GGAIT

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Prior remark:

- The Ggait application was originally developed by Prof. G. Courtine and Nadia Dominici.

HOW TO USE IT

The Ggait v9.0 application is intended to compute gait parameters from the recorded position of markers.

LOADING

Here are described the steps undergone by the software during loading depending on the selected options.

LOAD button

1. Reset all variables
2. Ask user to select .c3d file
3. Load KINEMATIC data from .c3d file (+ processing, reordering, gap filling, conversion to cm)
4. If EULER is selected
    - Euler computation, creation of _EULER.txt file
5. If EMG is selected
    - load data from _ANA.csv file if it exists, otherwise load data from .c3d file
    - If EMG gain is different from 1000, ask user to select muscles where EMG gain was different, correct EMG gain
    - Process EMG, filter EMG
    - If NOISE is selected
        - Apply bandstop filter at 50Hz to remove 50Hz noise
6. If FORCE is selected
    - load data from _ANA.csv file if it exists, otherwise load data from .c3d file
    - Process and filter force data
7. If NEU is selected
    - Load neuron data from _NEU.mat file
8. Generate ANGLE data
9. If GAIT file is selected
    - Load _GAIT.csv file

   Else
    - Create _GAIT.csv file through EVENT DETECTION interface
10. If Swing event is selected
    - Create GAIT_INFO with general events (detected on NEXUS)

    Else
    - Create GAIT_INFO without general events
11. If GAIT man. is selected
    - Erase previous stance starts and ask user to place stance starts (but keep other data in GAIT_INFO)
12. If GAIT auto. is selected
    - Erase all data in GAIT_INFO and then detect stance starts (as maximal limb axis angle)
13. If swing columns are empty in GAIT_INFO
    - Detect swing starts as minimal limb axis angle

Notes

- GAIT_INFO is a matrix containing:
    - Column 1: empty
    - Column 2: stance start of left limb
    - Column 3: swing start of left limb (often associated to time of min limb axis angle)
    - Column 4: toe off of left limb (i.e. end of dragging in case of dragging)
    - Column 5: empty
    - Column 6: empty

- Column 7: stance start of right limb
- Column 8: swing start of right limb (often associated to time of min limb axis angle)
- Column 9: toe off of right limb (i.e. end of dragging in case of dragging)

Be careful about

- Filter cutoff frequency to filter kinematic data should be carefully set !!
  - set at the second line of ggait_OpeningFcn() in ggait.m: handles.filterKIN_freq = 10; %Hz
  - was set to 4Hz in v7.6, but is set to 10Hz in v8.5 and v9.0
- Comparison with healthy animals
  - no control is performed to check if there is no mismatch between analyzed data and loaded data (e.g. do we really compare knee angle with knee angle and not to hip angle... which depends on the way data are arranged in reference txt file).
- When denoising (NOISE is selected), you are removing 40Hz noise due to stimulations. If your stimulation frequency is not at 40Hz then the denoising process is wrong.

What have changed between v8.5 and v9.0

- Step width computed between forelimbs was wrong
  - Wrong reference to contralateral wrist marker in forelimb case in params_gait_FL. For step width we want to look at the distance between the two wrist markers ... but when computing this parameters for RFL, we were comparing right wrist marker position to right elbow marker position instead of left wrist marker position. Fixed in v9.0
- Headers about forelimb angles were false
  - About FORELIMBS ANGLES parameters, the joint angles were named non-accordingly to what they measure. The JOINT Shoulder is in fact the JOINT **Scap**, the JOINT Elbow is the JOINT **Shoulder**, the JOINT Wrist is the JOINT **Elbow** and the JOINT MCP is the JOINT **Wrist** !! Fixed in v9.0
  - Concerned headers:
    - Angles_FL_header
    - Angle_RFL_header, LFL
    - Angle_LFL_mean, RFL
- Header of Data SumAverage was false about Min**Crest**speed
  - Min**Crest**speed (and MaxCrestspeed, MeanCrestspeed, AmpCrestspeed) concerns in fact Foot -> changed to Min**Foot**speed (and friends) in v9.0.
- Stick diagram were false for forelimbs
  - it was referring to wrong markers. Fixed in v9.0
- DISPLAY button
  - In previous version, each time you clicked on display, all gait cycles were selected (i.e. non rejected). In this v9.0 it is not anymore the case (i.e. rejected gait cycles are kept rejected)
- REJECT button
  - left click you reject, right click you select back the gait. Added in v9.0
- EMG/FORCE and OBSTACLES buttons have been removed in v9.0
- Possibility to close EMG ANALYSIS interface without saving data (and thus previous EMG data, if any, are kept). Added in v9.0
- Comparison with healthy animals
  - Mean Ref option outputs erroneous results and work only under certain circumstances. Option removed in v9.0
- Endpoint process

    - In forelimb case, a parameter was set to 0.5 instead of 0.05 (like in hindlimb case). This param is used to calculate acceleration, speed and angle velocity at swing onset (average from PSO to PSO+param*gaitcycle duration). Fixed in v9.0
- Some data were first put in GAIT matrices but were latter erased by other data put at the same placein the GAIT matrices. The overwritten data are no more put in the matrices.
- LADDER radio button instead of specifying ladder presence in conditions/setups

VARIABLES

Please refer to Ggait_Docs_Variables.pdf document.

FILES

Please refer to Ggait_Docs_Variables.pdf document.