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Traffic Signals Do Not Adapt to Real-Time Congestion

Context

Urban traffic signals are mostly time-based and do not change according to real-time traffic flow. This leads to:

- Long waiting times at empty roads
- Traffic jams at busy intersections
- Increased fuel consumption
- Driver frustration
- Emergency vehicle delays

This lab helps students understand real problems faced by daily commuters and design smart, adaptive traffic signal software solutions.

STEP 1: Define the Target User

Task:

Identify the user group affected by traffic signals.

Example:

- Age: 18–60 years
- Role: Daily commuters (bike riders, car drivers, bus drivers)
- Location: Urban / city roads
- Travel Time: Peak hours (office time)
- Technology Exposure: Medium to High
- Services Used: GPS apps, traffic apps, navigation systems

STEP 2: List Initial Assumptions

Students write assumptions before interacting with users.

Sample Assumptions:

- Traffic signals cause unnecessary waiting
- Signals are fixed-time and not intelligent
- Peak hour congestion is unavoidable
- Drivers often break rules due to frustration
- Emergency vehicles get stuck in traffic

Output:

Assumption Table

ID	Assumption
A1	Traffic lights waste time on empty roads
A2	Signals do not change based on traffic load
A3	Drivers feel helpless at long red signals

STEP 3: Prepare Interview Questions

Design simple, respectful, open-ended questions.

Sample Interview Questions:

- How long do you usually wait at traffic signals?
- Do you feel signals respond to traffic conditions?
- Have you faced unnecessary delays at empty roads?
- How do traffic jams affect your daily routine?
- Have you seen ambulances stuck at signals?
- What improvement would you want in traffic signals?

STEP 4: Conduct User Interview

Instructions:

- Interview at least one daily commuter
- Observe:
    - Frustration
    - Body language
    - Honking / impatience
    - Rule-breaking behavior
- Record exact statements

Example Observation:

"I wait 2 minutes at a red signal even when there is no traffic on the other side."

Output:

Interview notes & quotes

STEP 5: Create Empathy Map

Based on interview responses, fill the Empathy Map.

1. SAYS

- "The signal timing makes no sense."
- "There is no traffic, still red!"

2.THINKS

- System is outdated
- Feels time is wasted
- Thinks authorities don't care

3. DOESS

- Honks

- Tries to cross early
- Gets frustrated

4.FEELS

- Angry
- Helpless
- Stressed

STEP 6: Validate Assumptions

Compare interview results with assumptions.

Assumption	Validated?	Reason
Signals waste time	yes	User complained about empty roads
Signals are fixed-time	yes	No adaptation observed
Drivers feel frustrated	yes	User showed anger
Congestion is unavoidable	no	User believes smart signals can help

STEP 7: Identify User Insights

Convert observations into deep insights.

Examples:

- Drivers value fairness in signal timing
- Waiting at empty roads increases rule-breaking
- Real-time adaptation builds trust in the system

"Drivers are impatient"

"Drivers become impatient when the system feels illogical"

STEP 8: Create User Persona

Sample Persona:

Name: Ramesh

Age: 34

Occupation: IT Employee

Vehicle: Two-wheeler

Daily Travel: 12 km city commute

Goals:

- Reach office on time
- Avoid traffic jams

Pain Points:

- Fixed signal timing
- Long waits on empty roads
- No priority for ambulances

Motivations:

- Save time
- Reduce stress

Quote:

"If signals adjusted based on traffic, half my frustration would be gone."

STEP 9: Translate Insights to Software Needs

Insight	Software Requirement
Signals feel illogical	AI-based adaptive signal timing
Emergency vehicles get delayed	Ambulance priority detection system
Traffic load changes frequently	Real-time sensor-based traffic monitoring
Drivers feel system is outdated	Smart dashboard for traffic authorities

STEP 10: Reflection & Documentation

Students answer:

- What surprised you during the interview?
- Which assumption was wrong?
- How did empathy change your thinking?
- How will this affect your software design approach?

Expected Lab Outputs

✓ Interview Questionnaire

✓ Empathy Map

✓ Validated Assumptions

✓ User Insights

✓ Commuter Persona

✓ Software Requirement Mapping

Design Thinking Phase Mapping

Phase	Activity
Empathize	Interview, Observation
Define	Insights, Persona
Ideate	Requirements
Prototype	(Next lab)
Test	(Next lab)