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MP 710: Advance MRI

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**QUIZ 1**

**Question 1: Describe the two types of motion artifacts in MRI discussed by the paper. (3 points)**

The paper discusses both “Type-I” and “Type-II” artifacts. Type I artifact is the result of tissue displacement during the period between data sampling and the following rf excitation. Type II artifact is the result of phase accrued caused by motion through magnetic field gradients between an rf excitation pulse and data sampling.

**Question 2: Rotation of an object in image space corresponds to (2 points)**

A: A shift of the corresponding k-space data

B: Rotation of the corresponding k-space data

C: Accumulation of phase in the corresponding k-space data

D: Inversion of the corresponding k-space data

**B:** Rotation of the corresponding k-space data**.** This rotation can be accounted for by comparing the oversampled/averaged center of k-space matrix to each individual strip.

**Question 3: List the four corrections or processes that are applied prior to the final reconstruction of a PROPELLER data set. (3 points)**

1. Phase correction

2. Bulk rotation correction

3. Bulk translation correction

4. Correlation weighting

**Question 4: Could one change the order of the correction steps and compensate for translational motion before correction for rotational motion? Explain your answer. (2 points)**

No. Firstly, it is necessary that phase correction step be performed first to ensure that the center of each strip runs through the center of k-space. Secondly, the correlation weighting step be performed last since this steps correlates both the translation and rotation data. You can’t switch the rotation and translation because the rotation is needed first. If you can imagine an image of a rotated and translated object, it would be pointless to try to cross-correlate by translation when the object I still rotated. There would be some peak translation position where the rotated object “matches” the true object, but when this object is rotated, it may not match the object. If the object is rotated first, then the peak translation is found by cross-correlation (or equivalently by multiplication in k-space), then you will have an object that truly matches the oversample/averaged “R” matrix centered in k-space.