Create a "**data**" directory inside **/home/username/.ros/.** Copy the files included in the zip folder and paste them in the **data** directory. Those files contain the information extracted during training and are mandatory for the detection procedure.

It is worth mentioning that the technical specifications of the spring used for the training can be found in the link below:
http://cz.rs-online.com/web/p/tlacne-pruziny/0751607/?searchTerm=751-607&relevancy-data=636F3D3126696E3D4931384E525353746F636B4E756D6265724D504E266C753D656E266D6D3D6D617463668616C6C26706D3D5E283F69292852537C5253207C52532D293F5C647B337D285C73293F5B5C732D2F255C2E2C5D285C73293F5C647B332C347D2426706F3D313426736E3D592673743D52535F53544F434B5F4E554D4245522677633D4E4F4E45267573743D3735312D363037267374613D3037353136303726

Build the package using **catkin_make**.

Type **rosrun spring_detector test_detector** in the command window. It is the node which advertises the service for spring detection and pose estimation.

In another terminal type **rosservice call /detect_spring**. It returns a ros custom message containing the convex hull and the pose of each spring detected in the test image. Each convex hall is represented by a vector of x,y coordinates (point.msg) of the image. The convex hull and the variables theta,phi(rotation of the spring over the Z and Y axis respectively) form the hull.msg and they describe the position and the pose of a spring. A vector of hull.msg messages (hullArray.msg) containing the convex halls and rotations of all springs detected in the image, is the final output of the service.

The test image is read by a ros topic created for test purposes and it can be easily modified according to how the image will be provided.
Running the code will produce also an image in the /tmp/ directory.

Pose estimation
The initial position of the object is shown below, where the origin of the object is set to the center of its mass.

The variables phi and theta denote the rotation of the spring over the Y and Z axis respectively, following the sequence of XZY intrinsic rotations. Since the spring is symmetric with respect to X axis, no rotation is needed.