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ASSIGNMENT 2

(ROUTESMART - AI-DRIVEN ROAD NAVIGATION APPLICATION)

SECTION: 02

LECTURER: ASSOCIATE PROF. DR. MOHD ADHAM ISA

GROUP NAME: LogiCode

NO.	NAME	MATRIC NO.
1.	KOH LI HUI	A22EC0059
2.	KOH SU XUAN	A22EC0060
3.	MAISARAH BINTI RIZAL (LEADER)	A22EC0192
4.	TANG YAN QING	A22EC0109

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1.0 STATE SPACE SEARCH

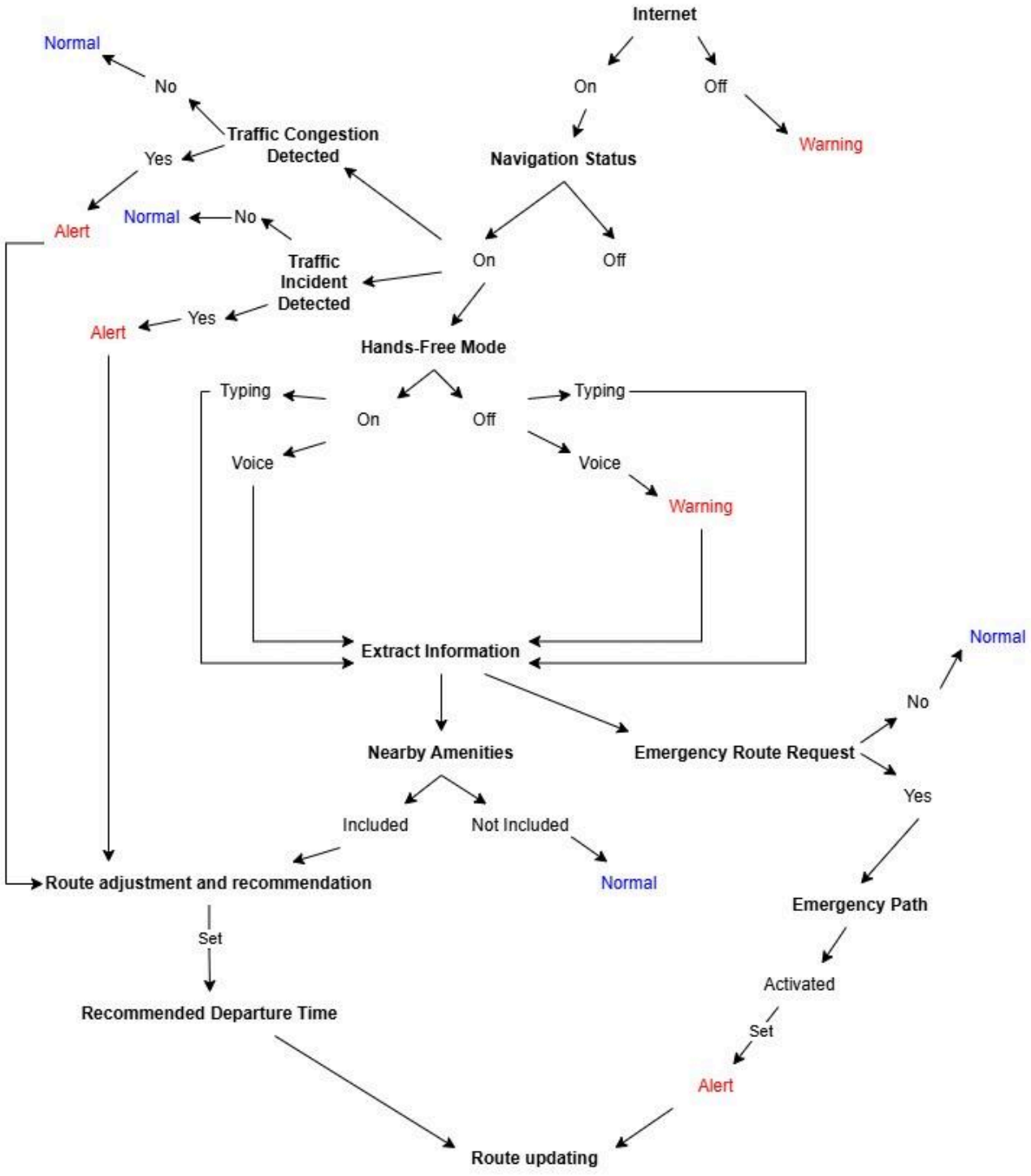

Figure 1.0: State Space Search Diagram of RouteSmart

1.1.0 EXPLANATION OF STATE SPACE

The Figure 1.0: State Space Diagram for the RouteSmart - Ai-Driven Road Navigation Application system clearly describes the structured decision-making process, knowledge base and inference system it follows to enhance navigation efficiency and user convenience. Each step is designed to adapt to real-time conditions and user needs.

Firstly, the system begins by assessing the user's situation, specifically if internet connectivity is available and whether they are currently navigating a route. If the internet is inactive, a warning is issued, as this system requires an internet connection to function optimally. However, whenever connectivity is established, the system proceeds to navigate the user by monitoring route conditions.

Next, the system analyzes traffic conditions for potential congestion or incidents. If either is detected, it immediately triggers an alert to inform the user any possible delays or disruptions. This considerable notification system enables users to make informed decisions to adjust their routes by being notified on route adjustment and recommendation.

The mode of interaction is another key feature of RouteSmart. The system provides two options, which are hands-free and manual modes. Hands-free mode uses voice commands to promote safety and ease of use for the users, especially while they are driving. Meanwhile, the manual input through typing is also available and a warning will be generated if the user chooses to use voice input without opening the hands-free mode.

The system then extracts and processes additional information based on user preferences. For instance, users can choose to include nearby amenities such as restaurants, gas stations or washrooms in their route planning. This customization ensures a good navigation experience that aligns with individual needs and priorities.

Also, emergency scenarios are handled with importance. When an emergency route request is received, the system prioritizes it by activating specific pathways and notifying

nearby users. This ensures a clear route for emergency responders while minimizing disruption for other road users.

Finally, the system dynamically adjusts routes based on real-time data, user preferences and emergency considerations. It offers adjusted and recommended routes, recommended departure times and necessary alerts to ensure efficient navigation. This continuous updating mechanism guarantees that RouteSmart users receive the most optimal route at any given moment.

In conclusion, the state space diagram effectively describes the RouteSmart system's logical flow and ability to handle diverse scenarios. By prioritizing real-time adaptability, user safety and efficiency, RouteSmart offers a robust solution to modern navigation challenges in the current market.

2.0 SEQUENCE OF ACTIONS

[Internet, Navigation Status, Hands-Free Mode, Traffic Congestion Detected, Traffic Incident Detected, Extract Information, Nearby Amenities, Emergency Route Request, Emergency Path, Route adjustment and recommendation, Recommended Departure Time, Route updating]

3.0 PROBLEM FORMULATION IN STATE SPACE SEARCH GRAPH

Critical	Details
Initial State	{Internet}
Action	Let S(x) = Set of action-state pairs. **S(Internet)** = {On: Navigation Status, Off: Warning} **S(Navigation Status)** = {On: Traffic Congestion Detected or Traffic Incident Detected or Hands-Free Mode, Off: No Further Actions} **S(Traffic Congestion Detected)** = {Yes: Alert, and Route Adjustment and Recommendation, No: Normal} **S(Traffic Incident Detected)** = {Yes: Alert, and Route Adjustment and Recommendation, No: Normal} **S(Hands-Free Mode)** = {On: Extract Information via Voice or Typing, Off: Extract Information via Typing (with Warning on Voice Input)} **S(Extract Information)** = {Nearby Amenities, Emergency Route Request} **S(Nearby Amenities)** = {Included: Route Adjustment and Recommendation, Not Included: Normal} **S(Emergency Route Request)** = {Yes: Emergency Path Activated, No: Normal} **S(Emergency Path Activated)** = {Set: Alert, and Route Updating} **S(Route Adjustment and Recommendation)** = {Set: Recommended Departure Time} **S(Recommended Departure Time)** = {Route Updating}
Goal	{Route Updating}
Path Cost	{On, Off, Yes, No, Included, Not included, Set, Activated}

4.0 FORMULATED PROBLEM THAT SUPPORTS THE PROPOSED KNOWLEDGE REPRESENTATION

Critical	Explanation
Initial State	The system starts with the availability of an Internet connection. The system checks if the connection is active, without an internet connection the system cannot continue.
Action	The actions in this project are transitions that modify the system's state based on user inputs or real-time events. Each action represents a specific system response to a particular condition or command. In this project, actions include processes such as detecting traffic congestion, handling traffic incidents, switching to hands-free mode, extracting user information and adjusting routes. These actions are triggered by either systems states or user interaction and they aim to guide the system towards achieving the goal state.
Goal	The goal is to achieve route updating, where the system has optimized and finalized the user's path based on real-time inputs, real-time data and user preference.
Path Cost	The path cost is a function that assigns a numeric value to each path. In this project, the path cost represents the computational expenses associated with each action including factors like time taken to compute a solution, response delays, user inconvenience, or any other additional resources such as fuel consumption, route distance or emergency response time required to achieve the goal state of route updating.