Thermal Signature Tracking System

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Opportunity and Significance

- Existing tracking systems may require “active” tracking peripherals to be worn by the target(s) (e.g., armbands, hats), of which will require their own power source.
- Motion-only based tracking systems require specific lighting conditions, and are prone to false-positives.
- Thermal tracking can be applied to devices for security, convenience, and efficiency. Example applications include: Cameras, lights, fans, and monitors.

Technical Approach

- Eight stationary Boolean PIR modules are used for course 360 angle detection.
- An 8x8 IR thermocouple array sensor is used atop a revolving turntable. This sensor gives a 60 degree grid view of temperatures in real-time (10Hz) and allows for increased precision in tracking.
- A servo is used to rotate the turntable, and an external potentiometer is implemented for measurement of the current angle.
- Two MCUs are used: The main unit in the stationary base, the second atop the rotating turntable. The secondary MCU controls the fan and laser, the main unit: everything else.

Technical Objectives

- Develop a 360 degree passive tracking system that uses thermal signatures and is accurate within the width of a person.
- Different tracking modes: Track single target, track multiple targets, and avoid mode.
- Multi-target mode must be able to accommodate when target(s) enter or leave the area.
- Device is to be controlled remotely
- A fan will be used so as to give purpose to the device and exemplify a real-world application.

Accomplishments and Results:

- Tracking works for both single and multiple targets.
- Movement is slow and jittery, due to plastic drivetrain and weak servo.
- The PIR modules used had a large hysteresis error, resulting in slow-retriggering.
- While the 8x8 IR readings are coded to compensate for ambient temperature, the sensor is still susceptible to environmental fluctuations.

Next Steps for Development and Test

- PIR should be replaced with better quality models (lower hysteresis).
- The 8x8 IR sensor array is very noisy and has short range, better quality is needed.
- The servo may need replacing with a stepper motor for faster response and torque.
- The turntable could be made to rotate freely in any direction through use of induction for power and RF for data.

Commercialization Plan & Partners

Panasonic developed the 8x8 IR sensor array.

Hurdles for commercialization includes the cost of 8x8 IR sensor array, which was the single most expensive piece of technology in the project.

Related Work and State of Practice

Other tracking systems exist with low-accuracy sensing (PIRs sensors only).