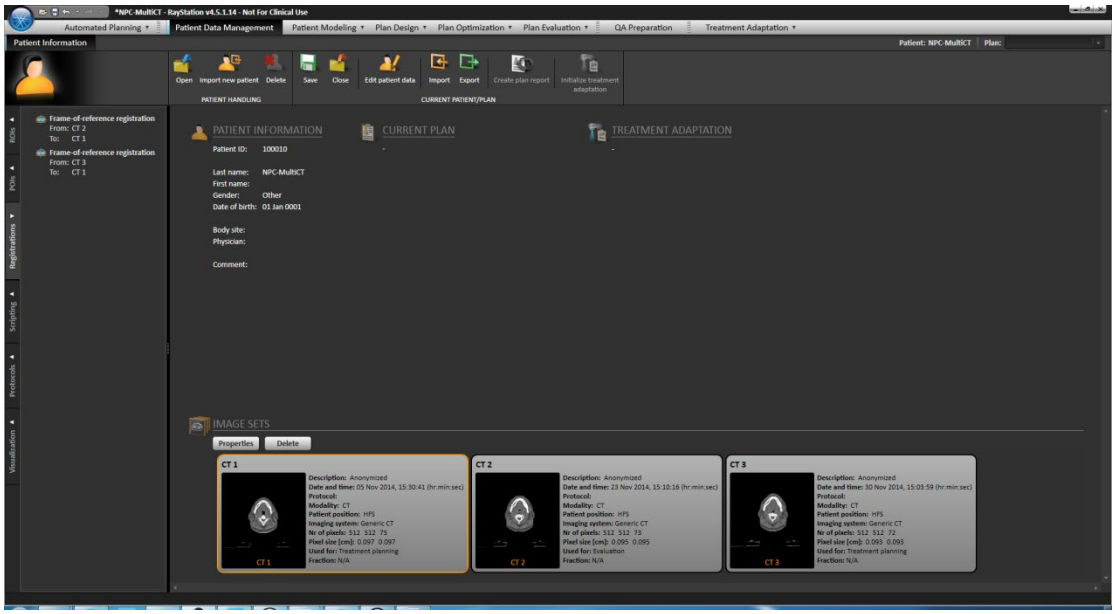
There are three CTs in the patient and two registrations. One registration is between CT1 and CT2, and the other is between CT1 and CT3.



Though there is not any registration between CT2 and CT3, now I can get the transform matrix through scripting.

Patient.GetTotalTransformForExaminations(FromExamination='CT 2',ToExamination='CT 3')

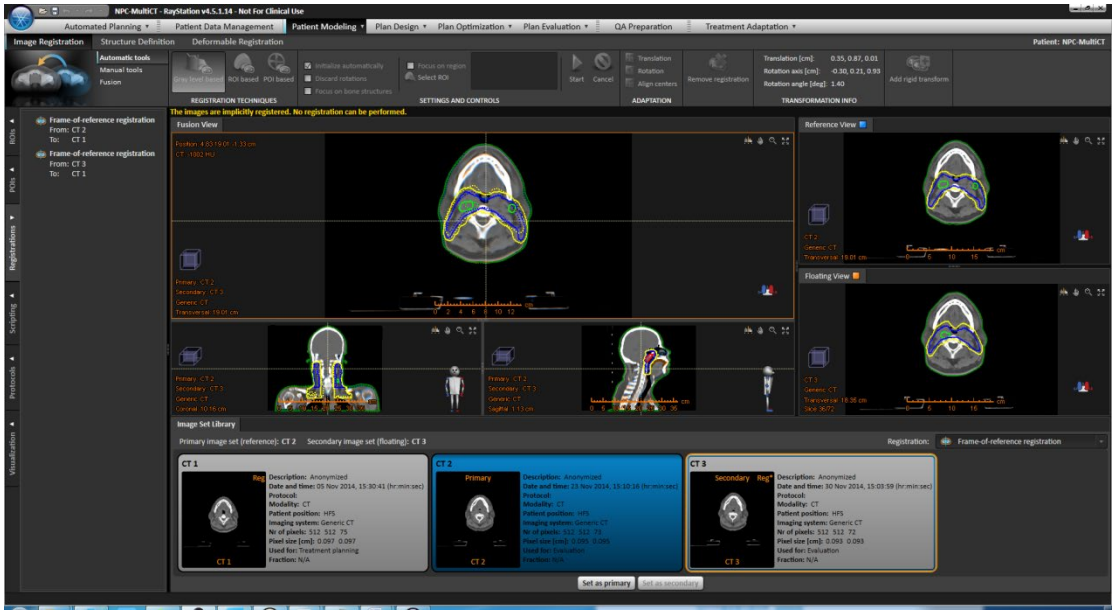
```
Array[float]((0.99973018180836759, -0.0050779691246622075, -0.022666667398996677
, 0.041464162802443361, 0.0052446644227449272, 0.99995959490970843, 0.0073008248
235360293, -0.13358585734622064, 0.02262867818721534, -0.007417733992274432, 0.9
9971641986411275, -0.93453856329302631, 0.0, 0.0, 0.0, 1.0))
```

And to create a transform of POI (0,0,0) for example. The coordinate of transformed POI is as follows:

Patient.TransformPointFromExaminationToExaminationUsingTotalTransform(FromExamination='CT 2',ToExamination='CT 3',Point= {'x':0, 'y':0, 'z':0})

```
>>> b.x
0.041464162802443361
>>> b.y
-0.13358585734622064
>>> b.z
-0.93453856329302631
```

If I want to create a registration between CT2 and CT3 in RayStation, I find it's impossible. No registration can be performed with either CT2 as the primary CT3 as the secondary or CT3 as the primary or CT2 as the secondary image set.



Then I delete the two exist registrations and create a new registration between CT2 and CT3. The result of scripting is as follows:

Patient.GetTotalTransformForExaminations(FromExamination='CT 2',ToExamination='CT 3')

```
Array[float]((0.99977894489804175, -0.0054891599192936312, -0.020296070110707637
, -0.02630539240801686, 0.0056304613011518177, 0.99996026423514006, 0.0069114293
98098864, -0.14335476458842411, 0.020257325689601067, -0.0070241778286923937, 0.
99977012441947688, -0.93628342325509006, 0.0, 0.0, 0.0, 1.0))
```

It's found that the 4th of the array differs, which means the translation along the x-axis.

Using the same POI for test. The coordinate of transformed POI is:

Patient.TransformPointFromExaminationToExaminationUsingTotalTransform(FromExamination='CT 2',ToExamination='CT 3',Point= {'x':0, 'y':0, 'z':0})

```
>>> b.x
-0.02630539240801686
>>> b.y
-0.14335476458842411
>>> b.z
-0.93628342325509006
```

The difference of coordinate of x-axis between two results is 0.067769cm.

Is the transform matrix between CT2 and CT3 calculated indirectly by the other two registrations? Can I suppose the difference to have no influence?

Answer:

1 - There is a logic behind the impossibility to register CT2 and CT3 : CT2 cannot be moved towards CT3 and CT1 at the same time.

2 - In the case where CT2 and CT3 are registered to CT1, a "side-effect" of these two registrations is that CT2 and CT3 will be almost registered. I say almost because automatic registrations are done on grey level matching. The match between CT1/CT2 and CT1/T3 are specific to these pairs.

There is no guarantee that the best matches between CT1/CT2 and CT1/CT3 is also going to be the best match between CT2/CT3. yes the differences are real and logical and may have an influence depending on their magnitude. Registrations are really specific to a pair of images. You

can think of it this way : if B resembles A and C resembles A, it does not necessarily mean B resembles C. It is likely to be true but not certain.