Olea Sensor Networks

IoT Intelligent Sensor Analytics

OleaVision™

OleaSense™
Vital Sign Sensing

Design Methodology
Using Matlab

MATLAB EXPO 2018

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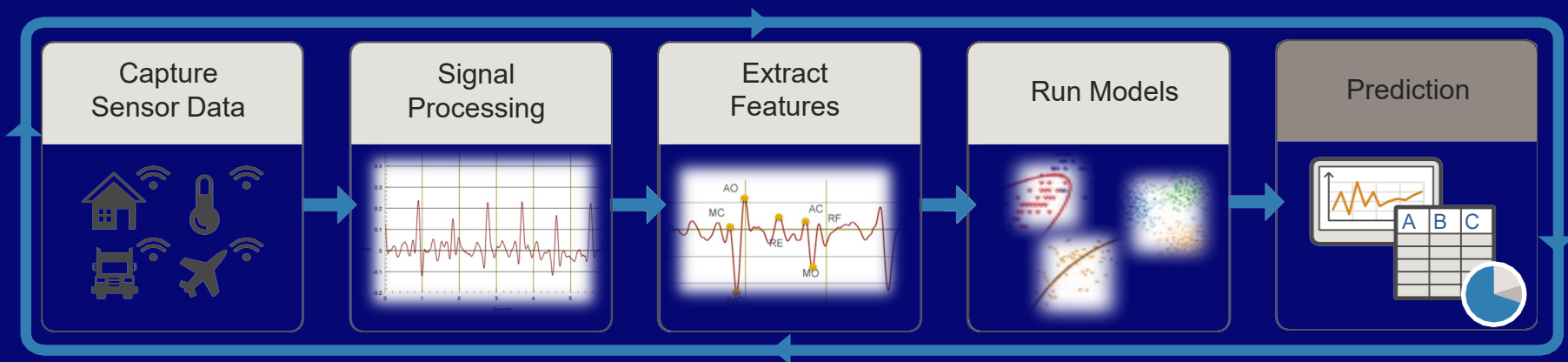Phone: 775.636.7680 ♦ e-mail: frank@oleasys.com

Vital Sign Sensing Development

Problem statement:

- The challenge of extracting out features from micro-doppler sensor signals that dynamically determine the presence of life and its vital signs

Approach used to solve problem:

- Incorporated an integrated design flow methodology for hardware, firmware, algorithm and software development.
- Used MATLAB tools as part of the machine learning design flow to develop feature extraction and signal processing algorithms
- Generated code for deployment on an embedded device.

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Design Flow Using MATLAB

Capture Sensor Data → Signal Processing → Extract Features → Run Models → Prediction

MATLAB Tools Used

- Statistics and Machine Learning Toolbox, Signal Processing Toolbox, DSP System Toolbox, Wavelet Toolbox, MATLAB Compiler, Simulink Control Design & Simulink Design Optimization

Extracted signal after preprocessing

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Development Results Using MATLAB

- MATLAB provided a design environment that allowed us to collect, analyze, process and extract features in an Iterative way until we achieved and verified the ultimate performance desired.

- By incorporating MATLAB in our design flow, we were able to generate advanced machine learning algorithms that enabled our sensor technology to capture medical grade vital sign data.

- Finally this accelerated the deployment of our embedded code in the final product.

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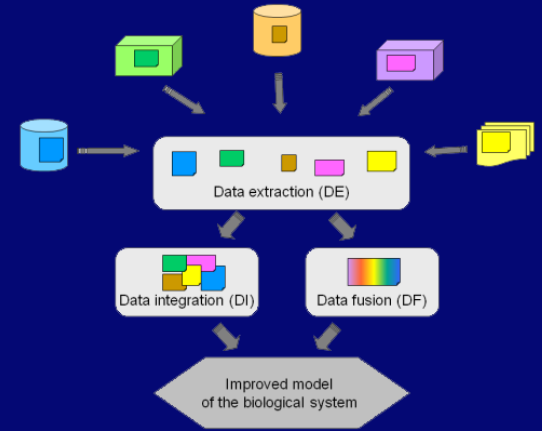
Intelligent IoT Sensor Networks

Multi-Sensor Data Fusion
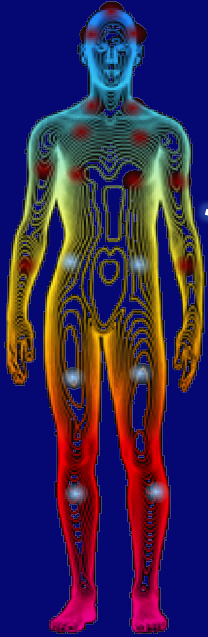
Body Area Network
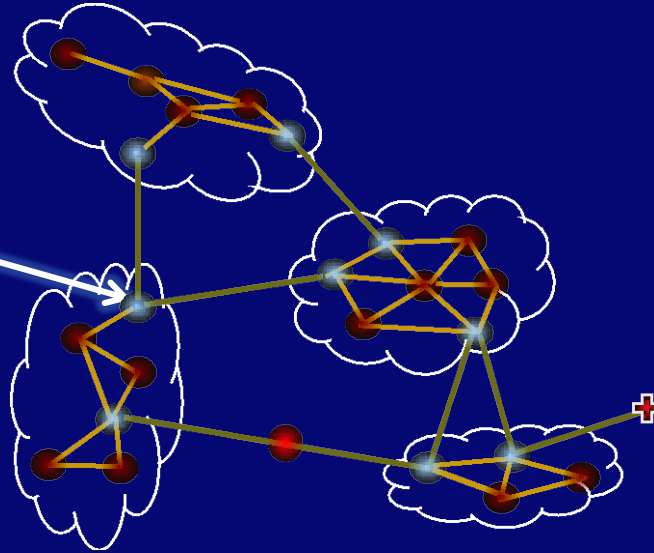
Intelligent Cluster Topology

Improved Model of the Biological System

Remote Vital Sensing IoT Solution

Intelligent Multi-Sensor Platform

Vital Sign Wearable Sensor Hub

Remote health monitoring applications

Data can be integrated with cloud-based analytics

(84mm x 35mm x 8mm)

*Multi-Sensor Hub with OleaSense™ Sensor Analytics*

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OS-3010 Vital Sign Sensor Hub

- On-Board Intelligent Sensors
- OleaVision™ 24 GHz Micro-Doppler Radar Sensor
- Optional Motion & Activity Sensors
    - Tri-Axis Magnetometer (compass)
    - Tri-Axis Accelerometer
    - Tri-Axis Gyroscope
- High-performance single-core 1GHz ARM Processor
- Connectivity
    - Wired (micro USB 3.0)
    - Bluetooth Low-energy (BLE) 4.0
- Rechargeable 1500mAh Li-ION battery

Dimensions—10 cm x 6.5 cm x 2.8 cm
Weight—Approx. 5.0 US ounces (142 grams)
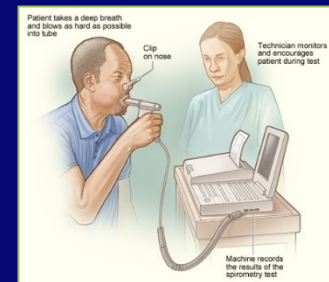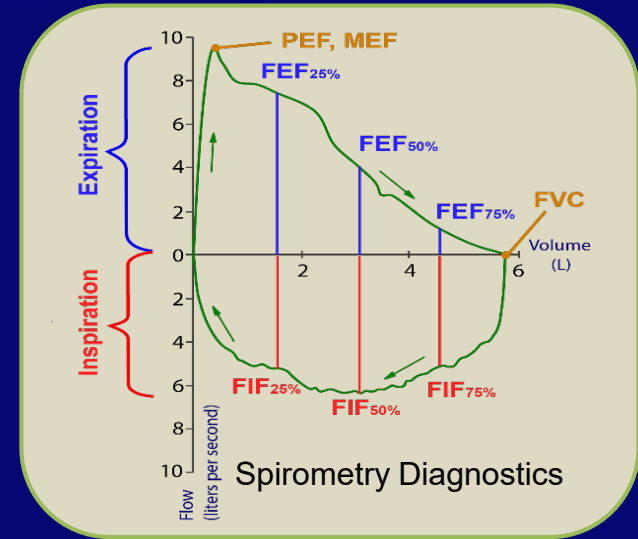
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# OleaSense AI Software
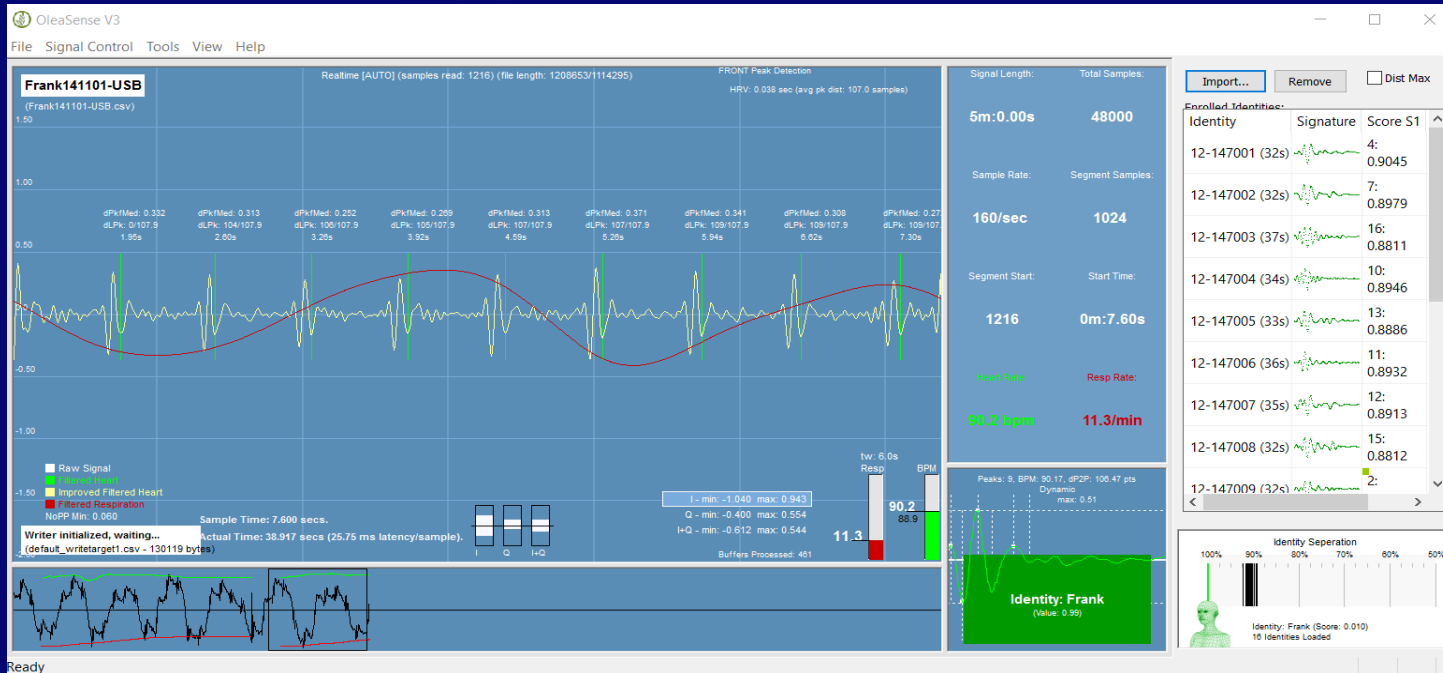
- Real-time Vital Data Captured
- Vital Sign Statistics Extracted by Sensor Analytics.

Respiratory Patterns

- OleaSense™ Spirometer
  - A Contactless sensor for measuring the air capacity of the lungs

- Spirometry - meaning the measuring of breath

- Most common of the pulmonary function tests (PFTs)

- Measuring lung function, specifically the amount (volume) and/or speed (flow) of air that can be inhaled and exhaled.

- Future diagnostics in assessing conditions such as asthma, pulmonary fibrosis, cystic fibrosis, and COPD.

Spirometry Diagnostics
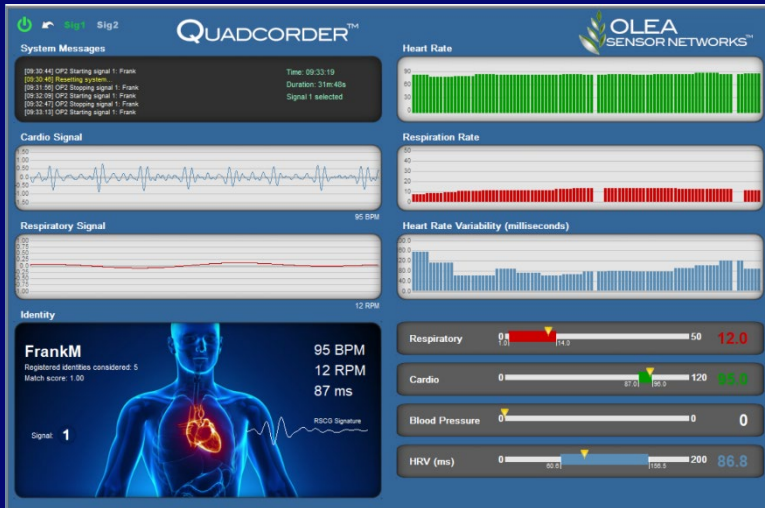
- ❖ Olea's mission is to develop new advanced telemedicine technologies

- ❖ Providing innovations in remote contactless vital sign sensing

The Fusion of Technology & Medicine

- ❖ Sensor Analytics

- ❖ Enhanced Diagnostics

  - – Statistical Analysis

  - – Pattern Recognition

  - – AI Predictive Algorithms

- ❖ Empowered Patient

- ❖ Knowledge Communities

Machine Learning Diagnostics

Summary

Results achieved:

- OleaSense medical-grade wireless-contactless sensor successfully acquires vital signs (respiratory & cardiac) in real time

- OleaSense was launched in only 6 months due to its design flow methodology which incorporated MATLB tools

- We continue to use MATLB tools for ongoing enhancements of the algorithms for Machine Learning Diagnostic applications

Connected Care

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