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Smart CAR PARKING SYSTEM

OBJECTIVE

Develop a smart vehicle parking system that uses sensors to detect empty slots and displays available best slots available to drivers which is implemented and controlled based over SCADA network system.

ABSTRACT

To develop a parking lot system that uses sensors to detect empty parking slots and send the information to a central server. The server will then sort the data and send it to a Pico at the entrance, which will display the available slots to drivers. Drivers can then select a slot and the Pico will open the gate to allow them to enter. The Pico will then send a message to the server to indicate that the slot is being filled. The server will update the database and GUI with the new information. The process will then continue.

SYSTEM OVERVIEW & METHODOLOGY

SYSTEM OVERVIEW

A Supervisory Control and Data Acquisition (SCADA) system is implemented in the project using a client-server architecture. The system consists of a central server (laptop) and two remote clients (Two Raspberry Pico) equipped with four IR sensors. The SCADA system enables real-time monitoring and control the allocation of parking slots.

The SCADA system follows the typical architecture with the server acting as the central control and data processing unit, while the clients function as remote units collecting data and sending it to the server for analysis and control.

The system enables real-time parking monitoring and allocation control system.

METHODOLOGY

- Socket programming is used to set up the SCADA master. Two clients are connected to the server using the multithreading technique.

- Client-Side Functionality:
  - Raspberry Pico: Continuously monitors the available parking slots by using the IR sensor. Send real-time data to the server for visualization and analysis. Later receives data for allocation of the parking slot.

- Server-Side Functionality:
  - Laptop: Create a server application to receive and process data from the clients. Implement real-time monitoring and controlling features.

- Communication:
  - Clients and Server: Establish WebSocket connections for real-time communication.
  - Data Transmission: Clients send available parking slots data to the server using the WebSocket connection.
  - Parking slot detection: Clients monitors and sends the data of parking slots allocated also the available parking slots to the server.

IMPLEMENTATION

- Use socket programming to create a server application on the laptop.
- Establish a server socket to listen for client connections.
- Implement multithreading for concurrent client handling.
- To detect and connect empty parking slots using 4 infrared sensors connected to the Raspberry Pico acting as a clients..
- To send the information of empty slots to the Scada Master through connection 1.
- To sort the empty slots and send the empty slots data to the Pico at the entrance through connection 2.

- To detect if there is any car at the entrance using infrared and open the gate accordingly.
- To send the slot data is being filled by a car to the Scada Master through connection 2.
- To update the data (Car entry, time, slot) in database and GUI.
- To send that data to the Pico at the parking lot via connection 1.
- Receive the available parking slots data from the Raspberry Pico acting as a client.
- To acknowledge whether the parking slot is being filled or not.

RESULTS

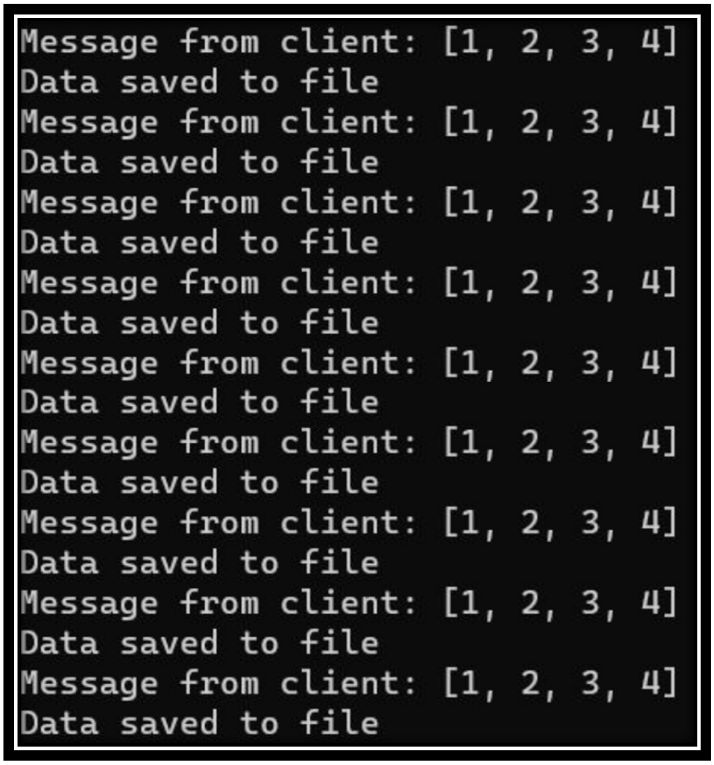


Fig 1: Server Output

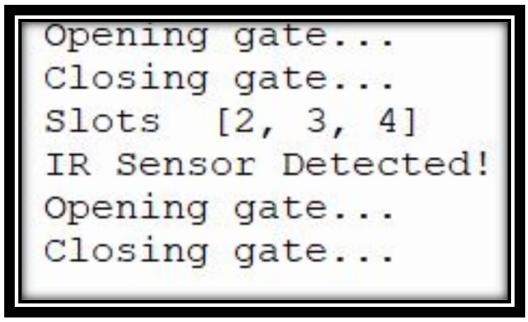
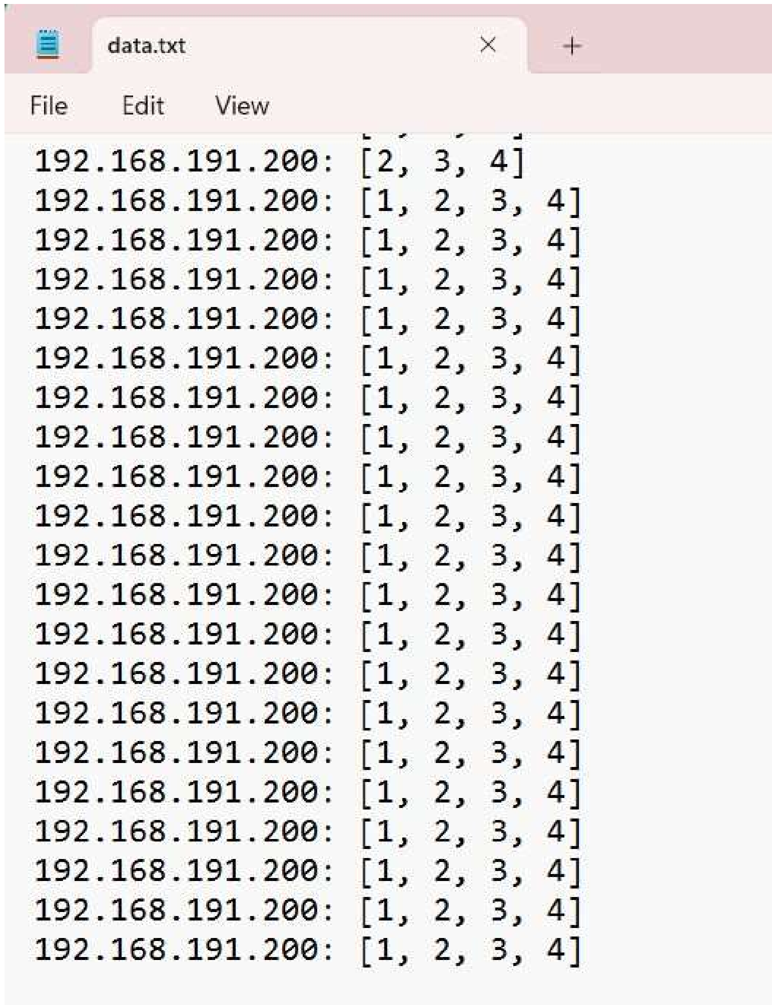


Fig 2: Client 1 Output

Fig 3: Client 2 Output

Fig 4: GUI Output



data.txt

File Edit View

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Fig 6: Data which is stored from server

CONCLUSION

- The parking slot allocation and monitoring system utilizing a client – server architecture presents an effective solution for real – time monitoring effective system.
- With implementation of socket programming and its connections, the system enables seamless communication between the clients and the server.
- The clients continuously provides the available parking slots using the sensors and transmit real – time data to the server.
- The server, in turn, receives the data, processes it, and gives the best available parking slots data to the user.
- The system is designed to be efficient and easy to use. The infrared sensors and the Scada Master work together to provide real-time information about available parking spaces. The Pico at the entrance and the Pico at the parking lot work together to control the gate and the LED display. The system is also designed to be scalable, so it can be easily expanded to accommodate larger parking lots.

Name & Roll Number:
Deepak Sai P (CB.EN.U4ELC20049)
Prem Sundar B (CB.EN.U4ELC20051)
S Sriyank (CB.EN.U4ELC20061)
Gowtham.t (CB.EN.U4ELC20076)

Component	Marks
Topic (2)	
Implementation & Results (5)	
Report (2)	
Total (9)	