

1 ISSUES

On-the-Road Evaluation

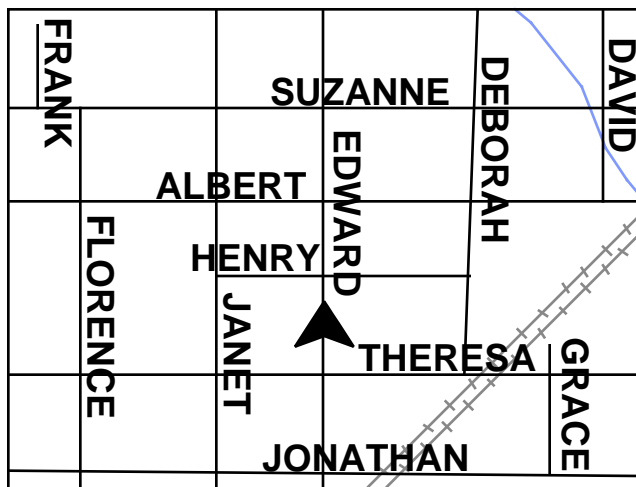
1. When do drivers feel that map reading is unsafe while driving?
2. How many streets should be displayed on an in-vehicle navigation system?
3. What size text should be used for the street labels?
4. What is the effect of time of day (day vs. night) on map reading?

Simulator Validation

1. How do the previous simulator results compare with the on-the-road results?

2 MAP TASKS

Sample Map



Task 1 - On Street

What street are you on?

Subject Finds: Edward

Subject Responds: male (M key)

Task 2 - Cross Street

What is the 3rd Cross Street?

Subject Finds: Suzanne

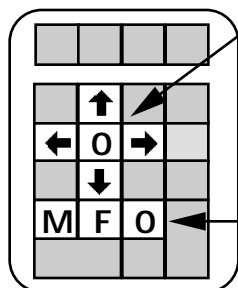
Responds: female (F key)

What is the 4th Cross Street?

Subject Finds: only 3 streets

Responds: not there (O key)

Response Keypad



Task 3 Directional Keys

- ↑ ahead → right
- ↓ behind ← left
- O not there

Tasks 1 and 2 Response Keys

- M male O not there
- F female

Task 3 - Where is?

Where is Jonathan?

Response: behind (↓)

Where is Florence?

Response: left (←)

Where is David?

Response: right (→)

Where is Albert?

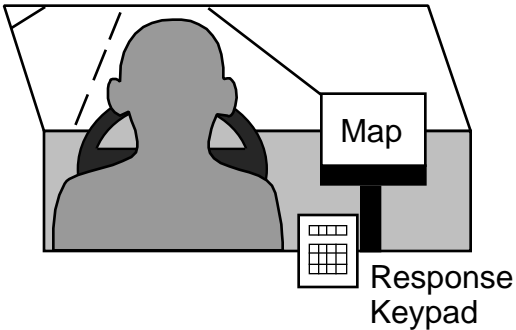
Response: ahead (↑)

Where is Tammy?

Response: not there (O)

3 METHOD

Expressway Driving Scenario

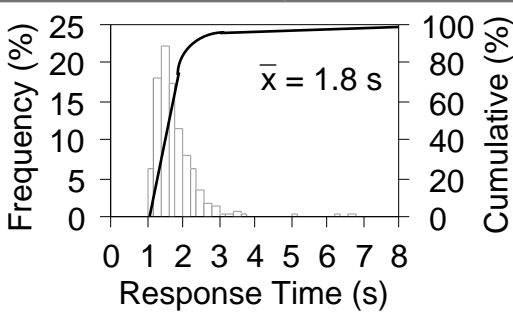


Subjects					
Session		Age 18 - 30		Age >65	
1	2	Men	Women	Men	Women
Day	Night	2	2	2	2
Night	Day	2	2	2	2

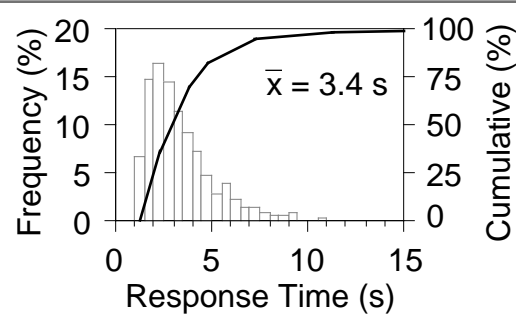
Main Test Conditions		
Text Size	12 Streets	24 Streets
10 POINT		
12 POINT		
14 POINT		

4 ON-THE-ROAD EVALUATION RESULTS

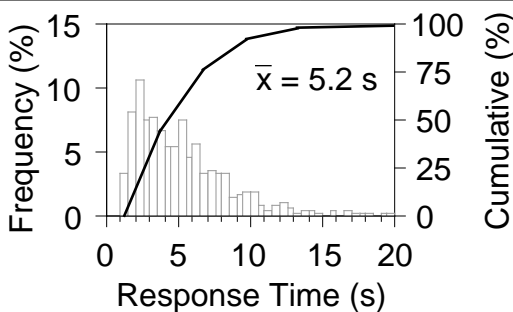
Task 1 - On Street



Task 2 - Cross Street

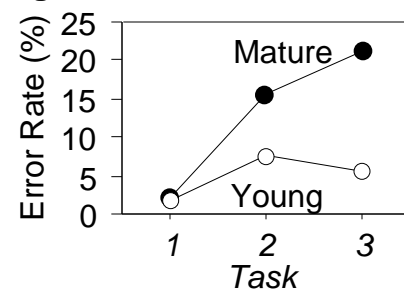


Task 3 - Where is?

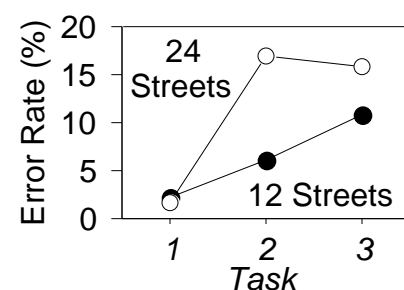


Error Rates

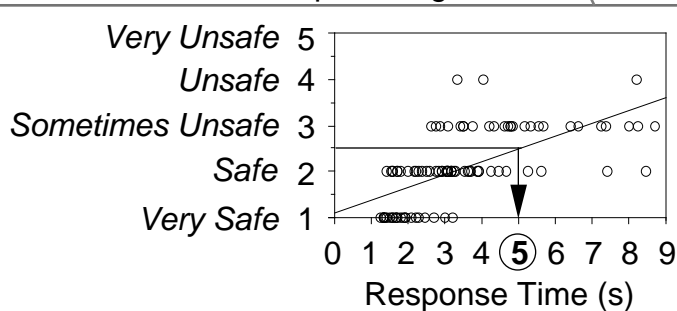
1. Age Effect



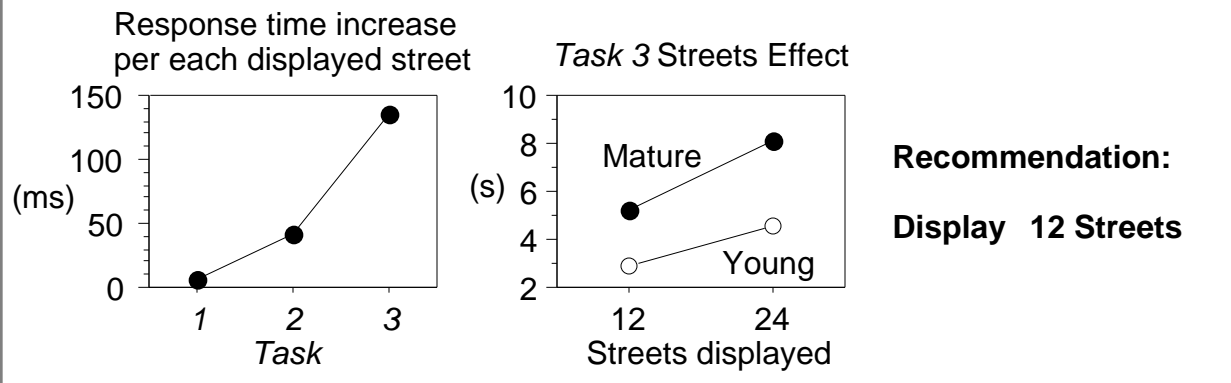
2. Number of Streets Effect



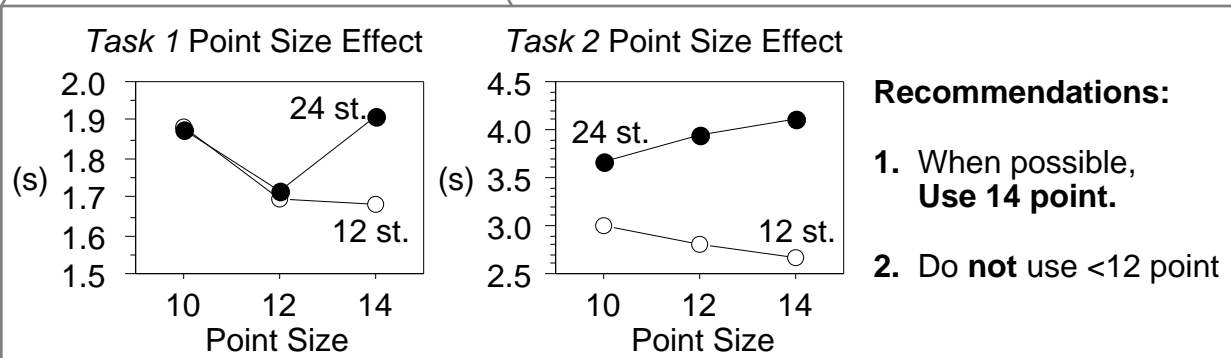
Issue 1 - When is map reading unsafe?



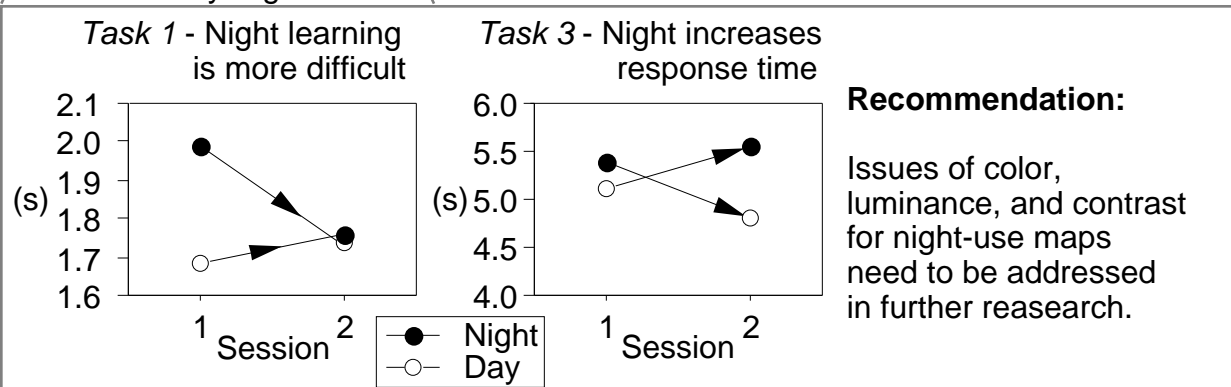
Issue 2 - How many streets to display?



Issue 3 - What text size to use?



Issue 4 - Day/Night Effects



Response Time Regression Equations (ms)

Task 1 - On Street $RT = 6710 + 325*(A) + 6.67*(S) + 33.75*(P)^2 - 832.50*(P) + 9.58*(C)$

Task 2 - Cross Street $RT = 1210 + 575*(A) + 370*(X) + 40.83*(S) + 8.08*(P-12)*(SL) + 40.83*(S-12)*[MINIMUM(1, X-2)]$

Task 3 - Where is? $RT = [1630 + 1235*(A) + 380*(T) + 136*(S) + 27*(A)*(SL) + 475*(L)]*(SR)$

Regression Equations Terms

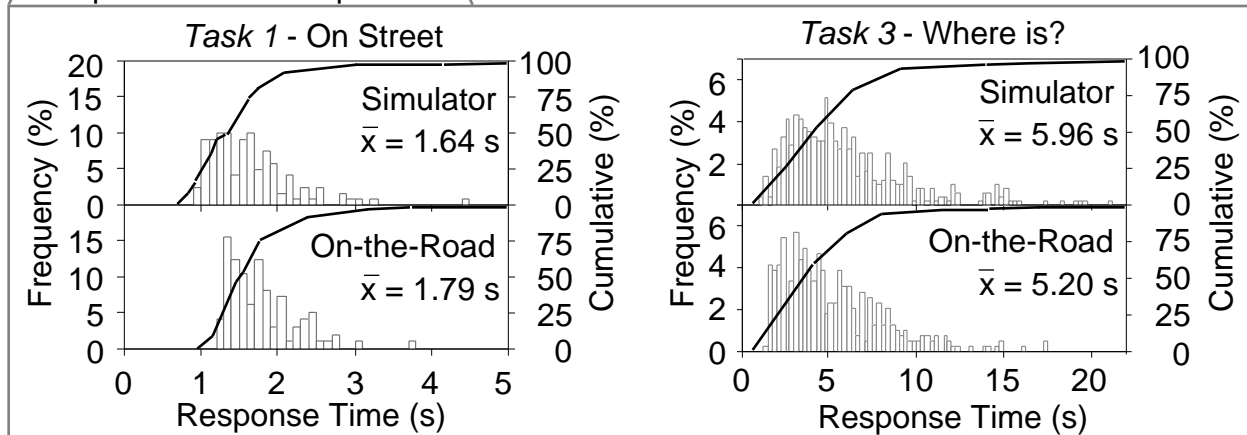
A = Age $\begin{cases} -1 & \text{if young} \\ +1 & \text{if mature} \end{cases}$	T = Time of day $\begin{cases} -1 & \text{for day} \\ +1 & \text{for night} \end{cases}$
S = Number of streets ($S \geq 1$)	X = Target cross street ($X \geq 1$)
P = Point size (10 \leq P \leq 14)	L = Target location $\begin{cases} -1 & \text{if ahead} \\ 0 & \text{if not there} \\ +1 & \text{if behind, left or right} \end{cases}$
C = Clutter $\begin{cases} 0 & \text{if } \leq 12 \text{ pt} \\ (P-12)(S-12.52) & \text{if } > 12 \text{ pt.} \end{cases}$	SR = Search result $\begin{cases} 1 & \text{if found} \\ 1.70 & \text{if not found} \end{cases}$
SL = Street level $\begin{cases} -1*(24-S) & \text{if } S \leq 12 \\ +1*(S-12) & \text{if } S > 12 \end{cases}$	

5 SIMULATOR VALIDATION RESULTS

Subjects

Experiment	Age 18 - 30		Age 65<		Trials per Subject	
	Men	Women	Men	Women	Task 1	Task 3
Simulator	5	5	5	5	6	24
On-the-Road	4	4	4	4	24	48

Response Time Comparison



Differences in Experimental Findings

