



## Sub-Challenge Instrument Segmentation and Tracking

### Readme Tracking Robotic Instruments

#### **Training Data (4 ~45 second videos with annotations):**

- 45 seconds ex-vivo video sequences of interventions together with annotations for the 2D pose of the instrument. This pose value is provided for each frame by a robotic system so may have some small inaccuracies in some frames. As far as is possible these values have been removed by hand.
  - TXT file with the following format:  
<center\_point\_x> <center\_point\_y> <shaft\_axis\_x> <shaft\_axis\_y> <head\_axis\_x>  
<head\_axis\_y> <clasper\_angle>

#### **Definitions:**

**< center\_point \_x> <center\_point \_y>:** Pixel coordinates of the center point for instrument, the center point is defined as the intersection between the instrument axis and the border between metal and plastic on the shaft.

**< shaft\_axis\_x > < shaft\_axis\_y >:** Normalized axis vector of instrument

**<head\_axis\_x > < head\_axis\_y>:** Normalized axis vector of instrument head

**<clasper\_angle>** The angle in degrees between the claspers.

To make these notations clear, an example frame is included.

The pixel coordinate system starts at the upper left corner (0,0).

Values where a component (e.g. center point) is not visible will be set to -1, -1.

In videos where more than one instrument is visible, there are 2 txt files with Left and Right indications in the name.

#### **Test Data:**

- 15 sec additional video sequences for each of the 4 recorded procedures provided for training
- 2 additional recorded interventions (one minute sequences)

No txt file will be provided for testing for the duration of the challenge.

**Release of the test data: 14.9.**

#### **Upload:**

Please upload your results and the short method description in a separate zip archive named *Tracking\_<Username>\_Rigid\_Results.zip*

**Format:** Please provide a txt file for each subset with the following format where each line is the position of the instrument for each frame. In videos where there is more than one instrument please upload 2 files with Left and Right in the name.

- <tracked\_point\_x> < tracked\_point \_y> <shaft\_axis\_x> <shaft\_axis\_y> <head\_axis\_x>  
<head\_axis\_y> <clasper\_angle>  
...

**Naming convention:** <OriginalFolder>\_Res.txt

See Definitions in Training Data!

Please use the training data in a leave-one-surgery-out fashion: Please do not include the same surgery for training when testing the 15 sec additional video sequences for each of the 4 recorded procedures provided for training. For the new procedures the whole training data can be used.

### **Reference**

For evaluating the rigid instrument tracking, the reference segmentation is used. As error measure, the Euclidean distance between tracked point and the estimate of this point is used. Furthermore, the angle between the axis of the instrument and the estimated axis is used.

The center point is defined as the intersection between the plastic and metal on the instrument axis.

### **Award**

The Euclidean distance between the reference center point of the end of the shaft and the submitted result is used. To be considered for the *Instrument Tracking Award* participation in the instrument tracking for rigid instruments is necessary.