi)
- f_get_linescan_header and f_get_linescan_header_vH
    - usage: f_get_linescan_header(filename or file handle)
    - returns parameter used in data acquisition
- f_get_lines
    - usage: data=f_get_lines(filename or file handle, start_line, end_line, channel)
    - returns the data from the specified file, from the start line to end line, and the specified channel
- f_get_lines_C

- functions that was written in C, performs the same function as f_get_lines, but much faster
- usage: data=f_get_lines_C(filename, start_line, end_line, channel, xpix).
- Xpix is the number of columns of the data.

**Run_analyze_diameter7.m**

- File for calling the function that performs the analysis
- Winsize, read_winsize: determines how many lines are read and processed at the same time

**Analyze_diameter7.m**

- File for diameter change analysis
- Software flow:
  1. Read out first 20 to 70 lines of the data, these lines are averaged to provide a reference shape for the vessel. Two profiles are obtained, one from the left edge and one from the right edge.
  2. For every data block, the data is smoothed down the column (over time) with a low pass filter. Then for each row, the data is compared to the reference profiles.
  3. By comparing the relative moments of the edges in the data with that of the reference, we can calculate diameter change.

**run_analyze_diameter_multivessel_scale1.m**

- Run file for diameter analysis for data files with multiple vessels

**analyze_diameter_multivessel_scale1.m**

- Analyze the vessels the same way, however, use can select the size and position of the reference profiles.
- Scaling of edges.