# Literature Survey: Smart Automatic Door Control System

## Overview

The automatic door control system is a fundamental part of modern automation in smart buildings, hospitals, public facilities, and industrial zones. Over the years, various approaches have been proposed for implementing intelligent door systems. These include sensor-based, wireless, IoT-enabled, and motor control techniques. This literature survey explores key research contributions and existing methodologies related to automatic doors with a focus on motor control, encoder feedback, homing mechanisms, and safety features like emergency stops and smooth motion management.

## Sensor-Based Automatic Door Systems

Most early systems focused on motion detection or IR sensors to trigger door operations. Example: 'Design and Implementation of an Automatic Door System using PIR Sensor' - IJERT, 2015. This system opened the door when motion was detected using a PIR sensor. It lacked real-time position feedback and closed the door based on a static delay. Limitations included lack of motor position control and inaccurate operation in high-traffic areas.

## Timer-Based and Relay-Driven Doors

'Microcontroller Based Automatic Door Opening System' – IJSER, 2017 implemented door opening and closing using relays with time delays. Pushbuttons were used for manual triggers but there were no encoders or feedback systems. Limitations included rigid delay timings and poor smoothness during operation.

## Use of Encoders in Automation

'Speed and Position Control of DC Motor Using Encoder and PID Controller' – IJERT, 2021 used encoder feedback to manage DC motor speed. This significantly improved motor control by providing real-time position and motion status. Relevance: Enables precise motor handling, emergency stops, and smooth landing logic.

## Homing Mechanism and Position Calibration

'Design and Control of a Homing Mechanism for CNC Applications' – IEEE Mechatronics, 2019 described how systems return to a 'home' position using limit switches. In our context, this helps define a zero position for consistent motion tracking.

## Smooth Acceleration and Deceleration

'Soft Start/Stop DC Motor Control Using PWM and Encoder Feedback' – IJRASET, 2020 demonstrated adjusting PWM to change motor speed smoothly. Useful to avoid mechanical stress. Our system applies this to start slow, increase speed, and decelerate near door endpoints.

## Emergency Stop and Safety Features

'Design of a Safe Elevator Door System with Obstruction Detection and Emergency Stop' – IEEE Sensors, 2022 inspired our system's ability to halt operations instantly. Emergency stop logic improves safety during manual overrides.

## Manual Override and Auto-Close Features

'Hybrid Manual-Auto Smart Door using Arduino' – IRJET, 2019 combined motion sensors and buttons with auto-close delay. Our approach enhances this with encoder feedback and smart logic.

## Summary and Research Gap

While many systems use basic logic for automatic doors, they lack precision, feedback, and smart controls. Our system incorporates encoder-based feedback, homing, manual control, dynamic speed adjustments, emergency stop logic, and real-time serial debugging. These features make it ideal for educational, industrial, and smart home applications.