Graph-Based Adversarial Thinking Assignment

Title: Navigating Speed: Applying Fastest Route Analysis in El Paso

Introduction:

Graph theory serves as an essential tool for understanding and optimizing interconnected systems like transportation networks. In this assignment, you will apply the principles of graph theory alongside adversarial thinking to analyze and enhance the speed of local travel routes within your community in El Paso, utilizing a graph data structure based on predefined local destinations. This will aid in understanding real-world applications of graphs and cultivating analytical skills in route optimization.

Task:

Using the provided graph data, which models various locations around El Paso connected by routes optimized for speed, apply the concepts of graph theory to determine the fastest route between given points. Analyze the graph to identify any potential adversarial factors that might impact travel time, such as roadwork, traffic patterns, or peak hours. Devise strategies to mitigate these factors and propose adjustments that could enhance travel efficiency.

Student Expectations:

Students are expected to:

- Examine the graph structure (nodes and edges) to understand the relationships and weights depicting route speeds.

- Identify influencing factors on travel time by applying adversarial thinking, considering both deliberate and incidental events.

- Develop and justify methods for optimizing route speed to cope with any identified adversarial elements.

Guidelines:

This assignment focuses on the "Applying" level of Bloom's Taxonomy, where students should use knowledge of graph theory to real-world scenarios. Specifically:

- Students should apply learned concepts such as Dijkstra's algorithm or A* search to determine optimal routes within the graph.

- Encourage hands-on manipulation by creating and testing new paths or node connections to strategically alter route speeds.

Critical Thinking Prompts:

1. How do factors like traffic congestion or road closures affect the edges of the graph in terms of travel speed? How can these factors be included in the graph model?

2. Propose how an adversary could intentionally slow down the network; what measures could counteract such intentional disruptions?

3. Reflect on how your personal familiarity with El Paso may have informed your understanding and interpretation of optimal travel routes.

Submission Guidelines:

Submit a detailed report documenting your analysis process, findings, and recommendations for route optimization. Include visual representations of your graph analysis and any modifications proposed. Ensure clarity and justification in your application of graph and adversarial theories to tackle the prompt.