OSMIUM MIMU4844/48XC

A Massive Multi-IMU (MIMU) Array

INERTIAL ELEMENTS

Highlighting Features

- A Massive 32 IMU array: Two 4x4 IMU arrays
- Array of nine-axis IMU (Gyro + Accelero + Magneto)
- Accelerometer Range - ±2, ±4, ±8, ±16g

Axis	Bias Stability (mg)	Velocity Random Walk (m/s/√hr)
X	0.023	0.018
Y	0.033	0.020
Z	0.036	0.021

- Gyroscope Range - ±200, ±500, ±1000, ±2000 deg/sec

Axis	Bias Stability (°/hr)	Angle Random Walk (°/√hr)
X	0.800	0.078
Y	0.668	0.080
Z	0.605	0.135

- Sensor's sampling rate: 562.5 Hz.
- Parallel communication with IMUs using 32 parallel s/w I2C buses
- Sensor fusion and calibration compensation on-board
- Floating pt. Atmel controller with 512 Kb internal flash
- USB 2.0 data interface, All sensors accessible through USB
- JTAG programmable (needs dedicated JTAG cable)
- Powering with USB; LED indicators
- *MIMU48XC = MIMU4844 + 10-pins Connector*
- Accessible to UART and SPI IOs. (for *MIMU48XC only*)
- Dimensions: 26.6 mm X 49.3 mm
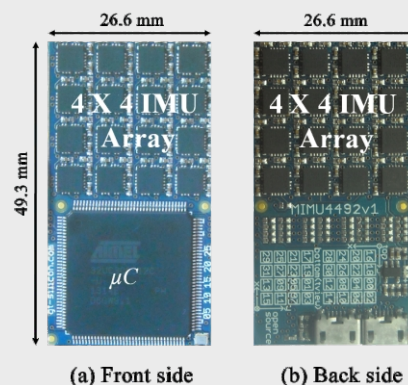
Features of MIMU48XC + BMBT4444

- Bluetooth v3.0 for wireless communication
- Micro SD card holder for storing sensors' data*
- Powering with Li-ion battery & USB; USB battery charging
- Power ON-OFF Switch; LED indicators for power & status
- Dimensions: 26.6 mm X 16.7 mm (BMBT4444)

*Contact us for Micro SD card support

Supporting Software

- Framework for sensors' i/f and data comm.
- ZUPT based inertial navigation
- Command based data communication protocol
- Easy to modify, highly modular s/w design
- Open source Python APIs

Osmium MIMU4844 - contains 32 IMUs, with two mirrored 4x4 square IMU arrays. MIMU4844 is an ideal platform to implement very high precision motion sensing by using Sensor Fusion and Array Signal Processing methods. It is an easy to use and highly configurable sensor-array platform, serves the needs for niche applications, such as gait analysis, 3D motion capture, Structure from Motion (SfM) etc. It comes pre-programmed as shoe-mounted pedestrian dead reckoning (PDR) sensor.

(a) Front side   (b) Back side

Osmium MIMU48XC - When used with extension board BMBT4444, is capable of storing data in micro SD card, operating on battery power and most importantly, wireless communication. This is in addition to all the features of MIMU4844. Thus it becomes a battery operable wireless massive IMU-array platform. A great platform for your Sensor Fusion and Array Signal Processing implementation needs!
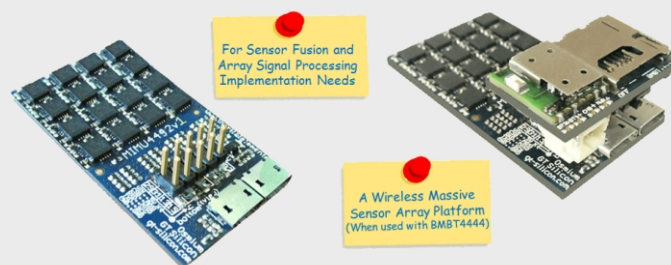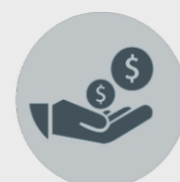
Value Proposition
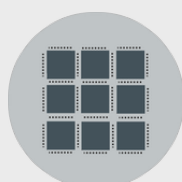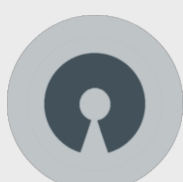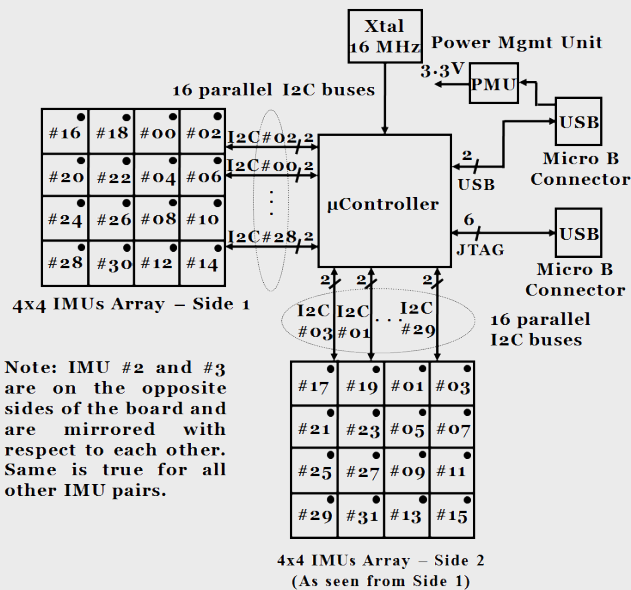
Massive IMU Array   API Support   Customization Service   Swift Integration   Affordable Cost
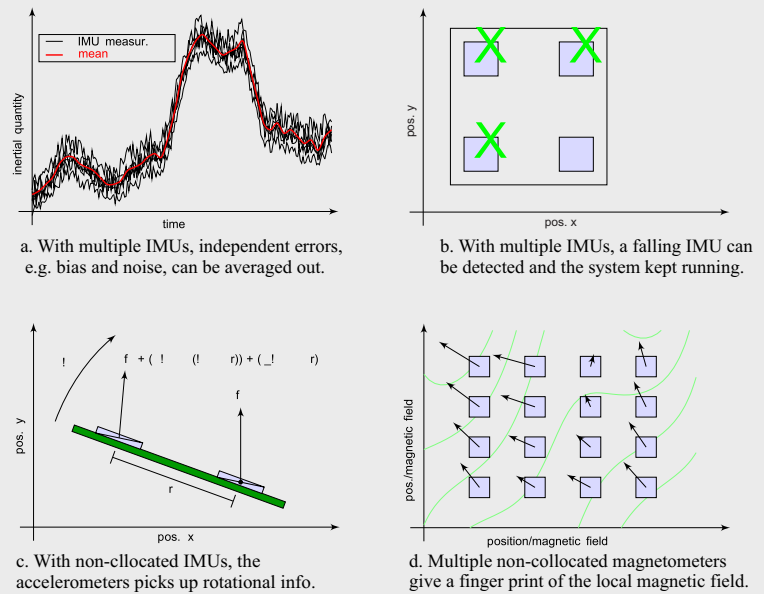
Block Diagram shows the interfacing of the microcontroller and massive 32 IMU array, USB and Power Management Unit.

4x4 IMUs Array – Side 1

Note: IMU #2 and #3 are on the opposite sides of the board and are mirrored with respect to each other. Same is true for all other IMU pairs.

4x4 IMUs Array – Side 2
(As seen from Side 1)

Advantages of massive IMU array [1]

a. With multiple IMUs, independent errors, e.g. bias and noise, can be averaged out.

b. With multiple IMUs, a falling IMU can be detected and the system kept running.

c. With non-cllocated IMUs, the accelerometers picks up rotational info.

d. Multiple non-collocated magnetometers give a finger print of the local magnetic field.

[1] Isaac Skog, John-Olof Nilsson, and Peter Handel, An Open source Multi Inertial Measurement Unit (MIMU) Platform, in *In Proc. 2012 IEEE ISISS*, Laguna Beach, CA, USA, 25-26 Feb, 2014.

Calibration: A simple calibration procedure which compensates for the inter IMU misalignment. A novel mechanical rotation-rig-free calibration procedure for all MIMU devices. Presenting a simple 3D printable 20-faced polyhedron (Icosahedron) for this purpose.
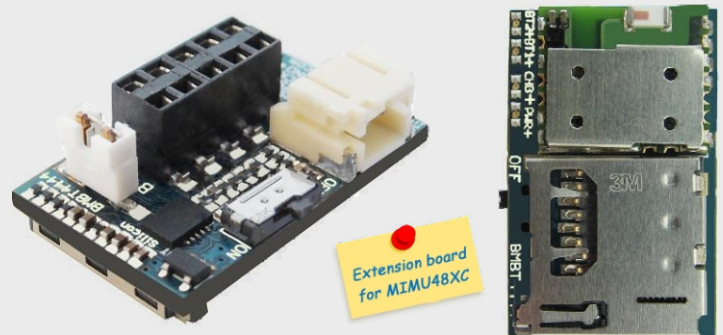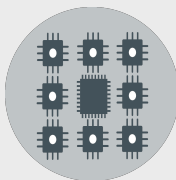
The **BMBT4444** serves the purpose of extension board for MIMU48XC. When used with MIMU48XC, it adds wireless communication interface (Bluetooth), data storage (Micro SD Card) and battery (Li-ion rechargeable) as another powering option to the inertial sensor array module.

Target Applications

IoT Applications

Sensors Array Fusion

VR Applications

Gait Analysis

3D Motion Capture

Structure from Motion

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