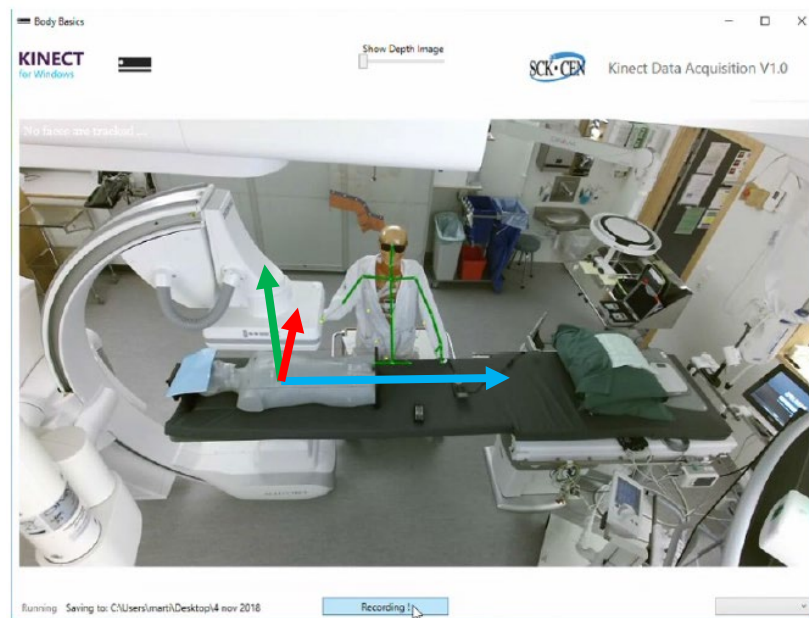# Advanced Topics on Computer Vision

Joan.aranda@upc.edu

Camera 3D Pose estimation

The goal of this exercise is to stablish the 3D pose of a camera with respect to a specific point of the scene (world coordinate system, WCS). This point will be the center of rotation of a C-arm located in an operation room of a Hospital.

We count on a set of images of the C-arm rotating around its center point at a fixed distance (rotation radius). A red circle was mounted on the C-arm to help the detection and tracking of the arm.
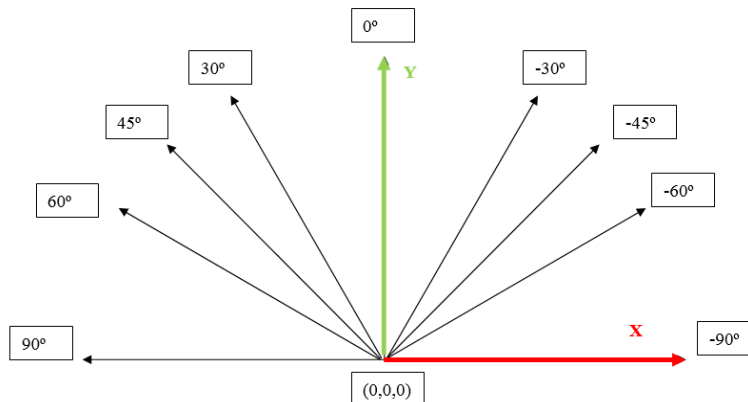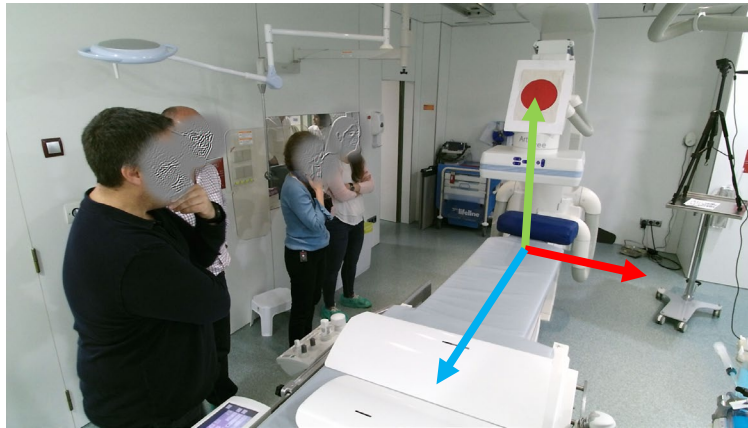
C_arm at position 0º. Defining the direction of the Y axis of the WCS

C arm 30.png

C arm -30.png

C arm 45.png

C arm -45.png

C arm 60.png

C arm -60.png

C arm 90.png

C arm -90.png

Procedure:
1. Locate the pixel coordinates of the centroid of the red circle in the images.
2. From these points, use some of the algorithms presented in class to obtain the homogeneous transformation matrix [R t] that convers world coordinates to camera coordinates (extrinsic calibration matrix).
3. Calculate the camera coordinates (pose) with respect to the WCS (center of rotation of the C-arm) using the obtained matrix.

Next data can be used (if needed):

Red circle diameter   183mm (Exact)
Angles of rotation of the C-arm   -90, -60, -45, -30, 0, 30, 45, 60, 90 degrees (Exact)
Radius of rotation C-arm   745mm (estimated)

Camera Intrinsic calibration matrix   K=

1060	0	Xres/2
0	1060	Yres/2
0	0	1

(estimated)