Sudersan GB 6:00 AM

Integrating the Bosch BHI360 (smart sensor hub with sensor fusion capabilities) and BMM350 (magnetometer) involves connecting the sensors to enable data fusion within the BHI360's inbuilt microcontroller and then passing the filtered data to the main STM32H747 microcontroller. Here's a step-by-step approach:

1. Understand the Sensors' Roles

BHI360: Combines an accelerometer and gyroscope with an integrated microcontroller that handles sensor fusion algorithms, including magnetometer data integration.

BMM350: High-performance magnetometer for magnetic field measurements, which the BHI360 can fuse with its IMU data to improve heading accuracy.

2. Hardware Connections

Communication Interface:

Both the BHI360 and BMM350 support I²C or SPI for communication.

Connect the BMM350 to the BHI360 over I²C or SPI. The BHI360 will act as the master to the BMM350.

Connect the BHI360 to the STM32H747 via I²C or SPI. The STM32H747 will act as the master to the BHI360.

Power Supply:

Provide a stable power supply to both sensors (e.g., 1.8V or 3.3V, as required).

Interrupt Pins:

Use an interrupt pin from the BHI360 to notify the STM32H747 of new data availability.

3. Firmware/Software Integration

a. Configure the BHI360

Initialize the BHI360:

Set up the I²C or SPI interface between the STM32H747 and BHI360.

Load the appropriate firmware onto the BHI360's microcontroller for sensor fusion (Bosch provides firmware binaries and development tools).

Configure BMM350 Integration:

Use the BHI360 API to configure the BMM350 as an external magnetometer. The API includes functions to add an external sensor to the BHI360's sensor hub.

Provide the BHI360 with the BMM350's I²C or SPI address and data format.

Enable Sensor Fusion:

Configure the BHI360 to perform sensor fusion using its built-in algorithms. This includes fusing accelerometer, gyroscope, and magnetometer data.

b. Interface the BHI360 with STM32H747

Data Output Configuration:

Set the BHI360 to output fused sensor data (e.g., quaternion, heading, pitch, roll) over I²C/SPI to the STM32H747.

Interrupt-Driven Data Handling:

Configure the STM32H747 to listen for interrupts from the BHI360, indicating new data availability.

Use the BHI360 API to read the fused sensor data from the BHI360.

Error Handling:

Use built-in diagnostic functions in the BHI360 to monitor data quality and handle errors like magnetic disturbances.

4. Software Workflow

On BHI360:

Initialize the BHI360 and configure its I²C/SPI interface.

Register the BMM350 as an external sensor using the provided API.

Enable magnetometer-based sensor fusion to correct heading errors caused by gyroscopic drift.

Continuously process data from the IMU and magnetometer, applying fusion algorithms.

On STM32H747:

Read fused data from the BHI360 periodically or on interrupts.

Use the filtered data for real-time flight mode calculations, AHRS, or other functionalities.

Log or transmit the data as required.

5. Key Considerations

Sensor Placement: Avoid placing the sensors near electromagnetic interference sources.

Calibration: Perform soft-iron and hard-iron calibration for the magnetometer via the BHI360.

Firmware Updates: Ensure the latest BHI360 firmware is used for optimized performance.

6. Summary Block Diagram

Sensors:

BMM350 → BHI360 (External Magnetometer Input)

BHI360 → STM32H747 (Fused IMU Data Output)

Communication:

I²C or SPI between:

BMM350 ↔ BHI360

BHI360 ↔ STM32H747

Power & Interrupts:

Power both sensors appropriately.

Connect interrupt pins for efficient data handling.

By following this setup, the BHI360 can seamlessly correct errors in magnetometer data and provide accurate, fused sensor data to the STM32H747 for real-time computations.