iRooms - Smart Campus

Occupancy tracking using IR sensors to improve resource management

Team 6

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Agenda

- Introduction and Motivation
- Problem and Solution
- Demo
- Future Work
- Q & A

Smart Campus

- Security
- Comfort
- Efficiency
- Network connectivity

Motivation

- Tackle a problem that affects a large area
- Rooms, areas that are frequently used
  - Bathrooms, classrooms, etc.
- Areas to target
  - Security
  - Comfort
  - Efficiency
  - Network Connectivity

Problem

Lights are universal. Often they are left on even when unused.

Can we improve the current lighting system using occupancy tracking such that lights turn on and off automatically?

Goals

- Achieve a occupancy tracking system without the need of cameras
- Save energy and electricity by intelligently turning on and off lights, appliances, etc.

Additional Perks

- Incorporate other sensors that can provide other quality of life updates
  - I.e. Automatic AC

Proposal

Use ESP32C3 and two IR sensors to implement a low cost room tracking occupancy module.

The two sensors allows us to both monitor presence and detect the direction of movement.

Overview

- Two sensors setup close to the entrance of a room
- Order of triggering will indicate direction

Order of triggering	Result
Sensor 1 -> Sensor 2	Person Entering
Sensor 2 -> Sensor 1	Person Leaving

1

2

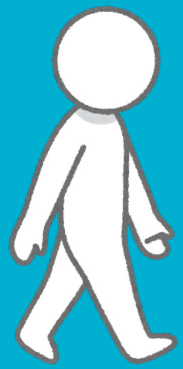
Solution

- Occupancy Tracking using two IR sensors
- We use two IR sensors to perform directional tracking
- If sensor A is triggered followed by sensor B, the person is entering the room.
- If the reverse happens, the person is leaving the room.
- This will allow us to keep track of the number of persons in the room.

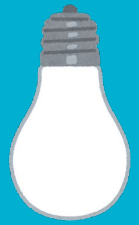
Solution

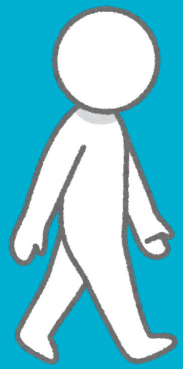
Entering

People inside: 0



Solution





Entering

Sensor 1 detects a person

People inside: 0

Solution

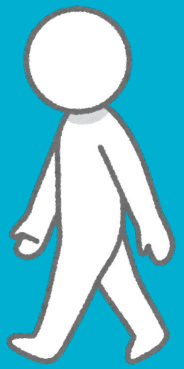
Entering

Sensor 2 detects a person

People inside: 1

Lights turn on.

Solution



Exiting

People inside: 1

Lights are on.

Solution

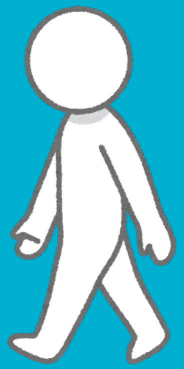
Exiting

Sensor 2 detects a person

People inside: 1

Lights are still on.

Solution



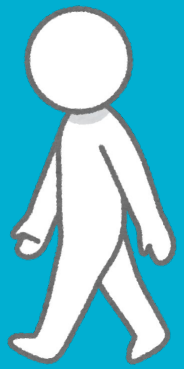
Exiting

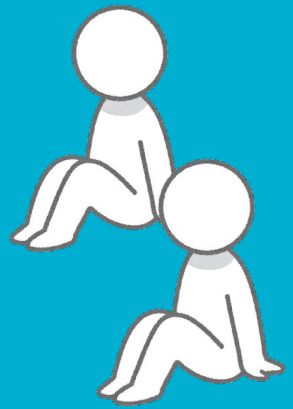
Sensor 1 detects a person

People inside: 0

Lights turn off.

Solution





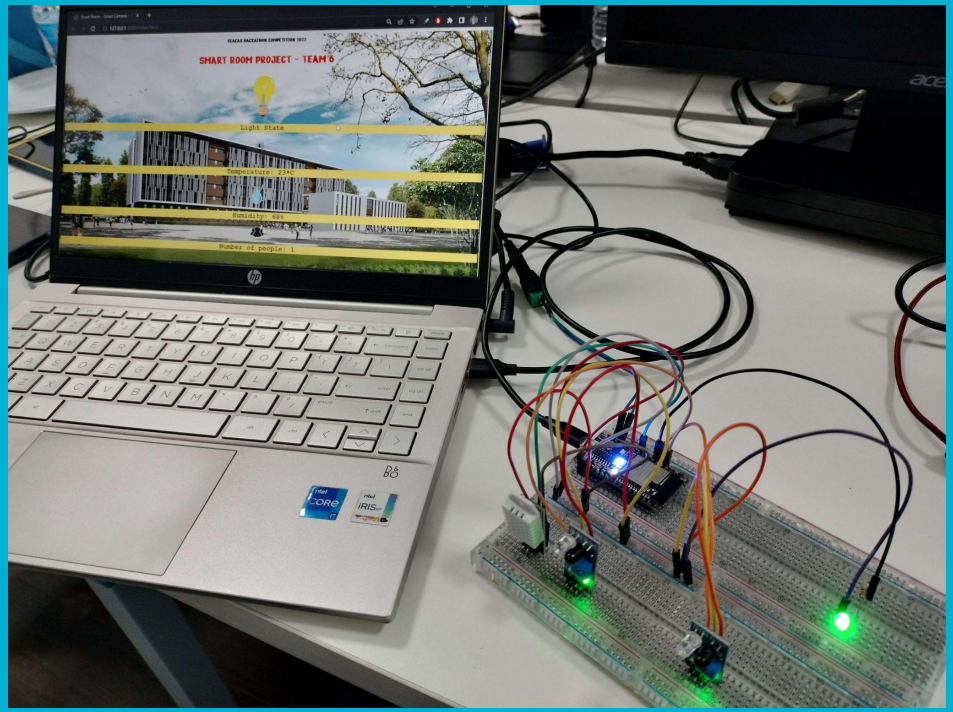
Exiting with non empty room

Sensor 1 detects a person

People inside: 2

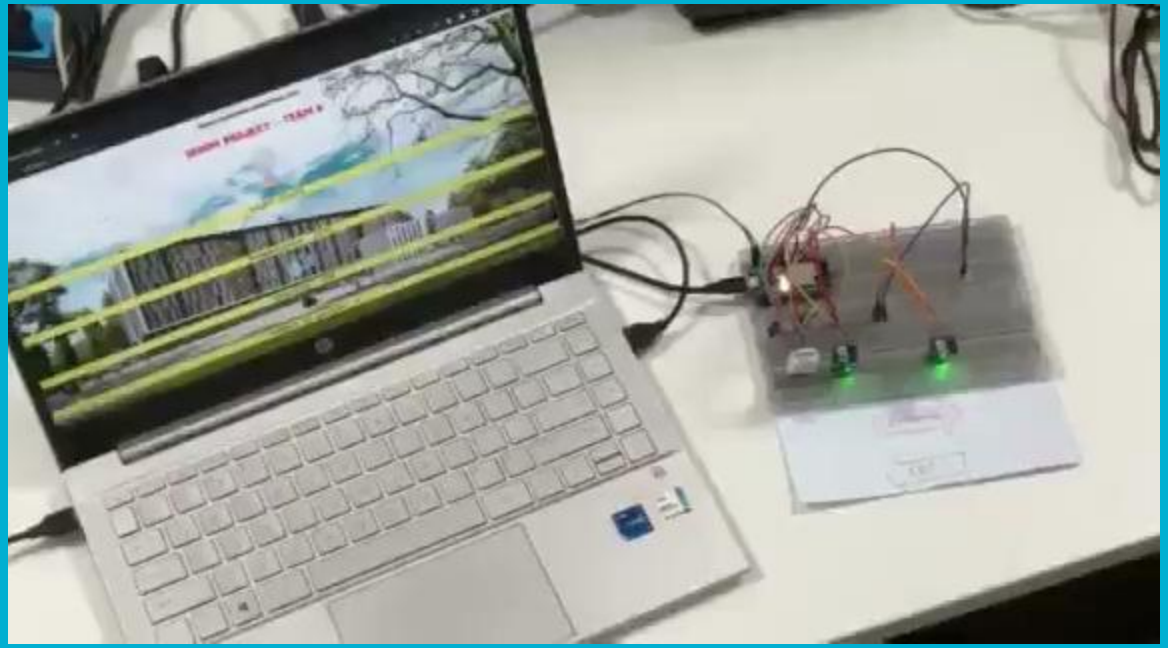
Lights remain on.

Proof of Concept Prototype



- Two IR sensors for occupancy tracking
- A temperature and humidity sensor for potential automatic ACs
- Uploading of data to a website wifi functionality

Proof of Concept Prototype



Future Work

- Make the system more robust to noisy data
  - Optimize distance between sensors
  - Multiple people coming and going at the same time
- Implement more sensors to make use of occupancy tracking.
- Integrate into hallways to allow intelligent lighting.
- Setup for different types of entrances

Cost of Parts for the prototype

ESP32C3	$1.95
Tracking IR x2	$2.88
Temperature and humidity sensor	$1.42
LED light	$0.10
Total	$6.35

Picture References

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Material Cost References

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https://shopee.vn/B%C3%B3ng-Led-10MM-F10-phi-10-ch%C3%A2n-d%C3%A0i-c%C3%A1c-m%C3%A0u-%C4%91%E1%BB%8F--xanh-l%C3%A1--xanh-d%C6%B0%C6%A1ng--v%C3%A0ng--Tr%E1%BA%AFng-i.134796651.14671169618?gclid=CjwKCAiAhKycBhAQEiwAgf19elacfWPlbxmtxvavtHpXmccH762O4UpjKYa7tC_jdVg-RBg3CpRTJRoCKOAQAvD_BwE LED light

Thank You!
Any questions?

QR code to access related project material