Politecnico di Torino

In collaboration with:

SUPSI

GAIT User Guide

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Contents

1. Loading Data

The file that contains the signals to be analyzed should be a struct file called "rec" (see Fig. 1) with the following fields in it:

- "AcquisitionType" where it must be specified whether the signals are derived from IMU or EMG.
- "SamplingFrequency" where the sampling frequency of the acquisition system must be declared.
- "Data" where signals in the form of numerical arrays are to be entered. The names of the individual signals are at the user's choice.

rec

1x2 struct with 3 fields

...	AcquisitionType	SamplingFrequency	Data
1	"EMG"	1.2593e+03	1x1 struct
2	"IMU"	148.1481	1x1 struct

Figure 1: "rec" struct file

Once the code is runned, user is asked to load the file containing "rec" mentioned above and choose whether to also include EMG signals or not. Next, all the IMU signals contained in the struct file will be displayed (see Fig. 2). The user, after checking which of these is the gyroscope signal corresponding to the mid-lateral axis of the body, will have to click enter in order to display a listbox from which he can select the signal (see Fig. 3)

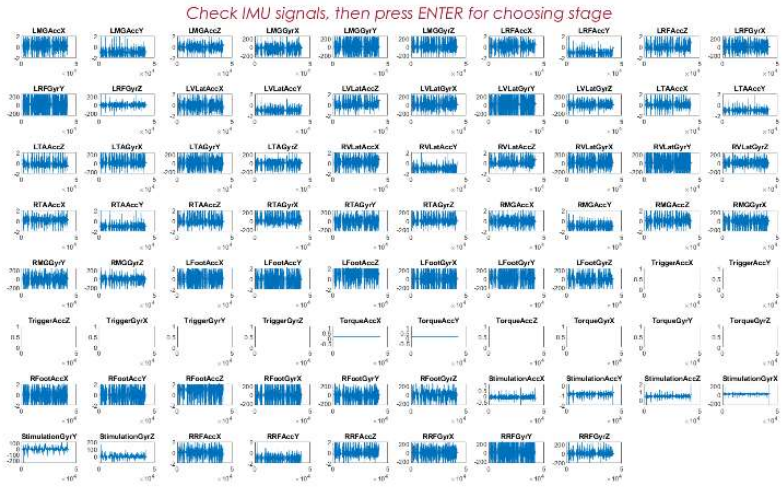


Figure 2: displaying IMU signals contained in "rec" struct file in the "Data" field

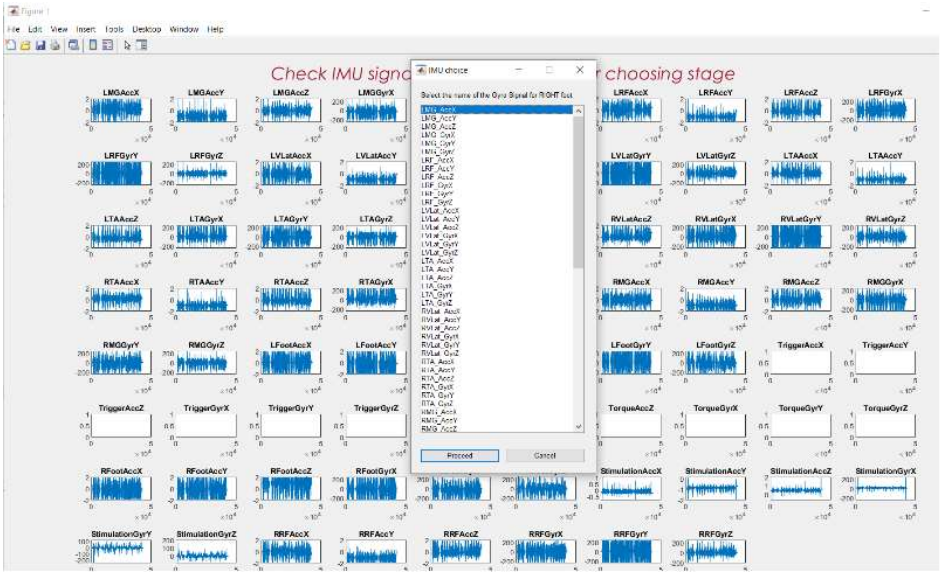


Figure 3: list box containing all file included in "rec" struct file in the "Data" field

2. Smoothing Signal

Four plots corresponding to different lengths of the moving average filter window are displayed (see Fig. 4) As in 1, pressing enter allows the user to choose one of the four signals through a listbox (see Fig. 5).

Figure 2: Display of filtered signals with different window lengths

Figure 3: List box by which the user can choose the filtered signal. Corresponding ID number is given in the title of each Matlab plot.

3. Gait Segmentation

The user will be able to zoom in and check whether the segmentation of the walk has been correctly detected by the algorithm (see Fig. 6-7) Once the check is completed, the user can choose trough a question dialog box (see Fig. 8) whether:

- "Accept": accept the segmentation detected by the algorithm
- "Choose which ones to change": change only some of the instants detected by the algorithm
- "Change all": perform walk segmentation from scratch

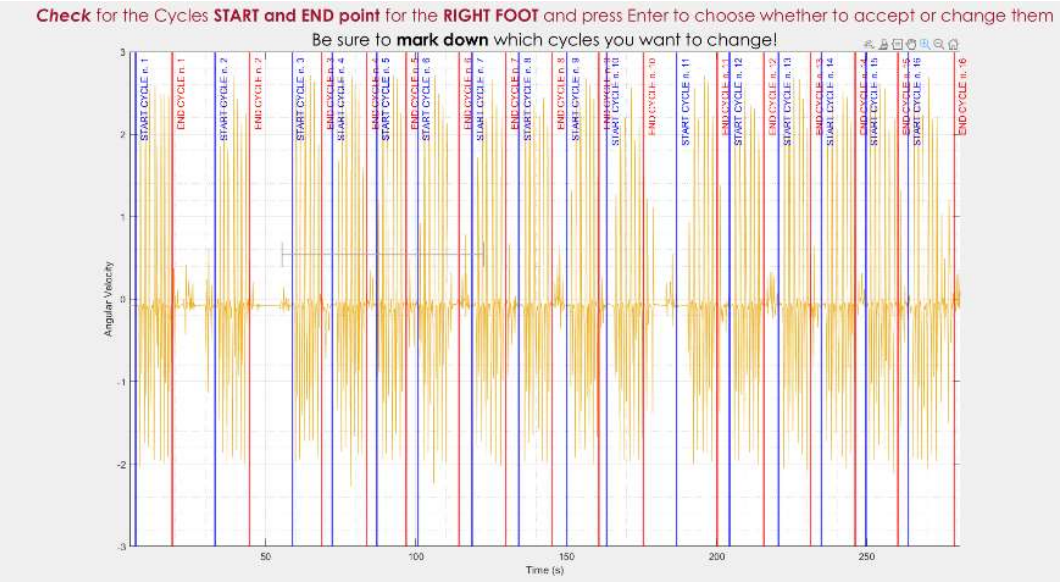


Figure 6: Signal display with walk segmentation detected by the algorithm. The user can zoom in to check whether the time instants chosen as the beginning and end of each "rep" have been properly placed.

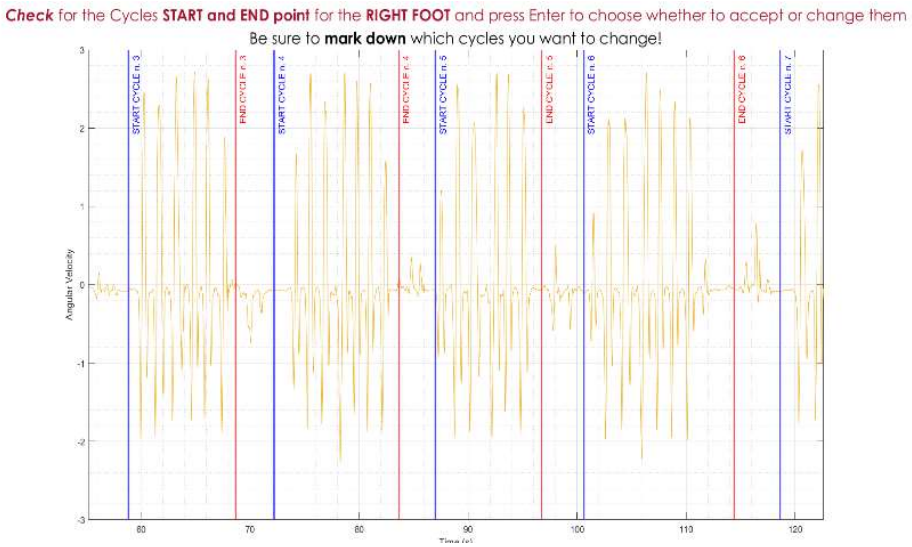


Figure 7: Example of signal display with zoomed segmentation on "reps" 3-4-5-6

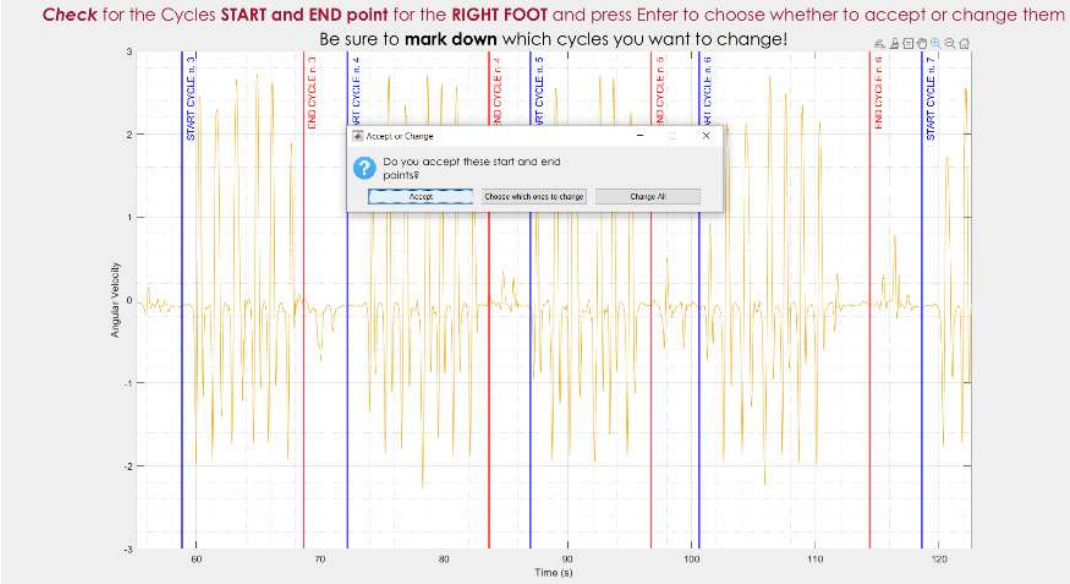


Figure 8: Question dialog box with which the user can implement the 3 choices: "Accept," "Choose which ones to change," and "Change All."

3.1 "Choose which ones to change"

Choose from the list which instants of the walk "reps" to change (see Fig. 9) For multiple choice hold down the ctrl key.

Then the zoom of the chosen "rep" is displayed, and the instant to be changed is indicated with a red vertical line. To change it, simply place the vertical line of the cursor on the desired instant, left-click and press enter (see Fig. 10-11).

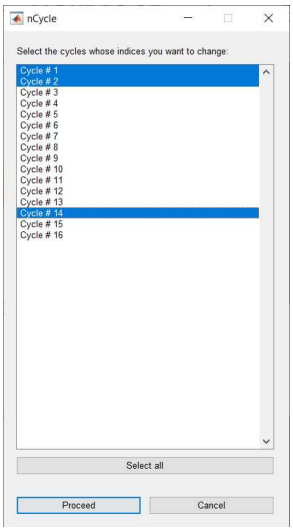


Figure 9: List box by which the user can choose the "rep" to change. For multiple choice hold down the ctrl key

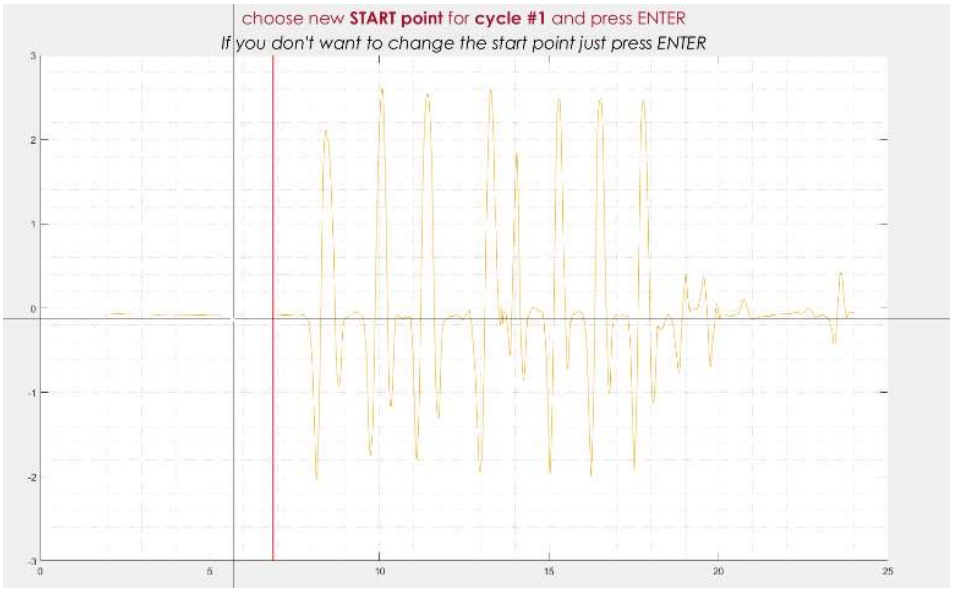
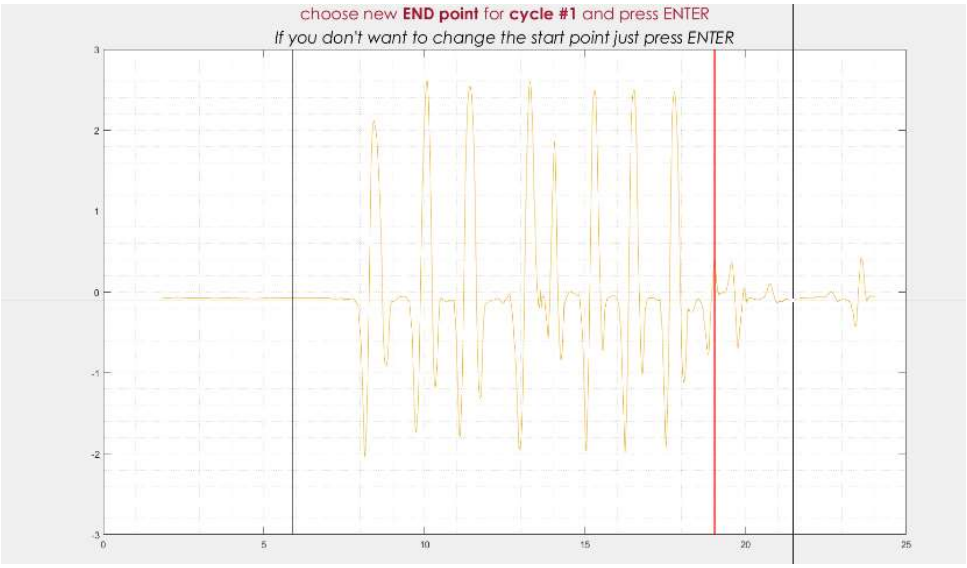


Figure 10-11: Example of changing the instants corresponding to the beginning and end of the first "rep". With the red line is represented the instant that is currently being changed



3.2 "Change all"

Place the vertical cursor line on the start instant of the first repetition, left-click with the mouse, and press enter. Repeat the same for the end instant of the first repetition. Click on the continue button if you want to proceed for a new "rep", on the end button to complete the segmentation. (see Fig. 12-13-14)

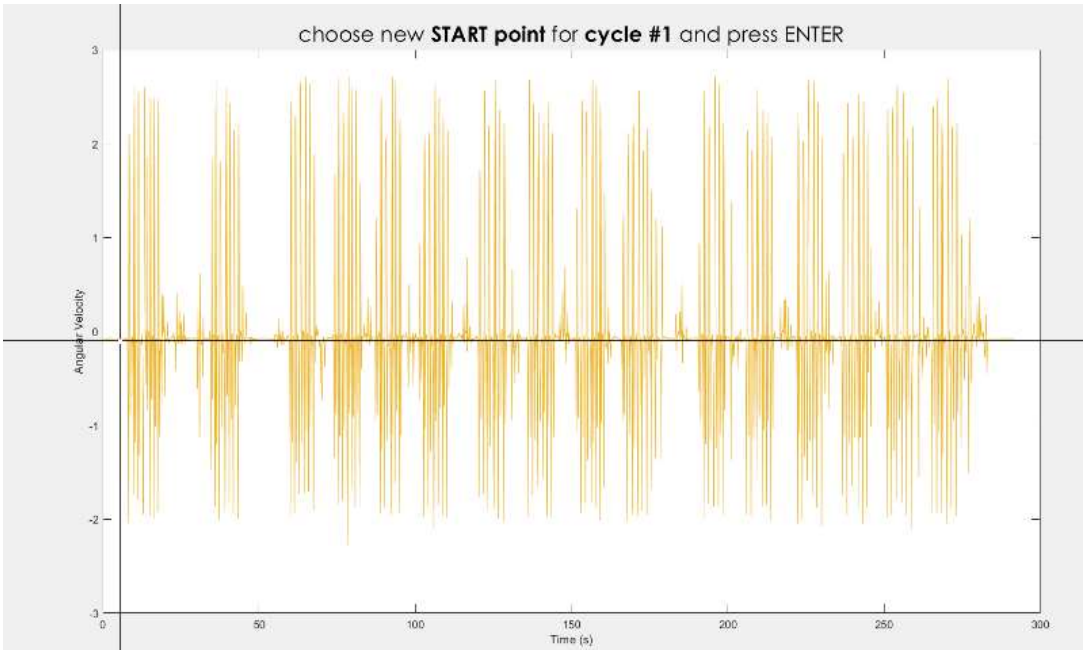
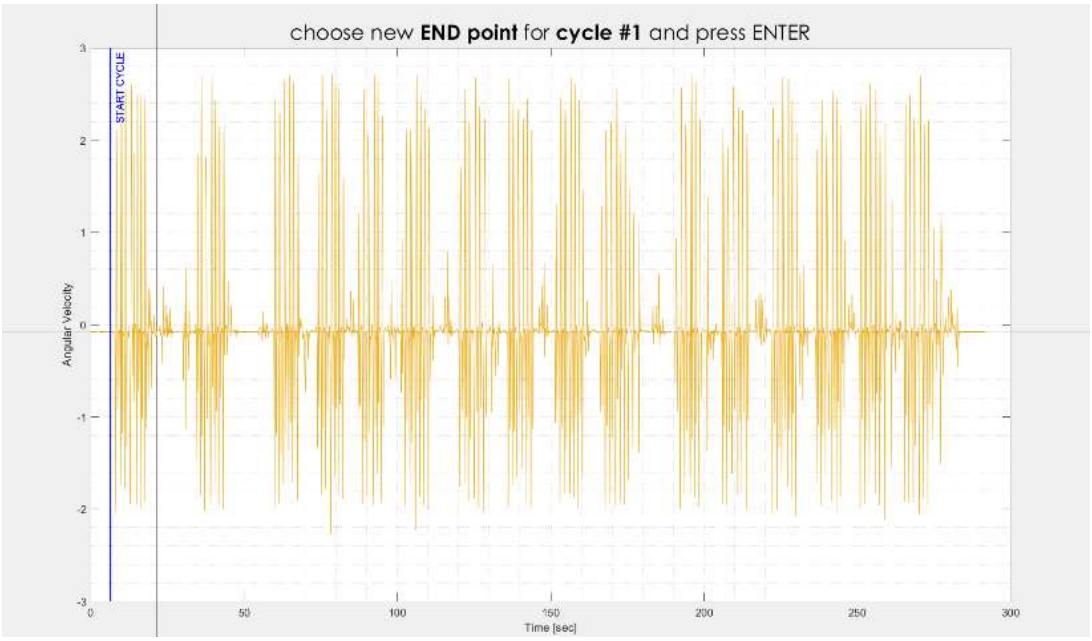


Figure 12-13: Example of segmentation performed from scratch. In the figure above is positioned the instant of the beginning of the first "rep". In the figure below is positioned the instant of the end of the first "rep".



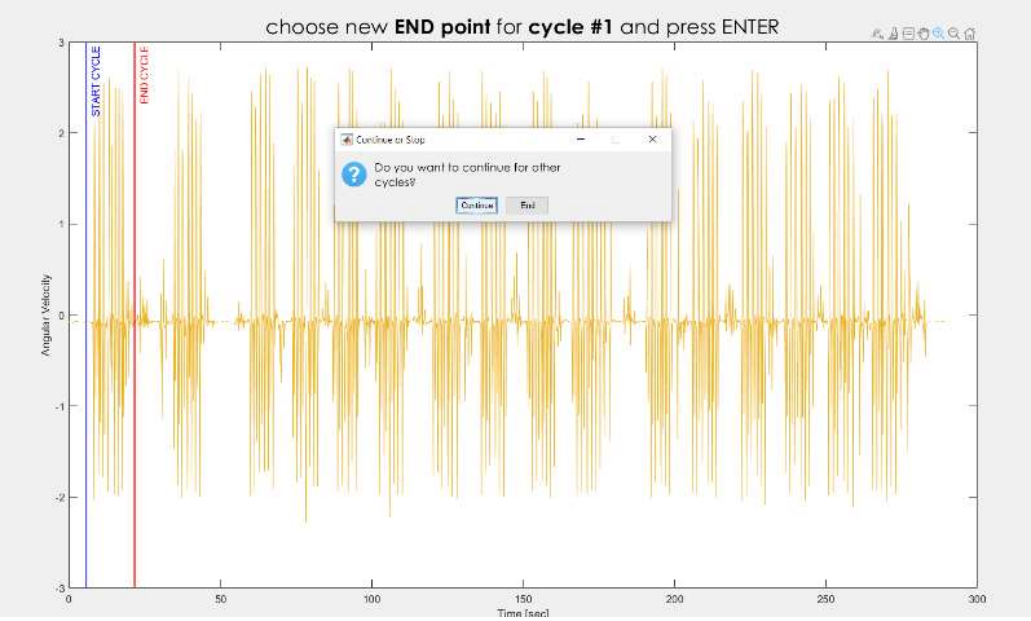


Figure 14: Once the corresponding instants are placed at the beginning and end of a "rep" it will be asked whether the user wants to continue adding more ("Continue" button) or end the segmentation ("End" button)

4. Manual Correction

All ”reps” are plotted sequentially with the events detected by the algorithm (Fig. 15). The user can implement these 3 choices:

- Delete an event: Place the cursor on the event you want to delete and click the left mouse button
- Add a Heel Strike: Place the cursor at the position on the plot where you want to add the event and click the 'H' key
- Add a Toe Off: Place the cursor at the position on the plot where you want to add the event and click the 'T' key

After completing the work for a “rep” click the enter button to view the editing and to be able to choose whether to change the “rep” or re-edit the current one.

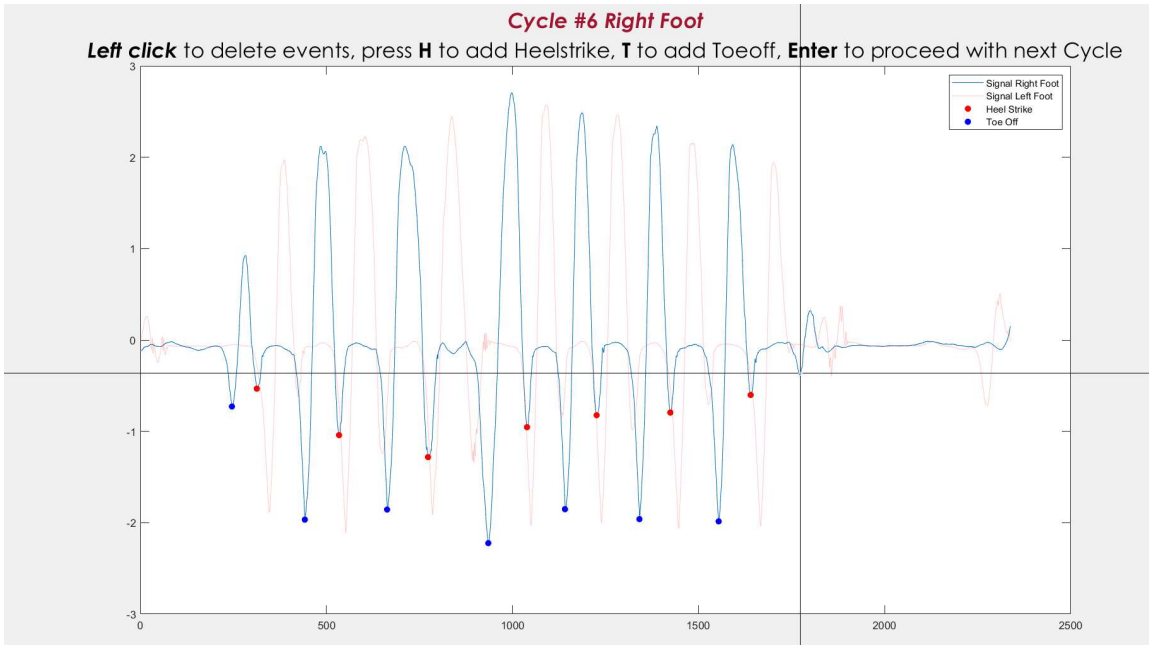


Figure 15: Example of editing the sixth "rep"