

Smart Parking System:

A **smart parking system** uses **sensors, cameras, apps, and automation** to help drivers **find and manage parking spaces efficiently**. It reduces traffic congestion, saves time, and improves the overall parking experience.

How It Works

1. **Sensors** (e.g., ultrasonic, infrared, magnetic) detect:
 - Whether a parking spot is **occupied or vacant**
2. **Data is sent** to a central system via:
 - Wi-Fi, LoRa, Zigbee, or cellular networks
3. **Real-time updates** are shown:
 - On apps, digital boards, or websites
4. **Optional features** include:
 - Online reservation, automatic payments, license plate recognition, and time-based billing

Types of Smart Parking Systems

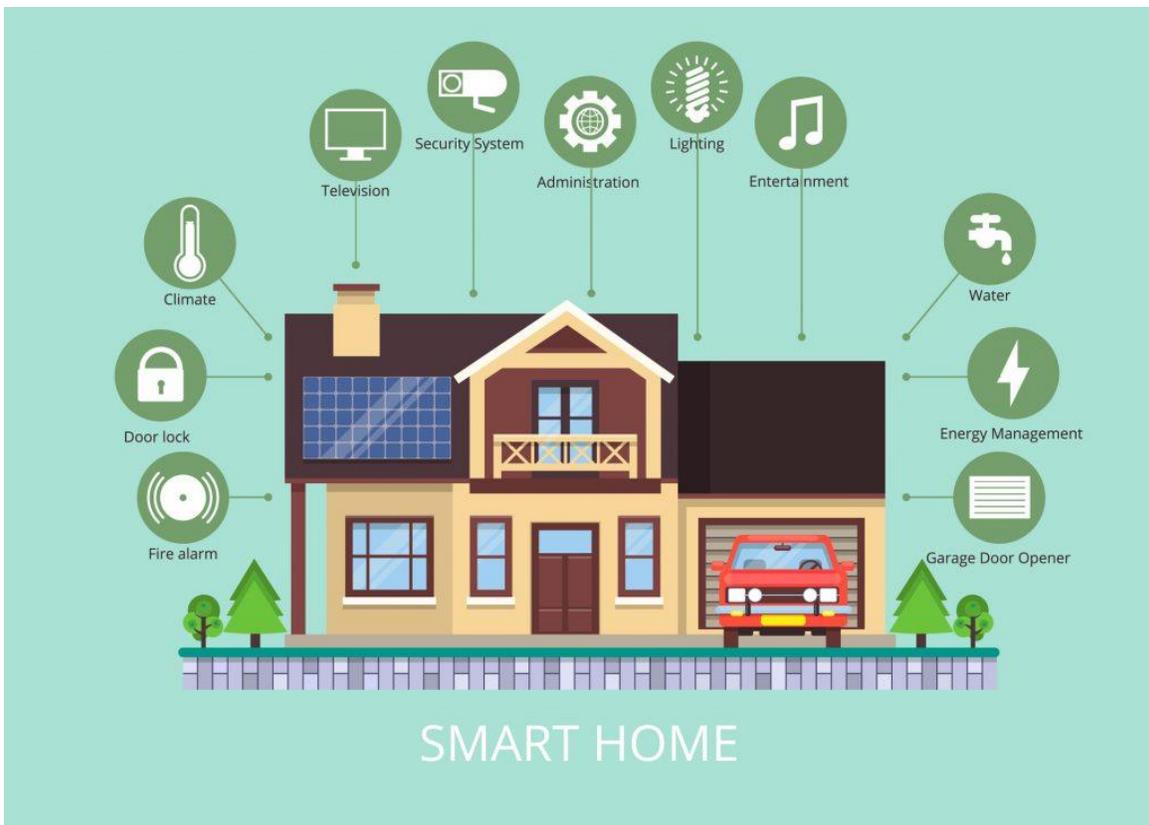
Type	Description
On-Street Smart Parking	Monitors public parking along roads; drivers view space availability via apps
Off-Street Smart Parking	Used in lots or garages with sensor-equipped bays and entry/exit automation
Automated Parking Systems (APS)	Mechanized systems that park and retrieve cars using robotics

Technologies Used

- **IoT Sensors** – detect vehicle presence
- **Wireless Networks** – transmit real-time data
- **Cloud Computing** – for data analysis and reporting
- **CCTV/ANPR** – for surveillance and number plate recognition
- **Mobile Apps** – for navigation, booking, and payment

Benefits of Smart Parking Systems

- **Reduces traffic** from cars circling to find parking
- **Saves time and fuel**
- **Enables dynamic pricing and digital payments**
- **Enhances security and enforcement**
- **Eco-friendly** by reducing CO₂ emissions from idling vehicles





Home Automation

Smart lightning

IoT design technique was used to create a smart automation system. The section describes a concrete implementation of the system based on the Django Framework. The goal of the home automation system is to use a web application to control the lights in a typical home remotely.

There are two modes in the system: automatic and manual. The device measures the amount of light in a room and turns on the light when it becomes dark in auto mode. In manual mode, the technology allows you to turn on and off the light manually and remotely.

Figure shows the deployment design of the home automation system. As explained the system has two REST services (mode and state) and a controller native service. The mode services are a RESTful Web Services that sets Mode to auto or manual (PUT request) or retrieve the current mode (GET request). The mode is updated to/retrieved from the database. The state services are a RESTful Web Services that sets the light appliances state to on/off (PUT request) or retrieves the current light state (GET request). The state is updated to/retrieve from the status database.

Smart appliances

TV, refrigerator, music systems, washer/dryer, and other appliances are common in modern households. With each device having its own control or remote control, managing and regulating these items might be difficult. Smart appliances make management easier and give users with status information remotely. For instance, a smart washer/dryer that can be managed remotely and alerts you when the cycle is finished. Smart thermostats enable for temperature control from a distance and can learn the user's preferences. Smart refrigerators can keep track of what's inside and notify consumers when an item is running low on stock.

Smart TVs allow users to search and stream videos and movies from the internet to a local storage device, as well as search TV channel schedules, weather updates, and other internet material. Open Remote is an open source home and building automation platform. It is platform agnostic and works with standard hardware. Users using open remote can utilize mobile or online applications to control a variety of appliances. OpenRemote is made up of three parts: a controller that handles scheduling and runtime integration between devices, a designer that lets you define both controller settings and user interface designs, and a control panel that lets you interact with and control the devices. An IoT-based smart home appliance control system that employs a system Center controller to set up a wireless sensor and actuators Network and control module.

Intrusion detection

Security cameras and sensors are used by home intruder detection systems to detect intrusion and generate alarms. An alert can be sent to the user in the form of an SMS or an email. Advanced systems can also send detailed notifications as an email attachment, such as an image grab or short video snippets. The geo-location of each node of a home automation system is recognized and saved in the cloud using a cloud controller intrusion detection system that leverages location-aware services. When an incursion occurs, the cloud services notify the appropriate neighbors (who are also using the home automation system) or the local police. In the described intrusion detection system based on UPnP Technologies. The system recognizes the intrusion, extracts the intrusion subject, and generates universal plug-and-play instant messaging for warnings using image processing.

Smoke/Gas detectors

In order to detect smoke, which is a common and early symptom of fire, smoke detectors are put in homes and businesses. Smoke detectors detect smoke using optical detection, ionization, or air sampling techniques. Smoke detectors can provide signals to a fire alarm system when they detect smoke. Gas detectors can detect dangerous gases including carbon monoxide (CO), liquefied petroleum gas (LPG), and others. A smart smoke/gas detector can sound an alarm, describe the situation, send an SMS or email to the user or the local fire department, and provide visual feedback on its status (healthy, battery-low, etc.). In the design of a system that detects gas leakage and smoke and gives visual level indication.