SEGMENTATION AND TRACKING APPLICATION

Overview

The Segmentation and Tracking application leverages advanced radar signal processing and unsupervised learning algorithms to detect, segment, and track multiple moving objects or people in real time. Designed for the PSoC™ 6 and integrated with the 60GHz BGT60TR13C radar sensor, this solution enables intelligent monitoring of environments for applications such as people counting, movement detection, and occupancy estimation. By running the radar data processing pipeline directly on the PSoC™ 6 platform, the system provides a cost-effective and power-efficient approach to implement contactless sensing and tracking in smart spaces, security systems, and automation environments.

Key Features

- Radar Signal Segmentation: Processes raw radar reflections to distinguish individual objects or people within the sensor's field of view.
- Multi-Object Tracking: Continuously tracks the movement and trajectory of multiple targets simultaneously.
- Unsupervised Learning: Uses clustering-based algorithms for automatic segmentation without the need for labeled datasets.
- Edge AI Processing: Fully runs on the PSoC™ 6 MCU for efficient, low-latency, and real-time inference at the edge.
- High Precision Sensing: Employs the 60GHz BGT60TR13C radar sensor for fine-resolution motion detection and accurate distance estimation.
- Scalable Integration: Compatible with smart building, retail, and security infrastructures requiring adaptable occupancy insights.

Key Benefits

- Contactless Monitoring: Enables continuous detection and tracking without the need for cameras or wearable devices.
- Energy Efficient: Optimized radar data processing pipeline ensures minimal computational overhead on PSoC™ 6.
- Accurate People Counting: Effectively differentiates and counts multiple individuals, even in dynamic environments.
- Privacy-Preserving: Radar-based sensing eliminates visual data capture, ensuring user privacy.

- Flexible Deployment: Suitable for both single-room setups and large-scale multi-zone installations.
- Future-Ready Design: Easily expandable to integrate AI-based behavioral analytics or occupancy trend prediction.

Use Cases

- Smart Building Automation: Detect and monitor room occupancy to optimize lighting, HVAC, and energy usage.
- Security Monitoring: Track movement and presence within restricted or high-security areas.
- Retail Analytics: Analyze customer flow and dwell time for improved store layout and engagement.
- Office Occupancy Management: Determine workspace utilization and support adaptive resource allocation.
- Elderly Care and Healthcare: Enable non-intrusive motion detection for fall prevention or activity monitoring.
- Industrial Applications: Monitor personnel movement in hazardous or controlled zones for safety compliance.

Specification and Compatibility

Sensor Settings – Radar

- Sensor: 60GHz BGT60TR13C Radar
- Sampling Rate: 2 GHz
- Extracted Features: Doppler, Range, Azimuth
- Processing Workflow: Radar Signal Processing → Segmentation → Tracking