| Sl36 | PxIoTG8-681 |
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Camera-Based Occupancy Sensing Using AI for Smart Home Applications

**Final Outcome**

1.Develop a camera-based occupancy sensing system using AI.

2.Implement and simulate the system using Python.

3.Evaluate the performance and accuracy of the system.

4.Explore applications in energy management, security, and user comfort in smart homes.

**System Design**

1.Hardware Setup: Define camera specifications and setup for data collection.

2.Software Architecture: Design the architecture for the occupancy sensing system.

**Data Collection and Preprocessing**

1.Collect a diverse dataset of indoor scenes with varying lighting conditions and occupancy states.

2.Preprocess the data (e.g., resizing, normalization) for training AI models.

**Model Development**

Object Detection: Implement object detection models (e.g., YOLO, SSD) for identifying human presence.

Pose Estimation: Integrate pose estimation techniques to improve recognition accuracy.

**Simulation and Implementation**

Use Python and relevant libraries (e.g., OpenCV, TensorFlow, PyTorch) to develop and simulate the models.

Implement real-time video processing for occupancy detection.

**Evaluation**

Define metrics for evaluating model performance (e.g., accuracy, precision, recall, F1-score).

Conduct experiments to assess the system’s effectiveness in different scenarios.

**Applications in Smart Home**

1.Energy Management: Implement scenarios where the system controls lighting and HVAC based on occupancy.

2.Security: Develop features for detecting unauthorized access and alerting homeowners.

3.User Comfort: Enhance smart home interactions by recognizing user presence and preferences.

**Expected Outcomes**

A functional prototype of a camera-based occupancy sensing system using AI.

Performance evaluation results demonstrating the system’s effectiveness.

Practical applications of the system in smart home environments.

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