

Kaylee Mock

Project: Go Baby Go: Adherence Sensor

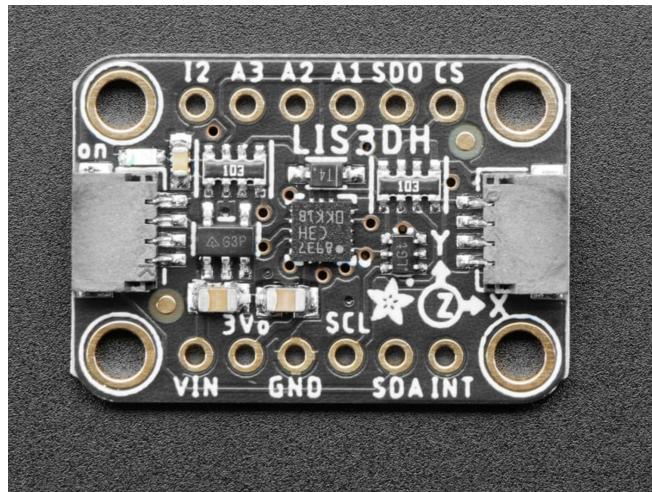
Client: Bethany Sloane, Go Baby Go Oregon

Advisor: Dr. Tammy VanDeGrift

Instructor: Dr. Andrew Nuxoll

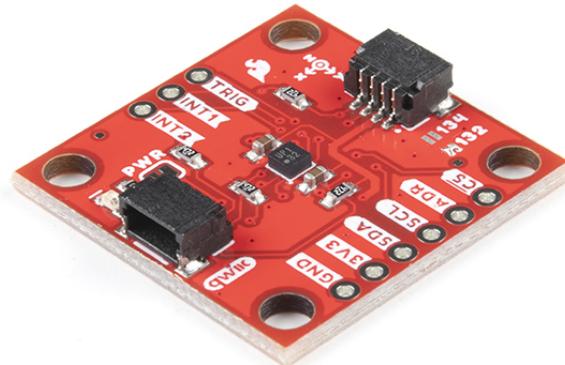
### Reference Guide Draft 1

The LIS3DH Triple-Axis Accelerometer is a popular triple-axis accelerometer made by Adafruit. It supports both I<sup>2</sup>C and SPI interfaces, offers a range of data rate options from 1Hz to 5kHz, and provides interrupt outputs. Additionally, the LIS3DH draws a low current of 2uA and has features like freefall detection, tap detection, and tilt orientation detection. It is compatible with various microcontroller platforms like Arduino and costs \$4.95 [1].



*Figure 1: The Adafruit LIS3DH Triple-Axis Accelerometer*

The SparkFun Triple Axis Accelerometer Breakout - KX132 (Qwiic) is a simple digital and power-efficient accelerometer made by Kionix. It is a 16-bit resolution three-axis accelerometer. It has a maximum of 10kHz output data range and is the size of a quarter. The KX132 also has a wide range of sensing features like Freefall detection, Directional Tap™ and Double-Tap™ detection, tilt orientation detection, vibration detection, tap sensing, and more. In addition, the device emits low noise and has a low-power mode with wake-up and back-to-sleep functions. Other parts and devices can easily connect to the accelerator through a Qwiic connector. This product relies on Arduino IDE and can be purchased at \$14.95 from the SparkFun website [2].



*Figure 2: SparkFun Triple Axis Accelerometer Breakout - KX132 (Qwiic)*

Currently, the Go Baby Go: Adherence Sensor can record and output data using a SparkFun IoT RedBoard - ESP 32 Microcontroller, Adafruit LIS3DH Triple-Axis Accelerometer, and real-time clock. An SD card reader is built into the microcontroller and data from the SD card can be read using a computer. The SD card data displays a time stamp of when motion is detected and stops. An internal battery exists on the microcontroller, but an external, rechargeable battery is required to record data over a four-to-six-week period. There is one light-emitting diode or LED to signal when the device is on or off. We plan to add two more LEDs (3 total), one signaling when the device is in low-power mode and another to signal low battery. The low power mode can be activated when the cart is idle for a certain amount of time and when the external battery life is below 20%.

The LIS3DH in the Adherence sensor and KX132 are very similar accelerometers. They have similar dimensions (as seen in Figure 3) and features like freefall detection, directional Tap, and double-tap detection. The KX132 is faster and more sensitive to motion than the LIS3DH. The KX132 sensitivity range can be set to a higher caliber, so it is better at processing high-speed data rates and high-sensitivity measurements [2]. The KX132 is a more powerful accelerometer so parents and clinicians can get precise data. Also, the KX132 offers the low-power mode option that we are striving to integrate into our adherence sensor.



*Figure 3: Size of LIS3DH (left) and KX132 (right) compared to a quarter*

### References

- [1] "Adafruit LIS3DH Triple-Axis Accelerometer (+-2g/4g/8g/16g)." Adafruit. Adafruit, Accessed October 5, 2023. <https://www.adafruit.com/product/2809>.
- [2] "SparkFun Triple Axis Accelerometer Breakout - KX134 (Qwiic)." SparkFun. SparkFun, Accessed October 5, 2023. <https://www.sparkfun.com/products/17871>.