Simulation Model Performance for Congested Freeways

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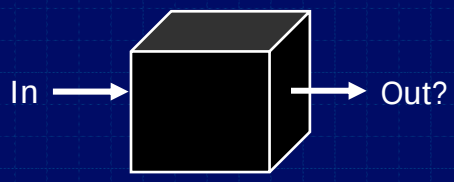
Presentation Outline

- Review basics of simulation
- Share results of TxDOT 3943 project
- Model improvements since 2000
- Resources and guidelines for simulation model usage

Purpose of Simulation



- Evaluate alternatives before spending money to build them
- Verify that what you think will happen, will happen
- Try new ideas before they are available to examine their safety and effectiveness

Purpose of Simulation

- Determine the best alternative from several competing alternatives
- Examine the effect of future traffic volumes

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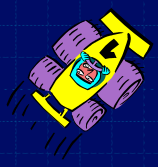
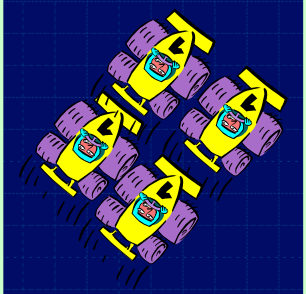
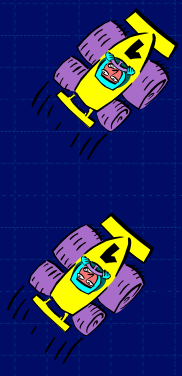
Types of Simulation Models

Microscopic | Macroscopic | Mesoscopic







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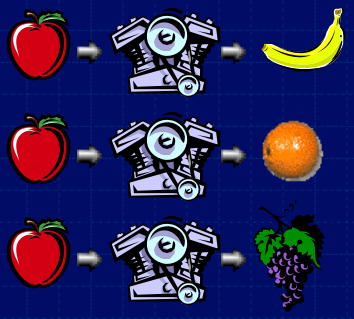
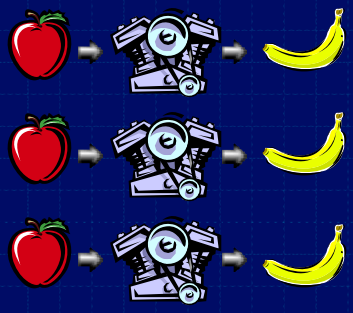
Types of Simulation Models

Stochastic



Deterministic



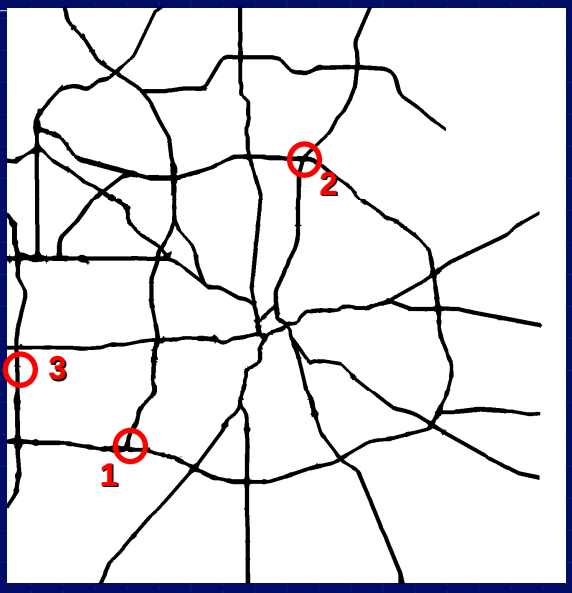
Modern Simulation Tools

	Stochastic	Deterministic
Microscopic	CORSIM VISSIM Paramics SimTraffic	NOT COMMON
Macroscopic	CORFLO	PASSER II, IV, TRANSYT-7F, HCS, FREQ and Synchro
Mesoscopic	Integration	NOT COMMON

3943 Research Objectives

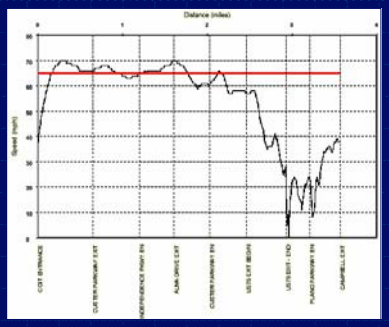
- Select appropriate models for simulating congested freeways
  - CORSIM
  - FREQ
  - Integration
- Test performance using data collected in DFW at 3 freeway bottleneck removal sites
- Provide recommendations on best model

Bottleneck Removal Sites



Data Collection

- Travel times
- Volumes
- O-D
- Queue locations



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#1: SB Spur 408 to WB IH20

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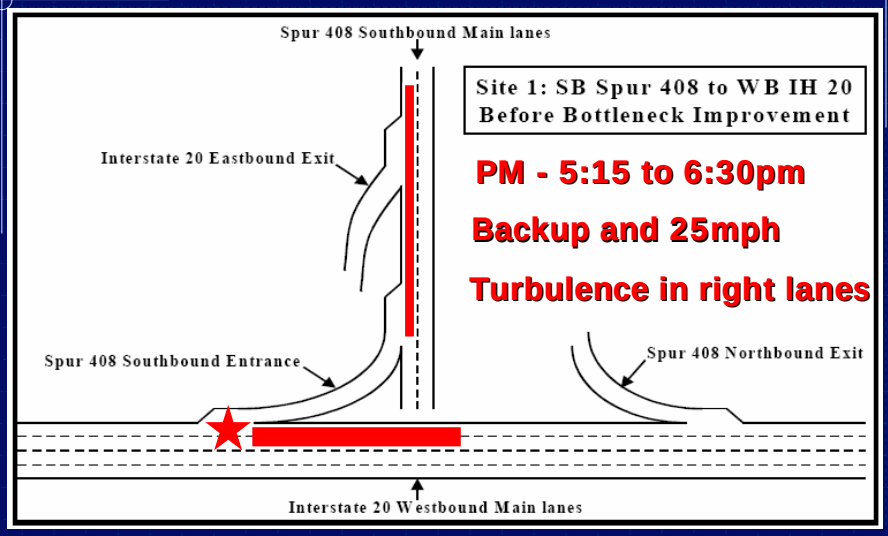
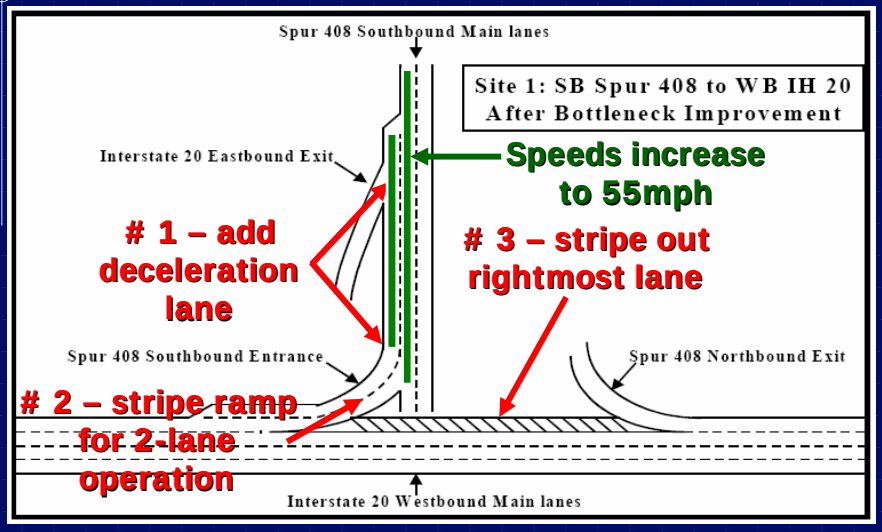
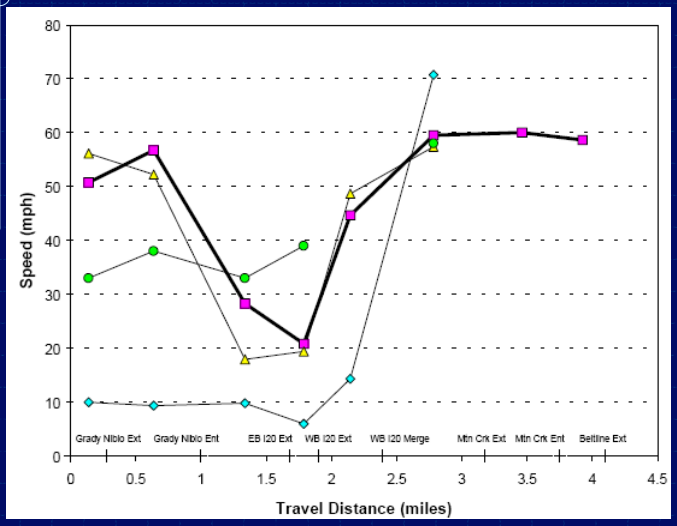
Before Site Layout



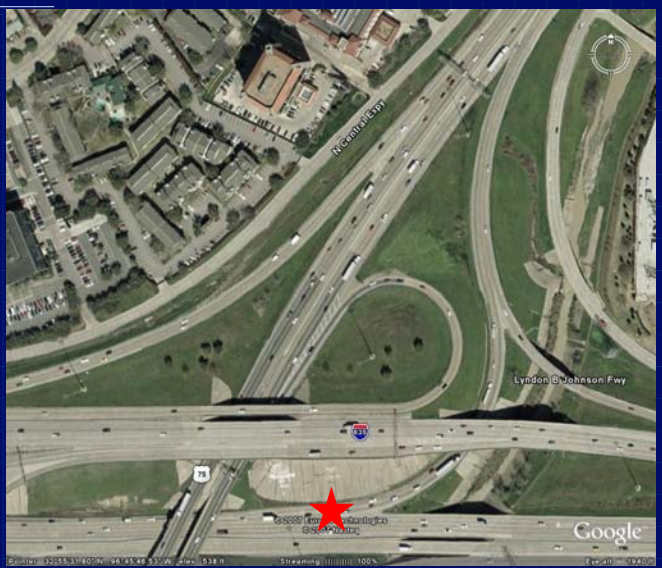
After Bottleneck Improvements



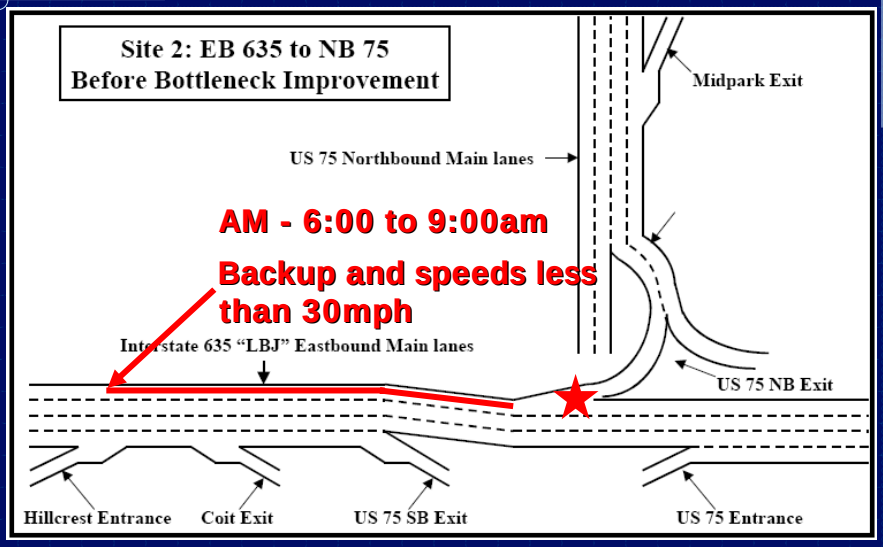
Model vs. Field Data - Speeds



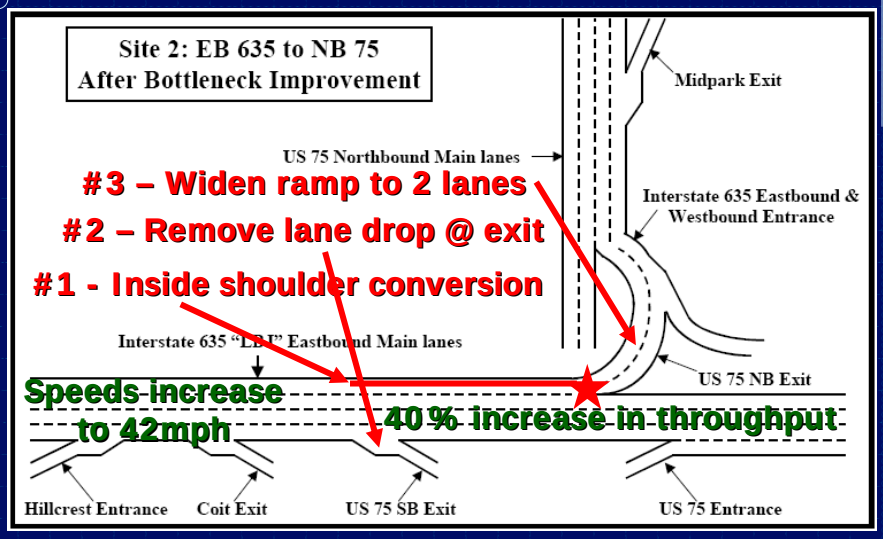
#2: EB IH635 (LBJ) to NB US75



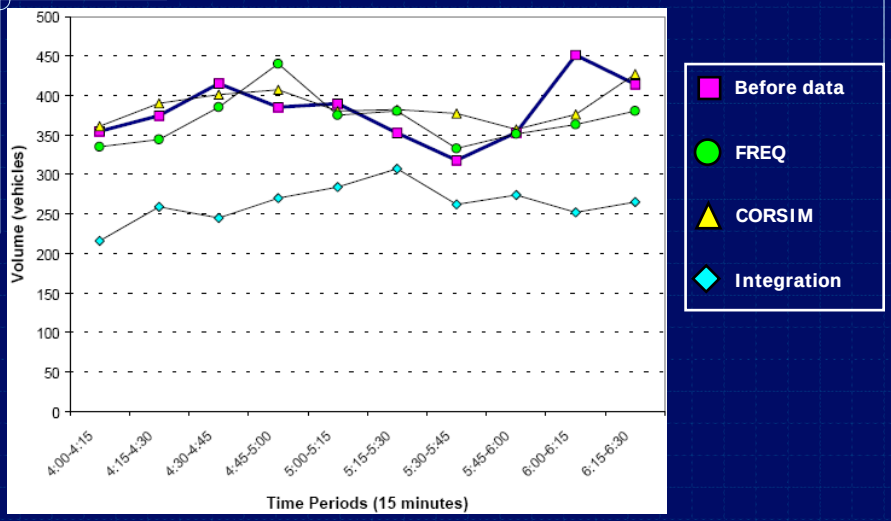
Before Site Layout



After Bottleneck Improvements



Model vs. Field Data - Volumes



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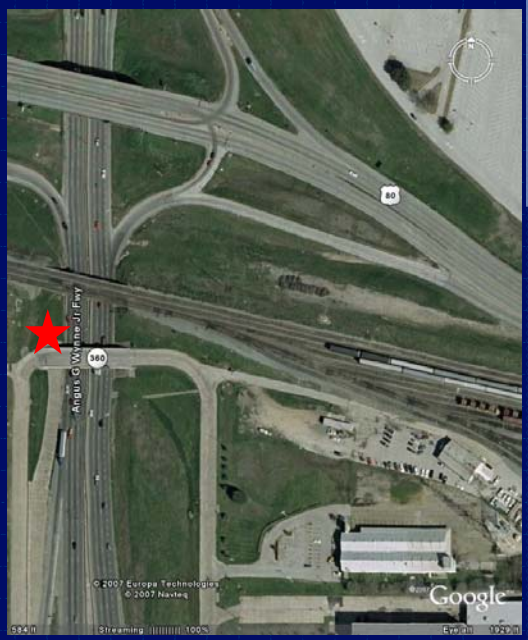
#3: NB SH360 Abram to Randol Mill



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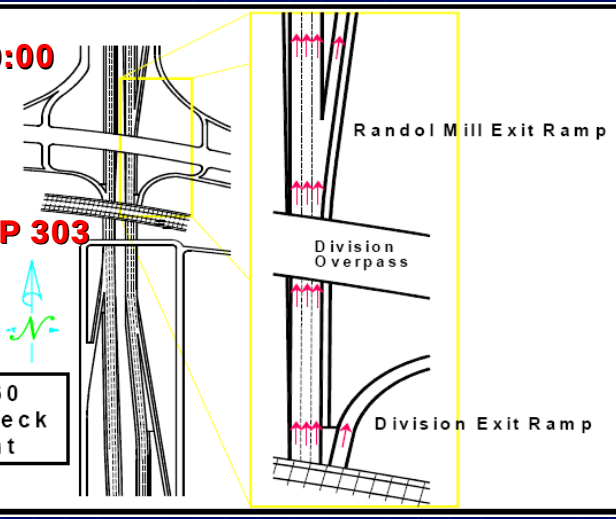
Before Site Layout

AM - 6:00 to 9:00

Backup past SP 303



Site 3: NB 360
Before Bottleneck Improvement

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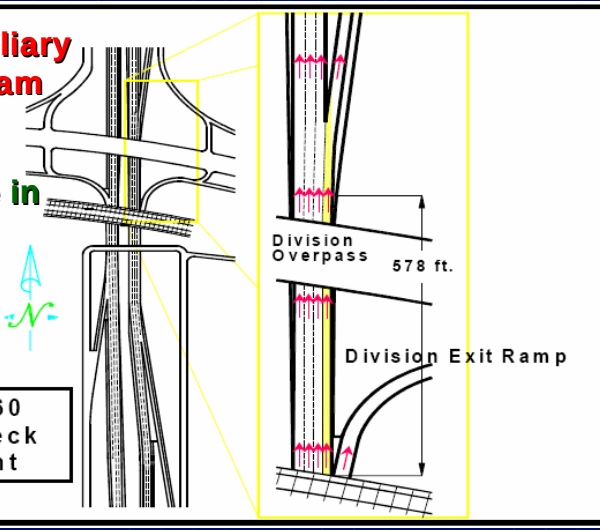
After Bottleneck Improvements

#1 – Add auxiliary lane from Abram to Randol Mill

10% increase in speeds

Large safety improvement



Site 3: NB 360
After Bottleneck Improvement

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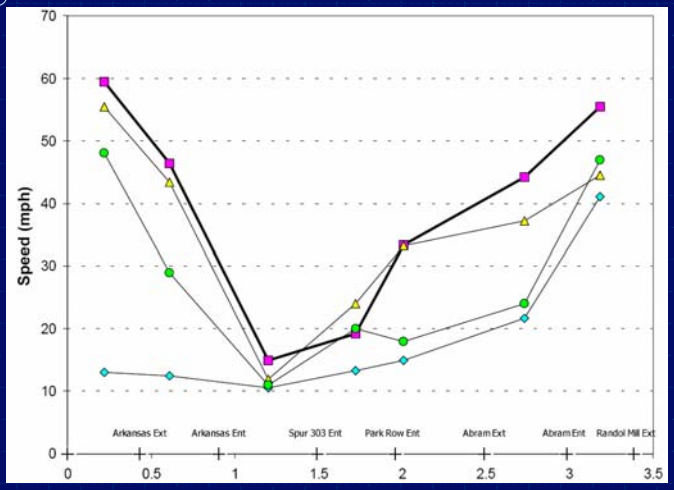
Model vs. Field Data - Speeds

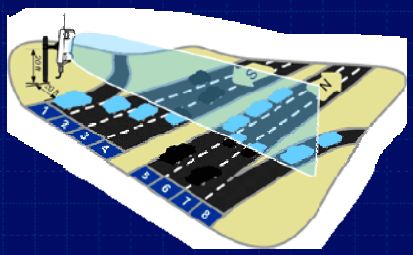


Research Results

- Performance is sporadic in congestion
  - Models did not recognize full capacity improvement of bottleneck removals
- Calibration can be difficult
  - Begin simulation prior to onset of congestion
- CORSIM most promising of 3 models evaluated

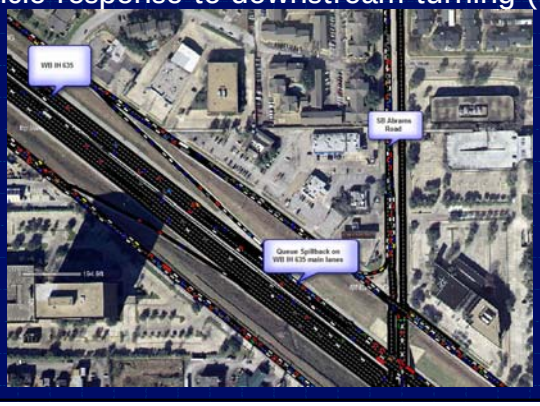
Model Improvements

- Easier network coding
- Better documentation
- Affordable training
- Smarter users
- Faster computers
- Available data



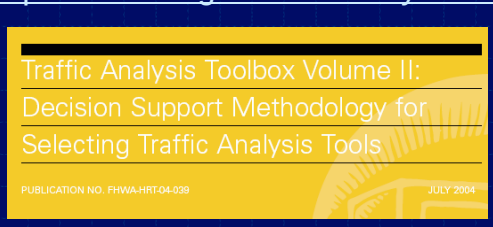
Model Improvements

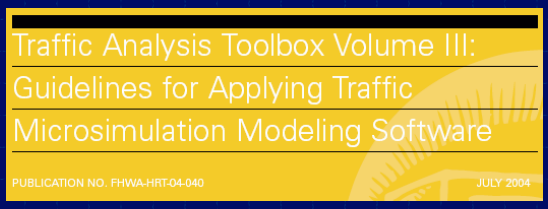
- VISSIM
  - More built-in capabilities
  - Vehicle routing/weaving analysis
  - Specify vehicle response to downstream turning (e.g., exit ramps)



Resources and Guidelines

- FHWA Traffic Analysis Tools
  - http://ops.fhwa.dot.gov/trafficanalysistools/index.htm





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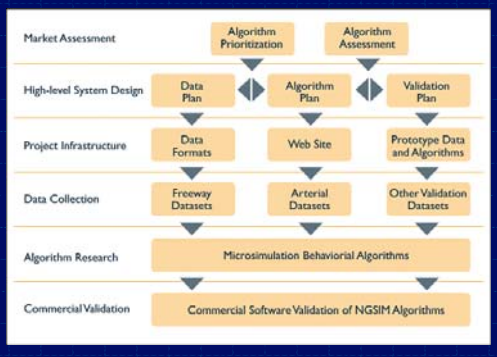
Resource and Guidelines

- NGSIM
  - Next Generation SIMulation



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Resources and Guidelines

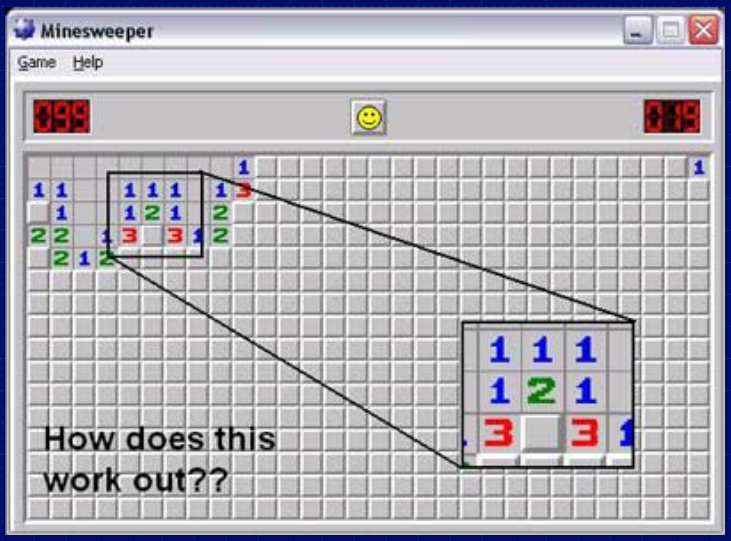
- 3943 Research Report
  - http://tti.tamu.edu/documents/3943-1.pdf
- 3943 Project Summary Report
  - http://tti.tamu.edu/documents/7-3943-S.pdf

Top 10 List

Top 10 Realities About Using Microsimulation Models In Texas...

10. You'll have a new best friend!

9. Diversions are recommended



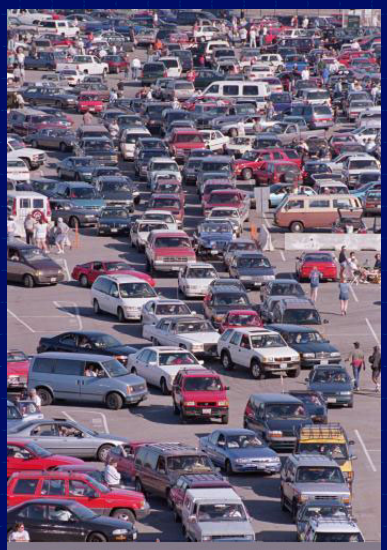
8. Confusion is going to happen

Visit www.renewal.ca

7. Proper equipment is needed

Wrong Mouse!

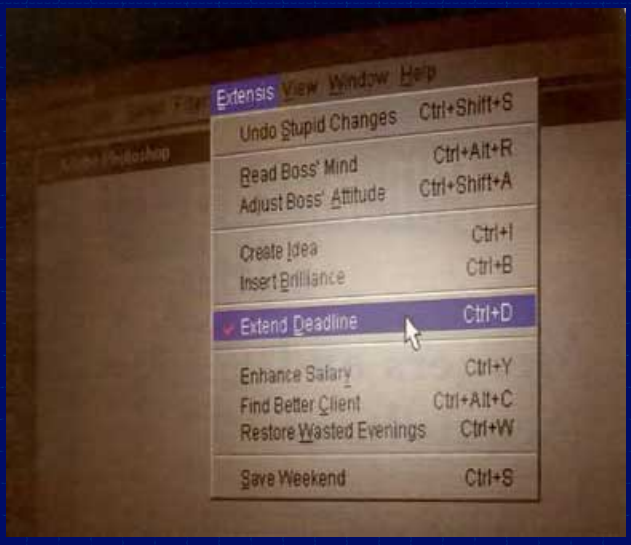
6. Animation shouldn't look like this



It Could Be Worse, Much Worse

5. Proper calibration takes patience

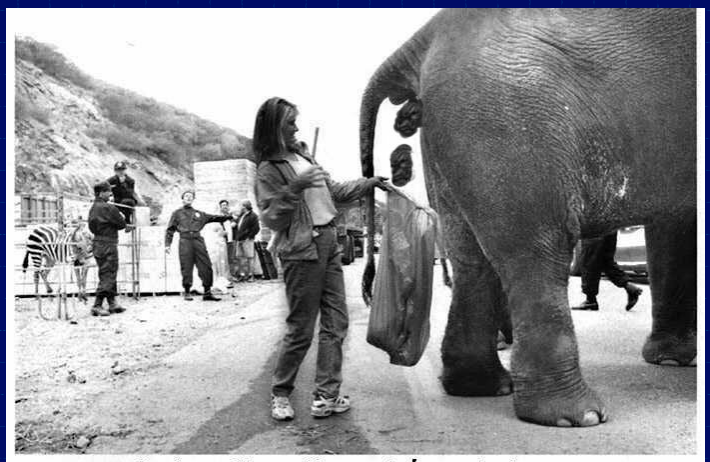
4. Deadlines are tough to meet



3. Expects lots of micromanagement

2. It might not be necessary?

1. It isn't so bad after all!



Questions

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