Report on Automatic Parking Lot System using IR Sensors and Servo Motors

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Abstract:

This report details the design and implementation of an automatic parking lot system utilizing Infrared (IR) Sensors and Servo Motors. The system was developed using National Instruments (NI) DAQ (Data Acquisition) hardware and LabVIEW software, incorporating a stop button on the front panel for user control. The core functionality of the system revolves around IR Sensors detecting the presence of vehicles and Servo Motors controlling the parking lot barriers accordingly. This report outlines the hardware setup, LabVIEW programming, and the project's functionality.

Introduction:

The objective of this project was to create an efficient and user-friendly automatic parking lot system, integrating IR Sensors for vehicle detection and Servo Motors for controlling entry/exit barriers. The system is designed to automate the parking lot management process and enhance security.

Hardware Setup:

1. **IR Sensors:** We employed IR Sensors to detect the presence of vehicles at entry and exit points of the parking lot. These sensors were strategically placed to cover each lane and were connected to the NI DAQ hardware for data acquisition.

2. **Servo Motors:** The Servo Motors were employed to control the parking lot barriers. These barriers were installed at the entry and exit points to restrict or grant access to vehicles.

3. **NI DAQ Hardware:** National Instruments Data Acquisition (DAQ) hardware was used to interface the IR Sensors with the LabVIEW software. The DAQ hardware provided the necessary analog and digital input/output channels for sensor data acquisition and Servo Motor control.

LabVIEW Programming:

The LabVIEW programming was divided into two primary components: the front panel and the block diagram.

1. **Front Panel:**

- **Start/Stop Button:** A user-friendly interface was designed with a Start/Stop button. This button allowed manual control over the system to halt operations when required.

- **Status Indicator:** A status indicator displayed whether the system was active, paused, or stopped.

2. **Block Diagram:**

- **While Loop:** The core of the program was a continuous while loop that ensured the system's real-time operation. Inside this loop, data acquisition and control tasks were performed.

- **DAQ Configuration:** The DAQ hardware was configured to read data from IR Sensors. Analog input channels were utilized to gather sensor data.

- **Case Structure:** A case structure was implemented to differentiate between system states (start, stop, pause) based on user input from the front panel.

- **IR Sensor Data Processing:** The data from the IR Sensors were processed to determine vehicle presence or absence at the entry and exit points.

- **Servo Motor Control:** Based on the processed sensor data, the Servo Motors were controlled to open or close the barriers accordingly.

- **Time Delay:** Time delays were incorporated to ensure smooth operation of the Servo Motors and to prevent any sudden movements that could pose safety risks.

Functionality:

The automatic parking lot system functions as follows:

1. When the system is started, it continuously monitors the IR Sensors for vehicle presence.
2. If a vehicle is detected, the system activates the Servo Motors to open the entry/exit barriers.
3. When the vehicle has safely entered/exited, the barriers are closed.

4. The system can be paused or stopped using the front panel button.

Conclusion:

The automatic parking lot system designed using IR Sensors and Servo Motors, integrated with NI DAQ hardware and LabVIEW, successfully automates the parking lot management process. It enhances efficiency and security while providing manual control when needed. This system can be further improved and expanded for use in various parking lot scenarios.