Short-Range Radar Sensors

Sensing a Safer World

OmniPreSense

Agenda

- Overview
- Example Data
- Mount Locations
- Rolling Buffer Feature

OPS243-A Ball Recommended Configuration

- Numerous sports are interested in details about the ball speed and movement
  - Golf
  - Baseball
  - Cricket
  - Hockey
- OPS243 provides a convenient radar-based solution for accurately reporting speed
  - Very accurate reporting (within <±1 mph)
  - Ability to report multiple speeds (club or bat speed)
  - Direction reporting (inbound pitch vs ball exit velocity)
  - Simple to configure via flexible API
  - Wireless interface option

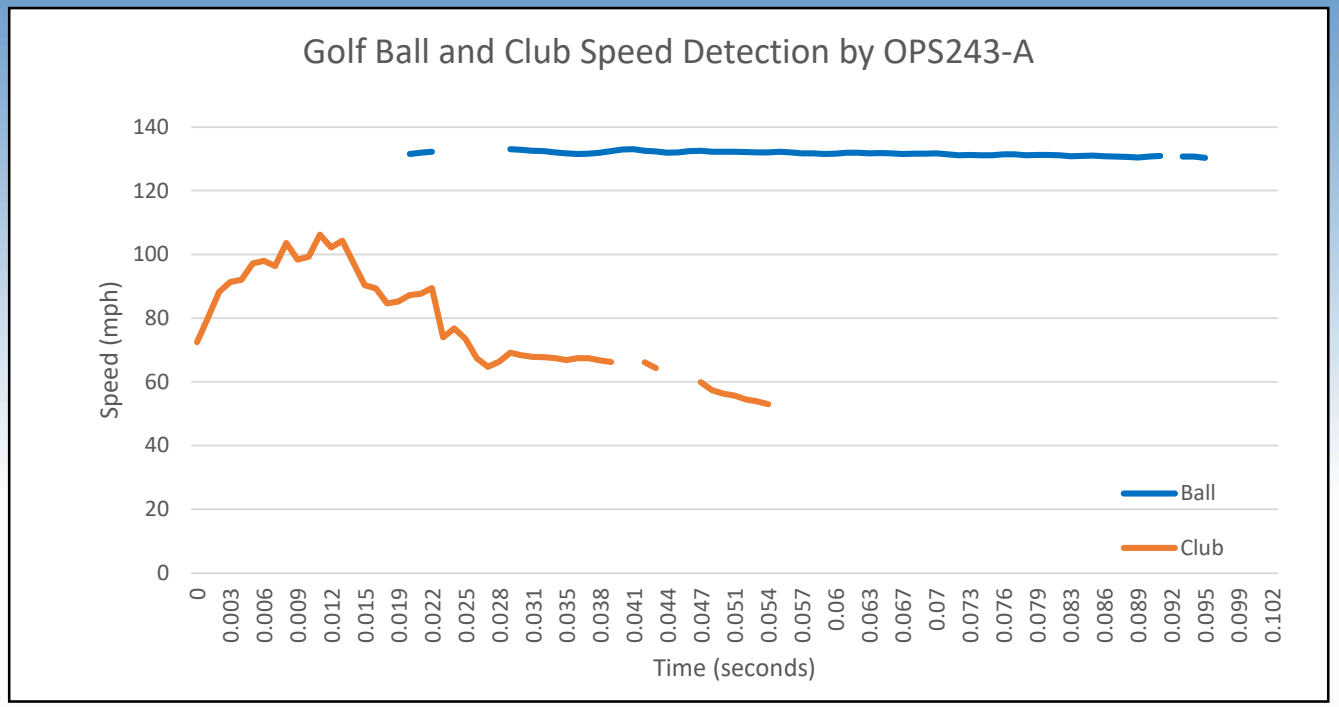
OPS243-A Configuration Settings

- Goal – capture as much reports of ball speed as possible with very good resolution
  - Set report rate very high
  - Adjust to keep resolution tight (±0.1mph)
- API settings different from default
  - Sample rate: change to 30ksps with S=30← API command
  - Buffer size: change to 128 with S(API command
  - FFT size: change to 4096 with X=32← API command
  - Magnitude threshold: if more detection distance needed, adjust with M>15 API command
  - Peak speed report: change to K+ to focus single speed report of ball
  - Above settings provide a report rate of 56Hz (18ms between speed reports) with 0.1mph resolution
- Can save API configuration settings to persistent memory with A! API command (holds values if power removed or sensor reset)

OPS243-A Configuration Options

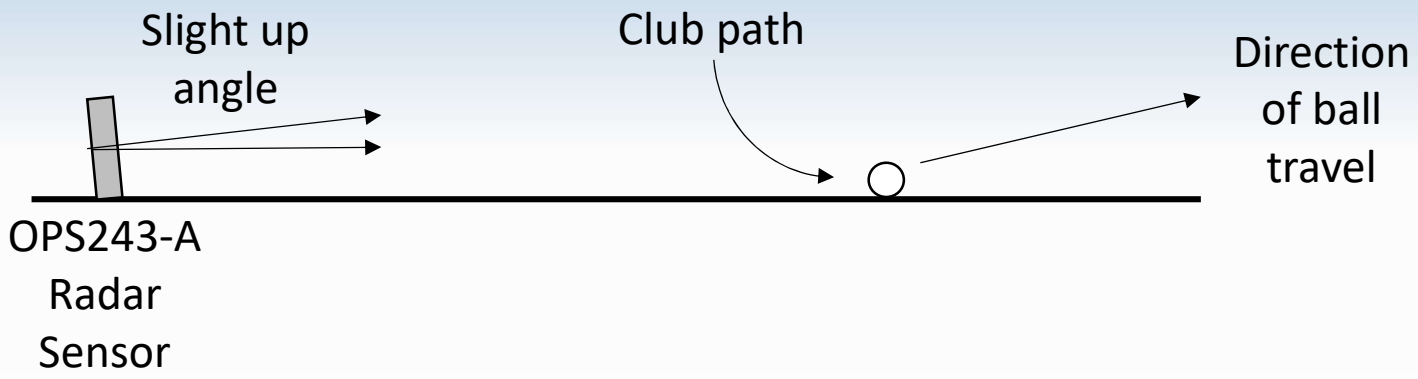
- If desired, can set other constraints for reporting such as filtering on direction or triggering on speed
- Filter direction
  - Set R+ for positive (inbound) speed only
  - Set R- for negative (outbound) speed only
- Filter or trigger reporting based on speed
  - Set R>n where n is the speed to only report greater than
  - Set R<n where n is the speed to only report below
- Multi-output speed reporting – useful for club/bat speed or exit velocity
  - Set O2 or O3 to report the top 2 or 3 ball speeds detected
  - When reporting ball and club/bat at same time, will need additional means to separate out which speed is which

Example Ball Speed Data



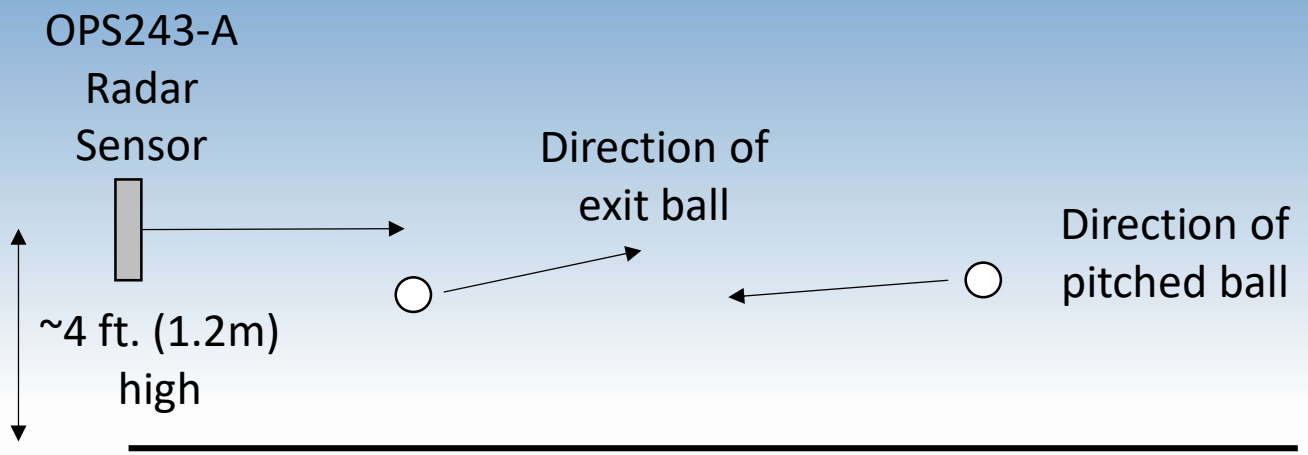
- Ability to provide many speed reports while ball is in motion
- Ability to detect both club and ball speed for golf

OPS243-A Positioning - Golf



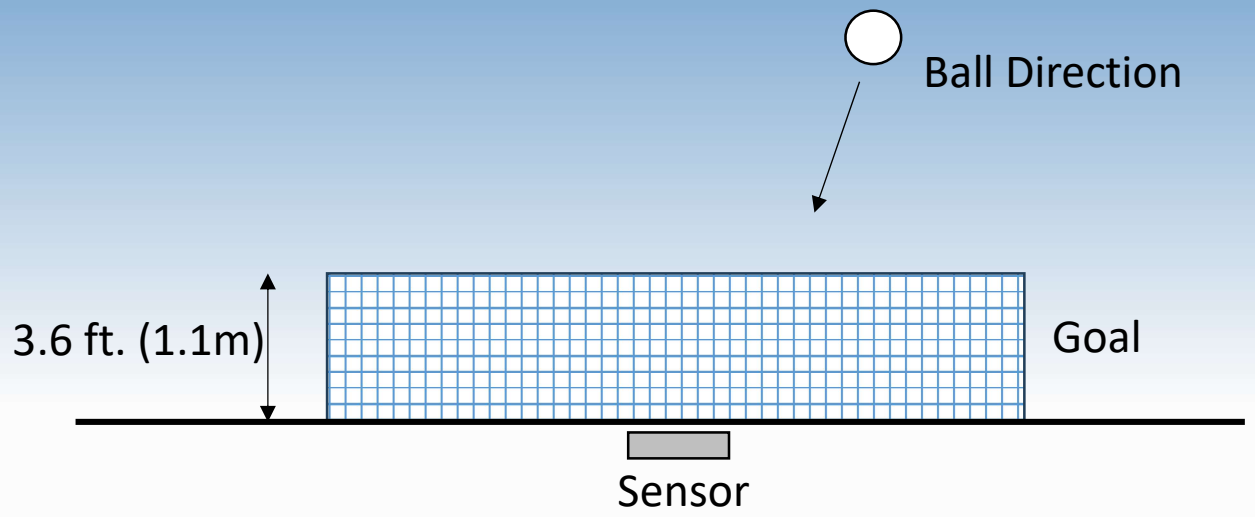
- Place sensor behind ball 6-8 ft. (1.8-2.4m) facing the direction of travel
- Provide slight 10˚ up angle of sensor to catch more vertical path

OPS243-A Positioning - Baseball



- Ideally placed where umpire would be
- Pitched ball will be + speed reported
- Hit ball will be – speed reported
- Bat swing speed may be seen as initial + speed and then mostly – speed
- Placing sensor off to left or right may require adjustment to speed reported based on cosine error

OPS243-A Positioning – Water Polo



- Place sensor behind goal to cover inbound balls
- Option to use inbound only (R+ command) to eliminate hand waves of goalie

Ball Speed and Size

- Max ball speeds determine some configuration settings
- Reflectivity of the ball determines distance of detection

Sport	Ball Speed (max)	Size (diameter)	Reflectivity to Radar
Baseball	108mph (pitch) 118mph (exit)	7.6 cm	Medium
Basketball	48 mph	75 cm	Medium
Cricket	100mph	7.2 cm	High
Football (American)	63mph (thrown) 80mph (kicked)	17x28 cm	Low
Futbol	80mph	22 cm	Low
Golf	211mph	4.3 cm	High
Hockey	108mph	0.4 x 1.2 cm	High
Rugby	85mph (kicked)	19x29 cm	Low
Volleyball	110mph	20.7 cm	Low
Water Polo	55mph	22.6 cm	Medium