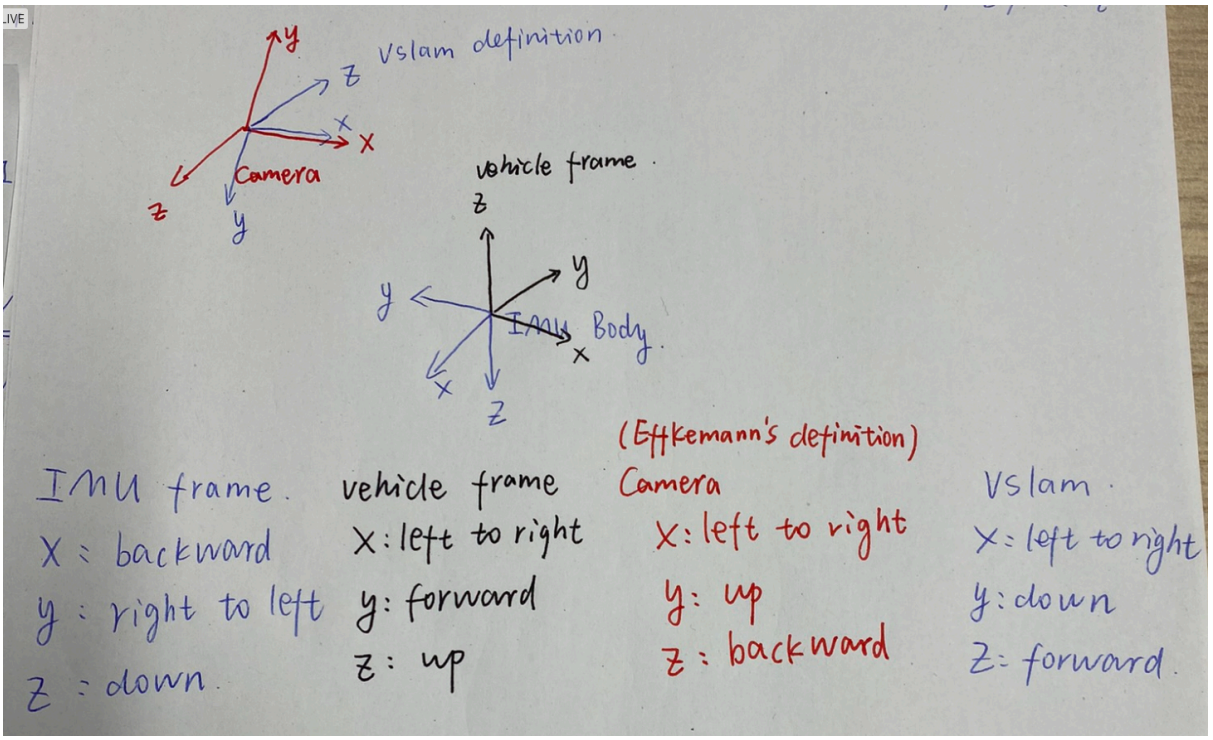
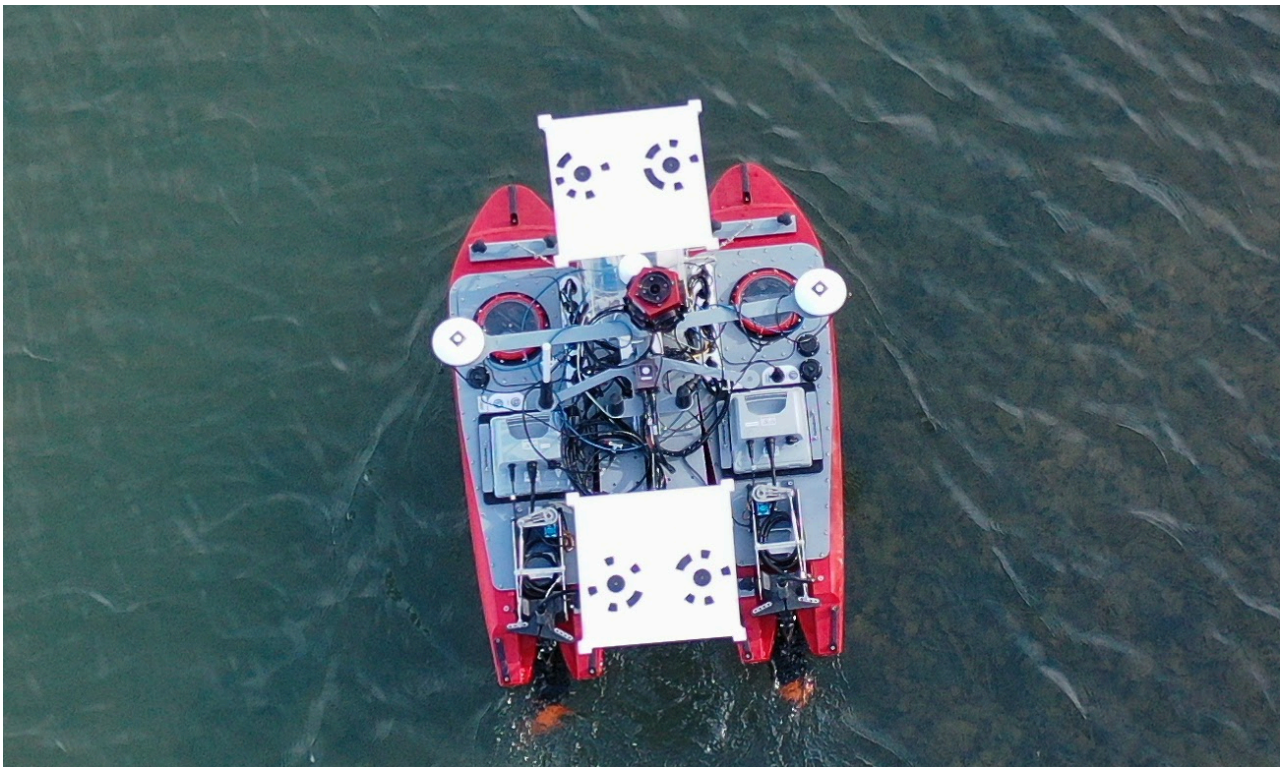
Definitions of coordinate systems used in RiverCloud projects

1. IMU frame: calibrated by manufacturer, used for setting relative location between IMU and antennas
2. vehicle frame: IMU data outputted in this frame and assigned by user in the command `SETINSROTATION`
3. camera frame: Effkemann used for calibrating the relative pose between physical camera body and physical IMU body. NOTE: Although he used the word “IMU body”, actually in his definition, it is actually the vehicle frame
4. visual SLAM: camera coordinate system used in ORB SLAM library, different from Effkemann’s definition



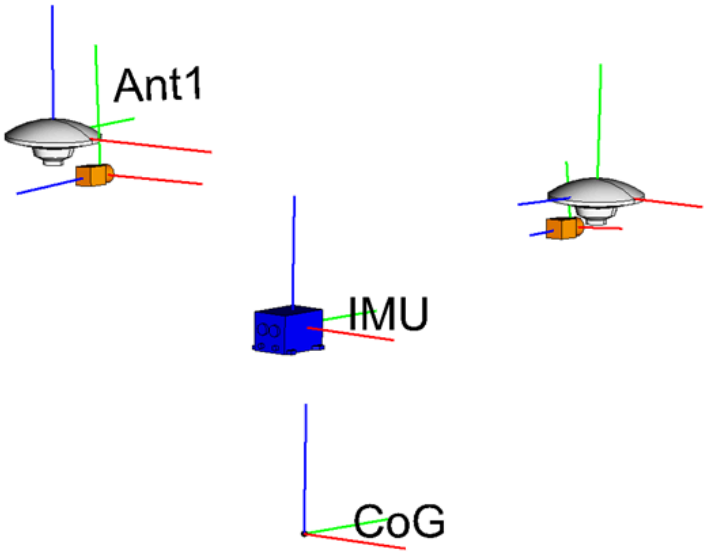
Explanations of IMU frame and vehicle frame

Based on both images below (specially ports for cables), it can be inferred that the definition of IMU body frame is like (x: backwards, y: right to left, z: down to ground).
In the configuration file the vehicle frame will be determined by “SETINSROTATION” command. For example, in my plot, “SETINSROTATION RBV 180 0 -90” was used.



Explanation of Camera frame and IMU body frame

In his email on 20.11.2023 15:50, he provided a plot about the results of calibration between different coordinate systems.



But in this plot, he used the word **"IMU"** frame, which is NOT correct. It is actually the above mentioned vehicle frame. I have to point it out again since it is really confusing. So the results are **actually** given as the relative transform from the vehicle frame to the camera coordinate system.

And again, about the camera coordinate system, his definition was **still different from** the definition used in the ORB SLAM library.

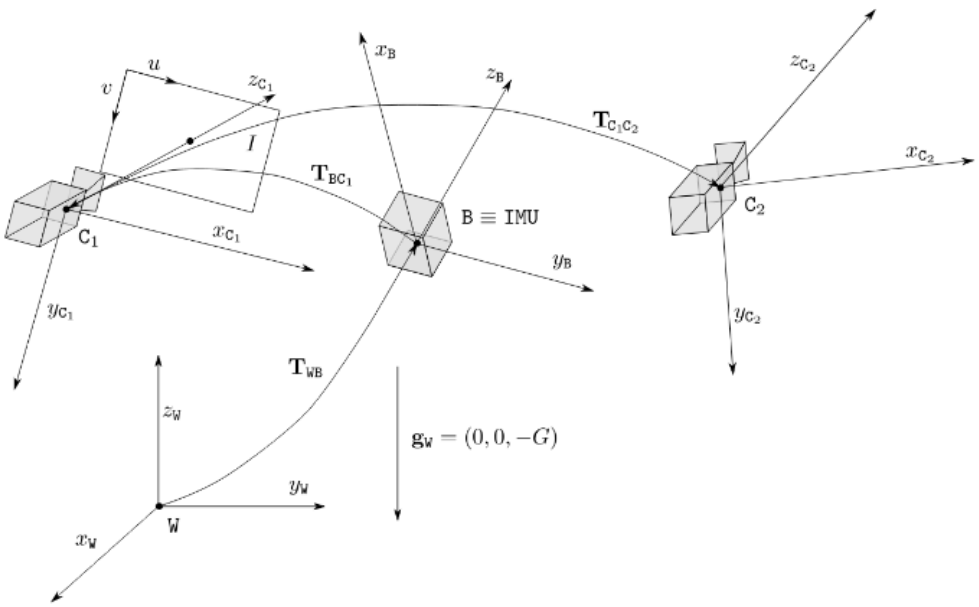


Figure 1: Reference systems defined for ORB-SLAM3 stereo-inertial.