4.10 Real-time streaming

In real-time streaming, motion data is streamed and logged to the central device via a constant Bluetooth connection. You can set measurement mode, start/stop measurement and log the data to csv files with the SDK.

Figure 4 shows the workflow to start and stop real-time streaming.

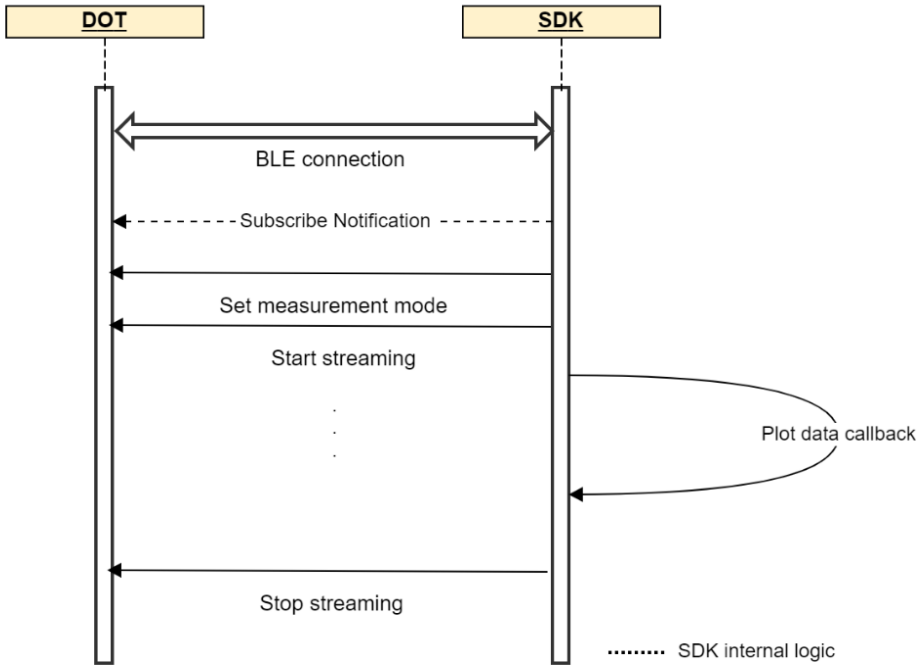

Figure 4: Workflow to start and stop real-time streaming

DotDevice can report sensor data in real-time streaming and the callback is *setDidParsePlotDataBlock* block. To use this, notify the sensor to enter the measurement mode, then start the measurement by following the steps below.

4.10.1 Set measurement mode

You can get all the measurement modes of real-time streaming in this enum: *XSBleDevicePayloadMode*. 17 measurement modes are available for now. Refer to the Appendix for data outputs of different modes. Section 4.2 in *Movella DOT User Manual* also gives detailed explanation about output values.

```
[DotDevce setPlotMeasureMode:
XSBleDevicePayloadInertialHighFidelityWithMag];
```

4.10.2 Start measurement and set data block

```
[DotDevce setPlotMeasureEnable:YES];

[_DotDevice setDidParsePlotDataBlock:^(DotPlotData * _Nonnull
plotData) {
```

```
double acc0 = plotData.acc0;
double acc1 = plotData.acc1;
double acc2 = plotData.acc2;
      …
         }];
```

Then you can get the data output according to different measurement modes.

4.10.3 Stop measurement

```
[DotDevce setPlotMeasureEnable:NO];
```

Refer to *DotPlotData.h* for more information.

4.10.4 Data Logging

Call *setPlotLogEnable* method in *DotDevice* to enable or disable the data logging during real-time streaming.

```
[DotDevce setPlotLogEnable:YES]
```

The logging data is saved in 'Logs' folder under *NSDocumentDirectory* as csv files.

4.10.5 High fidelity modes

In high fidelity mode, higher frequency (800 Hz) information is preserved with lower output data rate (60 Hz), even with transient data loss. There are 3 measurement modes containing high fidelity inertial data in the SDK:

- XSBleDevicePayloadInertialHighFidelityWithMag
- XSBleDevicePayloadHighFidelityNoMag
- XSBleDevicePayloadCustomMode4

To parse the high fidelity inertial data to to delta_q, delta_v or calibrated angular velocity and acceleration, you need to select the above measurement modes with high fidelity inertial data. After starting the measurement, you can get the values with read the properties of acc0-acc2, gyr0-gyr2, dQ0-dQ3, dV0-dV2 from *DotData* object.

4.10.6 Data conversions

Data conversion functions are provided in Movella DOT SDK. Developers can make use of these conversion functions to get the measurement quantities as required in their applications.

Convert quaternion to Euler angles

quatToEuler method is provided in DotUtils class to convert quaternion values to Euler angles.

```
DotPlotData *plotData;
[DotDevice setDidParsePlotDataBlock:^(DotPlotData * _Nonnull plotData)
{
        plotData = plotData;
}];
```

```
double eular[3];

[DotUtils quatToEuler:eular WithW:plotData.quatW withX:plotData.quatX
withY:plotData.quatY withZ:plotData.quatZ];
```

Calculation of free acceleration

You can get the free acceleration from orientation and acceleration as mentioned in this BASE article.

In real-time streaming, *getCalFreeAcc* function is provided to help you omit the mathematical calculations.

As this function requires both orientation (in quaternion) and acceleration as input it can currently only be used with XSBleDevicePayloadCustomMode4. Custom mode 4 is the only mode that can output these two quantities at the same time.

```
Double *calFreeAcc = [plotData getCalFreeAcc];
//calFreeAcc[0] is free acceleration along the x-axis
//calFreeAcc[1] is free acceleration along the y-axis
//calFreeAcc[1] is free acceleration along the z-axis
```

The default gravity is 9.8127 m/s^2. You can set a custom gravity vector (for example 9.82 m/s^2) by defining its value in the following way:

```
double localGravity=9.82
[double *calFreeAcc = [plotData getCalFreeAcc:localGravity]
```