



Smart Car Parking System

A project proposal submitted to the

Department of Electrical and Information Engineering

Faculty of Engineering

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in partial fulfilment of the requirements for the module

EE6304: EMBEDDED SYSTEM DESIGN

by **Group 17**

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1. Chapter 1

1.1.Introduction to Problem

The growing number of vehicles in urban areas has led to an increased demand for efficient and automated car parking systems. Traditional parking management methods often suffer from issues such as limited space, difficulty in finding available parking slots, and manual entry and exit processes, which can result in congestion and inconvenience for both drivers and parking facility operators. Therefore, there is a need for a smart solution that automates the parking process, improves efficiency, and enhances the overall user experience. [1] [2]

1.2.Introduction to Smart Car Parking System

The Car Parking System using IR Sensors is an embedded system project that aims to automate and manage parking spaces in a convenient and efficient manner. This project utilizes object detecting sensors to detect the presence of vehicle in the parking slot, a gate mechanism to control entry and exit to the park, and a display system to indicate the availability of parking slots in the park.

1.3.Objective of the project

The main objective of this project is to create a car parking system that offers the following functionalities:

1. Automatic gate control: The gate should open when a car approaches and close once the car has entered or exited. 4.1
2. Parking slot availability checking: The system should be able to examine the availability of parking slots in the park real-time. 4.2
3. Display the slot occupancy status: There should be a display method which updates dynamically as slots become occupied or vacated.

1.4.Scope of the project

Following are the limitations identified in the project,

1. The project could be the inability to differentiate between a vehicle and other objects or obstructions in a parking slot. Since the project relies on some kind of an object detecting sensors for detection, there may be instances where the sensors are triggered by objects other than vehicles in the slots.
2. Since gate also based on these object detecting sensors it also can open or close by objects other than vehicles, such as pedestrians.
3. System Scalability: Depending on the complexity of the project and available resources, the system's scalability to accommodate a large number of parking slots may be limited.

2. Chapter 2

2.1. ~~Project~~ Specifications

- 1) Vehicle availability in a parking slot should be able to detect in real time.
- 2) Approaching vehicles and leaving vehicles near the gate should be able to detect.
- 3) By utilizing a motor implement an automatic gate control mechanism.
- 4) Includes a display system to ~~indicate real-time~~ slot availability.
- 5) System should be powered up easily.
- 6) Allows for system scalability to accommodate changes in the number of slots.

3. Chapter 3

1.1 Block Diagram

Following Figure 1 represents the block diagram of the smart car parking system which indicates the connectivity of each block and communication method (directional or bidirectional) between them.

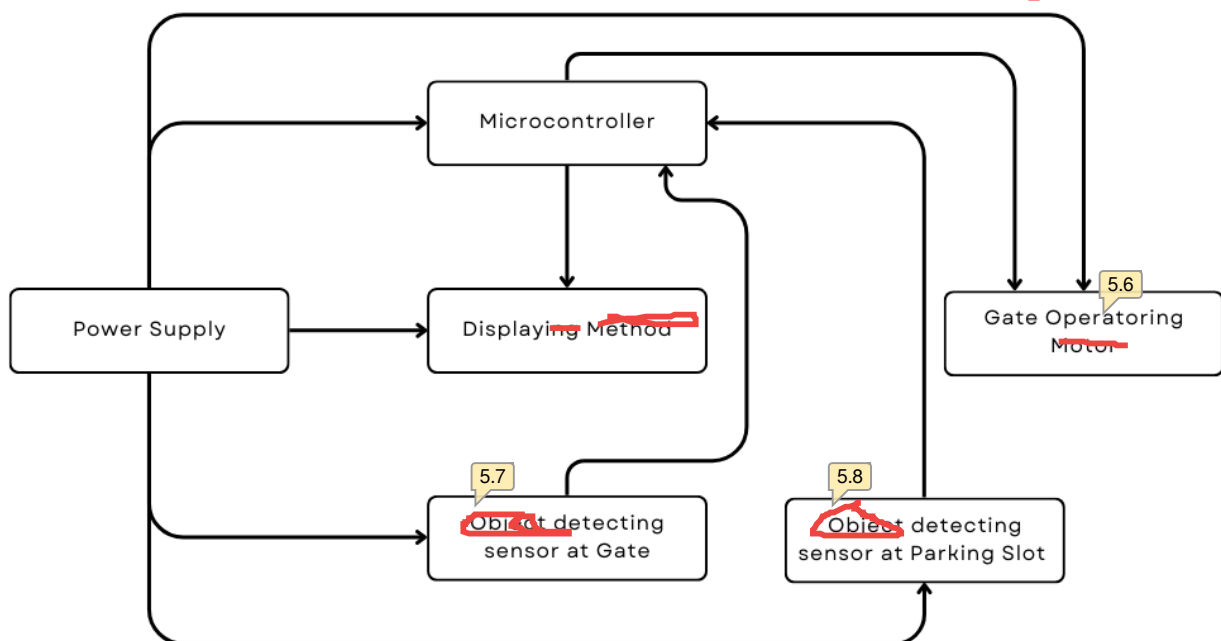


Figure 1: Block diagram of Smart Car Parking System

1.2 Functions of blocks

1.2.1 Microcontroller

The microcontroller serves as the central processing unit of the system. Micro-controller is responsible to do following functions

- i. Receiving the inputs from the gate object detecting sensors and parking slot object detecting sensors.
- ii. Processing the sensor data to determine the occupancy status of parking slots and the presence of vehicles at the gate.
- iii. Sending control signals to the gate operating motor to open or close the gate.
- iv. Updating the display system to reflect the real-time availability of parking slots.
- v. Coordinating the overall operation and communication between different components of the system.

1.2.2 Power supply

The power supply block provides the necessary electrical power to operate the entire system. It should be able to provide DC power to Microcontroller, Gate operating motor, Display and to all object detecting sensors.

1.2.3 Gate operating ~~Motor~~

The gate operating motor block controls the movement of the gate. It should be able to open and close the gate based on the control signals received from the microcontroller.

1.2.4 Object detecting sensor at gate

The gate sensor block detects the presence of vehicles approaching the gate. Its functions include:

- i. Sensing the vehicles in the gate entrance or exit.
- ii. Sending signals to the microcontroller to indicate the presence or absence of vehicles.

1.2.5 Object detecting sensor at parking slot

The parking slot object detecting sensors block is responsible for detecting the presence of vehicles in individual parking slots. Their functions include:

- i. Sensing the vehicles to detect the occupancy in the parking slots.
- ii. Providing input to the microcontroller to determine the occupancy status of each parking slot.
- iii. Assisting in updating the display system to reflect the availability or occupancy of parking slots by providing real-time status of the slot.

1.2.6 Display ~~Method~~

The display ~~method~~ block represents the display system used to visually indicate the availability status of parking slots. Its functions include:

- i. Displaying real-time information regarding the occupancy status of each parking slot.
- ii. Receiving updated data from the microcontroller and refreshing the display accordingly.
- iii. Providing a clear and intuitive visual indication for drivers to identify vacant parking slots.

4. References

- [1] "Journal of Applied Research and Technology. JART," 2023. [Online]. Available: <https://www.elsevier.es/en-revista-journal-applied-research-technology-jart-81-articulo-a-survey-intelligent-car-parking-S1665642313715803>.
- [2] "Parking Management Challenges," 2023. [Online]. Available: <https://ops-com.com/blog/parking-management-challenges/>. [Accessed 16 07 2023].

Index of comments

- 4.1 approaches what?
- 4.2 identify
- 5.1 Scope should provide the limitation of the device..

Specifications should provide the functional specifications of the device with quantitative parameters..

Blocks in the block diagram should represent a functionality not components/modules
- 5.2 real-time word is good for objective.
At the specification you have to specify the target detection time if you want to talk about the speed.
- 5.3 detect what?
- 5.4 what is meant by automatic?
Under what conditions gate should open?
- 5.5 display
- 5.6 Gate operating mechanism
- 5.7 Vehicle
- 5.8 vehicle
- 5.9 why underline?
- 6.1 Processor
- 6.2 system