ParaView-Plugins for veterinary use

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Installation

Download the precompiled ParaView files and QT libraries as provided in the drop box (Win 32 version). Copy the files into any directory and start paraview.exe. When you run the program for the first time you will need to link the plugins into ParaView. Menu->Tools-Manage Plugins opens the plugin dialog.

Load New -> and load the desired plugins (*.dll files). To permanently link the plugins you will need to check the Auto Load check box.

In the future ParaView will load the plugin at start up. The available plugins are located at Filters-> Leipzig Vets. Only the plugins suited for the actual data type are active. The others are marked in gray.
Available Plugins

1. CTOAM
2. Distance
3. DistanceMin
4. FittRUI2D
5. TTA-2-Measurement
**CTOAM-Plugin**

This filter calculates the maximal subchondral bone density and projects the value onto the surface of the joint. See the following references for further details and potential applications:


You need to inputs: The 3D model of the joint surface and the CT volume of the respective model. It is important that you keep the density of the surface mesh high (many points), because the CTOAM is calculated for every point of the surface mesh. You can adjust the depth to which the filter measures the local bone (CT) density. Typical a depth up to 2 mm are used. To get only a projection on to the true joint surface we suggest generating two 3D models: one entire model and one where the joint surface has been selected. The CTOAM is calculates using only the joint surface model. Finally both models are combined. Another way would be to use only one entire model, render it with bone color and then with CTOAM values. Using Photoshop or similar programs you can extract the joint surface and copy it onto the 3D-bone model.
**Distance Plugin**

This filter measures the spatial distance between two surface models (source and target model) at each point of the surface of the target model and projects the distance values onto the surface of the target model. See the following references for further details and potential applications:


The mode which is used to calculate the distance is based on the surface normal of the target model (the one which will be colored). If the distance along the surface normal does not intersect with the source model, a scalar value of -1 is stored. True values range from 0 to max length.
**DistanceMin Plugin**

This filter measures the spatial distance between two surface models (source and target model) at each point of the surface of the target model and projects the distance values onto the surface of the target model. The mode which is used to calculate the distance is based on the minimal distance between the two surfaces.
**FittRUI2D Plugin**

This filter fits a sphere to the trochlea notch to quantify axial radio-ulnar incongruence. See the following references for further details and potential applications:


To use the filter effectively the elbow has to be positioned in global space, such as the X-axis is aligned medio-laterally!!! Otherwise the fitting does not function properly! You can use the Transformfilter to adjust the pose of your 3D elbow model in case the x-axis is not aligned as needed.

Once you have loaded the 3D-model of the radio-ulnar joint cup select the central portion of the trochlea notch with the point selection tool.

Then apply the FittRUI2D and a sphere will be fitted to the selected points. The ParaView Output Window tells you the parameters of the sphere: center and radius. By adding a new sphere with the same parameters to the scene you can measure the distance between the sphere and the radial head, by up- and downscaling he sphere. This gives you the RUI measure.
TTA-2-Measurement Plugin

This filter allows pre- and postoperative calculation of tibial tuberosity advancement (TTA) on plain radiographs of the stifle joint. It is important that the stifle is in full extension and that the tibia is projected true medio-laterally. The measurement is based in the common tangent method. Both jpg and DICOM images can be processed. For the latter, the DICOM Reader Plugin has to be loaded.

Once you have loaded the image you can adjust the colors to display the image in black and white. When you start the TTA2 filter there is a dropdown selection with several options. You have to go through all the selections to get a measurement. Until you complete all options the filter does not provide any measurement.

First you start with the Calibration. Place the cross hair on the periphery of your circular calibration object. Press Apply. Set the cross hair at another point on the periphery of the calibration object, hit Apply. Repeat this a third time. For every circular measurement you will have to set three landmarks. The filter then calculates the respective circle. In case you placed on of the landmarks badly, just reselect the selection and start again. This overwrites the landmarks already set for the specific selection (e.g. calibration).

Repeat the same, placing three landmarks for the tibia and the condyle, according to the common tangent method. Then define the tibial tuberosity and the patella.
Finally mark the planes osteotomy from proximal to distal with two points.

The filter now calculates two different advancements: the traditional advancement, parallel to the joint axis and one along the radial advancement of the tibial tuberosity. The latter value is always larger.

The results are provided in the Output Window and already calibrated according to the calibration object (which is set to 25 mm diameter).
PlanWidthTT is the cranio-caudal thickness of the osteotomized tibial tuberosity.

PlanCagePos is the distance from the proximal starting point of the osteotomy. The calculated advancements are based on the assumption that the cage is placed at that level.

PlanAdvancementParallel is the calibrated advancement in mm based on the parallel projection of the patellar ligament.

PlanAdvancementCircle is the calibrated advancement in mm based on the radial advancement of the tibial tuberosity until it touches the parallel projected patellar ligament.

Update Sep2014: The new version calculates PTA (Patellar Tendon Angle). In addition, when overcorrection is present (post op evaluation), the values for advancement are shown with negatives.