COLLEGE CODE:3105

COLLEGE NAME:Dhanalakshi Srinivasan college of engineering and technology

DEPARTMENT:B.E CSE

STUDENT NM-ID:52DF3D2EB80D901AB0E42F850BBA8157

ROLL NO:310523104092

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TECHNOLOGY-PROJECT NAME:traffic flow optimaization

SUBMITTED BY,:Mounika,pooja,madhu,meenakshi

Phase 5: Project Demonstration & Documentation

Title: *Traffic Flow Optimization Using AI and IoT*

Abstract:

- The **Traffic Flow Optimization** project focuses on leveraging Artificial Intelligence (AI), Internet of Things (IoT), and real-time data analytics to enhance urban traffic management systems. The final phase showcases an integrated platform capable of monitoring traffic congestion, analyzing patterns, and dynamically adjusting signal timings to optimize flow. This document outlines system demonstration, technical documentation, performance evaluation, source code, and testing reports. The project ensures scalability, real-time responsiveness, and secure data handling for smart city integration. Visual content such as architecture diagrams, screenshots, and test logs are included for clarity.

Project Demonstration

Overview:

- The Traffic Flow Optimization system will be demonstrated live, highlighting its ability to reduce congestion, adapt to traffic patterns, and manage real-time vehicular data through AI and IoT.

Demonstration Details:

- **System Walkthrough:** A guided tour through the dashboard showing how traffic data is collected and how adaptive signal control is managed.
- **Real-Time Monitoring:** Live display of traffic density from IoT sensors placed at intersections and roads.
- **AI-Based Predictions:** Demonstration of AI models predicting congestion and recommending signal timing adjustments.

Outcome:

- Stakeholders will witness the system's effectiveness in real-world-like conditions, showcasing its capability to enhance urban mobility through intelligent automation.

Project Documentation

Overview:

- A detailed account of the Traffic Flow Optimization system, including architectural design, AI logic, coding structure, and user/admin guides.

Documentation Sections:

- **System Architecture:** Flowcharts and system diagrams explaining how AI, IoT, and backend modules interact.
- **Code Documentation:** Annotated source code covering traffic prediction models, API integrations with traffic sensors, and signal control logic.
- **User Guide:** Step-by-step instructions on system usage by municipal authorities and traffic controllers.

Outcome:

- A complete blueprint of the system is provided for replication, scaling, or integration with existing smart city infrastructure.

Feedback and Final Adjustments

Overview:

- Feedback will be gathered post-demonstration for refining system efficiency and user experience.

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Outcome:

- System readiness for deployment is ensured after fine-tuning based on real user feedback.

Final Project Report Submission

Overview:

- A consolidated report outlining all project phases, milestones, difficulties faced, and overall success metrics.

Report Sections:

- **Executive Summary:** Snapshot of project goals, scope, and outcomes.
- **Phase Breakdown:** Description of work done across ideation, development, IoT integration, AI training, and system testing.
- **Challenges & Solutions:** Issues like sensor failures or algorithm biases and the solutions implemented.

Outcome:

- The final report serves as a project archive and a reference guide for future enhancements or deployments.

Project Handover and Future Works

Overview:

- Documentation and discussion for future expansion and continued development.

Handover Details:

- **Next Steps:** Recommendations include integration with navigation apps (e.g., Google Maps), multilingual UI, machine learning model refinement, and city-wide deployment.

Outcome:

- Formal handover of the project with future growth prospects, open-source code repository links, and system maintenance guidelines.

```python
from flask import Flask, render_template, jsonify
from simulate_iot import get_traffic_data
from traffic_ai import calculate_signal_timings

app = Flask(__name__)

@app.route('/')
def dashboard():
    return render_template('dashboard.html')

@app.route('/traffic-data')
def traffic_data():
    data = get_traffic_data()
    timings = calculate_signal_timings(data)
    return jsonify({
        "traffic": data,
        "signal_timings": timings
    })

if __name__ == '__main__':
    app.run(debug=True)
```