How to do depth to color registration

(ASTRA and OpenNI2)

By 2016.01.04

Step 1: turn on d2c(depth to color) registration

OpenNI2 supports d2c registration in 2 ways:

1. Global method

   openni::Device::setImageRegistrationMode(IMAGE_REGISTRATIO

   N_DEPTH_TO_COLOR)

   note: call this function AFTER creating depth stream
2. Local method

   CoordinateConverter.ConvertDepthToColor(…)

For now, Orbbec supports only the global method. Please DON'T use the local method.

By using global method, you are sending d2c command to the sensor, which will handle it in firmware. After d2c, the depth pixel should be altered to align with color pixel.

Step 2: convert depth(from projective) to world

OpenNI2 has built in function to convert depth to world:

CoordinateConverter.ConvertDepthToWorld

This function needs correct FOV properties. However, OpenNI2 is doing it wrong: always returning depth FOV no matter what FOV(depth FOV or RGB FOV) you are asking. This will make the wrong conversion, as after d2c, we need to use RGB FOV for depth to world conversion, while it's still using depth FOV.

Alternatively, user can do it manually following below formula:

$$X = \left(\frac{x}{X_{res}} - 0.5\right) * \tan\left(\frac{FOV\_h}{2}\right) * 2 * d$$

$$Y = \left(\frac{y}{Y_{res}} - 0.5\right) * \tan\left(\frac{FOV\_v}{2}\right) * 2 * d$$

$$Z = d$$

Where:

FOV_h: horizontal FOV;

FOV_v: vertical FOV;

Note:

1. *If depth and color are not registered, use depth FOV*
2. *If depth and color are registered, use RGB FOV*

Xres, Yres are resolution of depth image(e.g., 640x480);

d is the value of depth image pixel at(x, y);

x, y are coordinates in projective space;

X, Y are coordinates in world space;

APPROX: ASTRA(ASTRA S) FOV

Stream	HFOV	VFOV
IR(Depth)	58.4°	45.5°
RGB	62.7°	49.0°

