

University of Illinois Facilities and Services
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Crowd Management for Quad Day



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Project topic

Event: Quad Day

Planning phase: Spring 2020

Event date: September 2020

Topic: Traffic measurement,
estimation, planning, and
control for special events



Summary and Recap

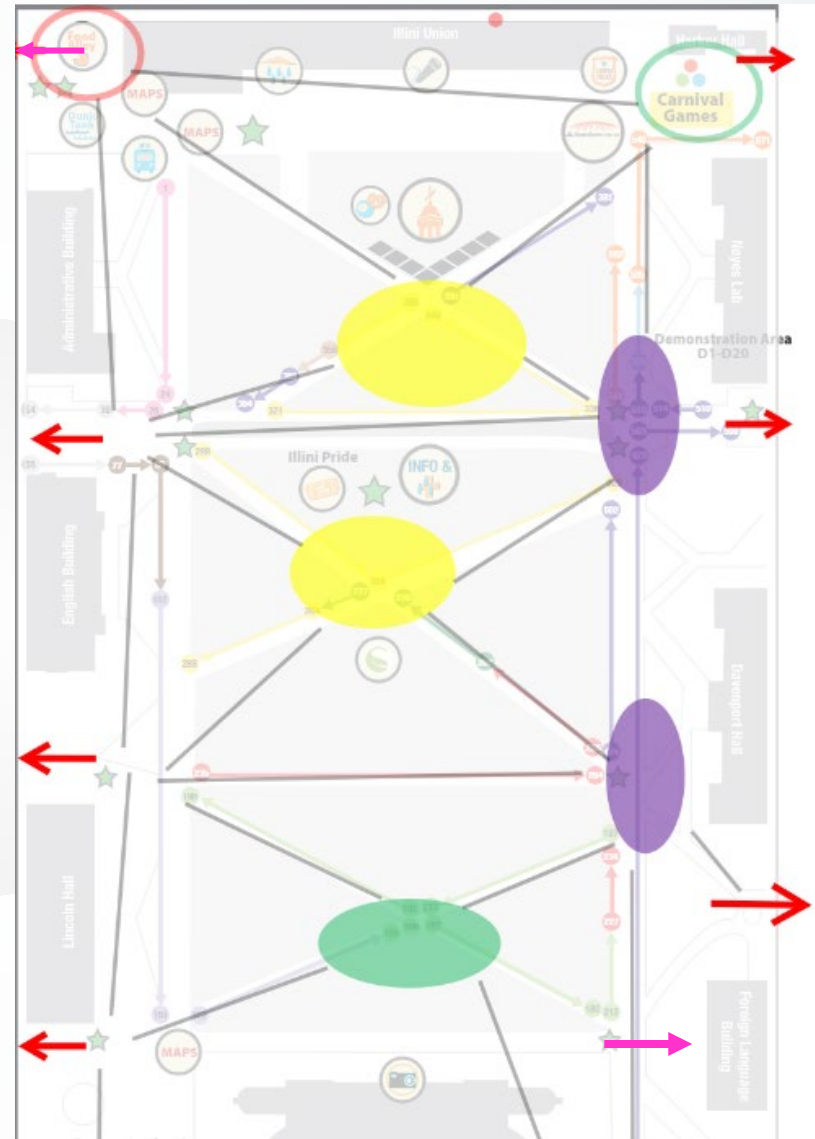
- **Objectives and Concerns**
 - Better traffic flow & management in the Quad
 - Allow more people to participate in activities (accessibility)
 - Allow people to get to their activities fast(mobility)
 - Alleviate congested areas:
 - Popular booths
 - Demonstration regions
- **Options and restrictions**
 - Adding new pavements over the lawn is NOT preferred
 - moving the booths onto the lawn is NOT preferred
 - Extending the Quad Day to two days is an option
 - Moving some of the booths to the South Quad is an option
- **Remaining Questions**
 - What adjustment to the Main Quad is feasible?
 - Adding barriers/guiding facilities?
 - Relocating/clustering booths?
 - Enforcing one-ways?

Research Plan

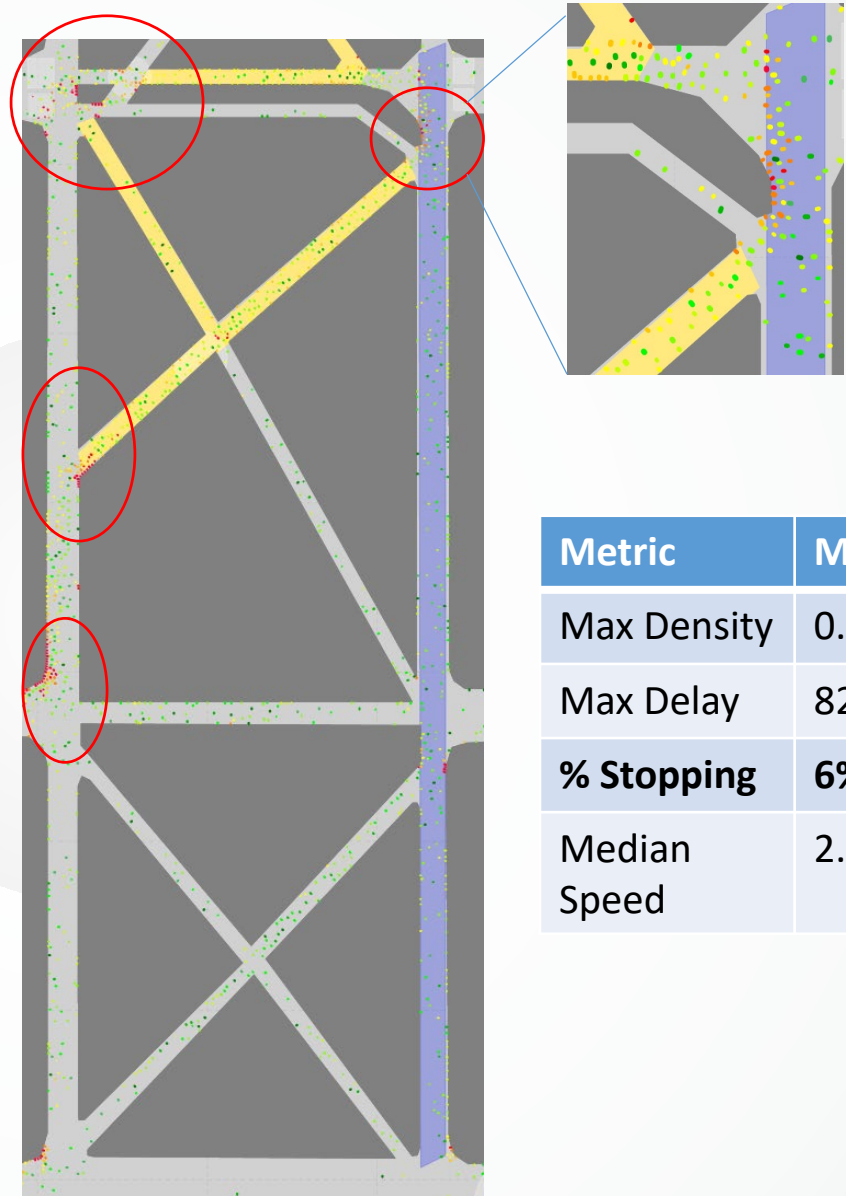
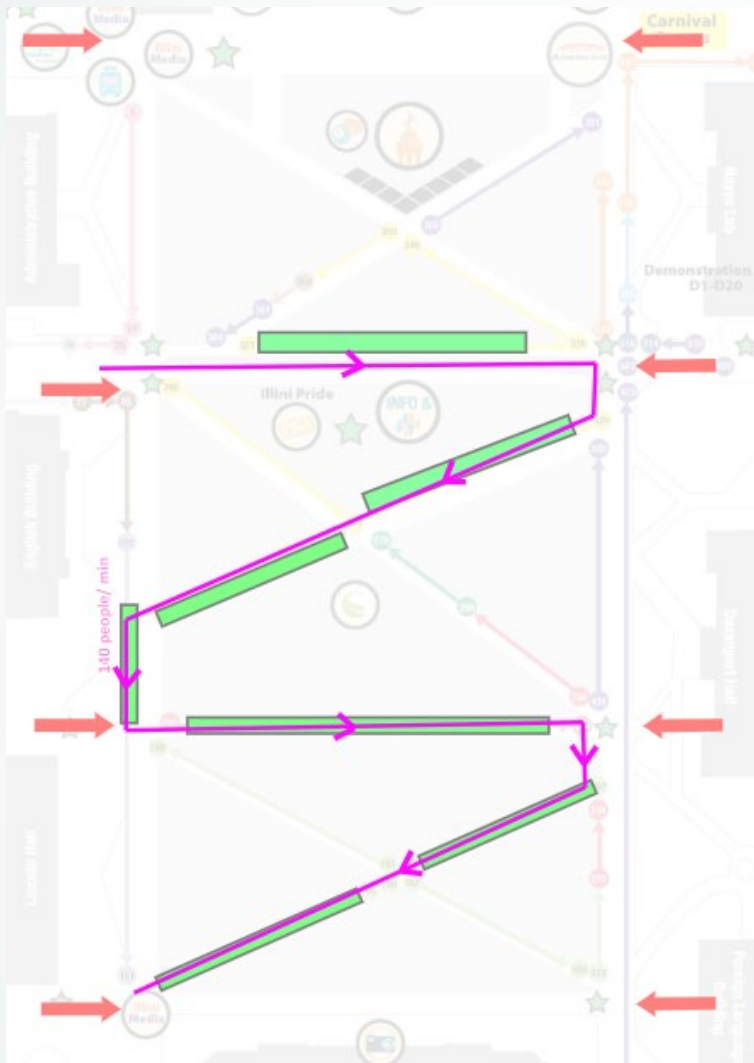
- **Benchmarking – Status quo of current Quad Day**
 - Demand estimation
 - Route generation
 - Finite element analysis
 - Simulation
- **Proposed Solutions**
 - What adjustment to the Main Quad is feasible?
 - Relocation of booths
 - Adding barriers
 - Extending operation area
 - Extending time

Benchmarking

- Abstract graph from popular clusters
- Total duration: 11 AM – 4 PM
- Peak hour: 12 PM – 2 PM
- Assume 20,000 people visited throughout the duration, and peak-hour flow takes 30 % of total flow.
- **Where do congestions form and how does the composition of visitors affect the pattern?**
 - Assume background traffic of 2400 people/hour uniformly distributed.
 - Categorized flow of 4000 people/hour on specific routes.

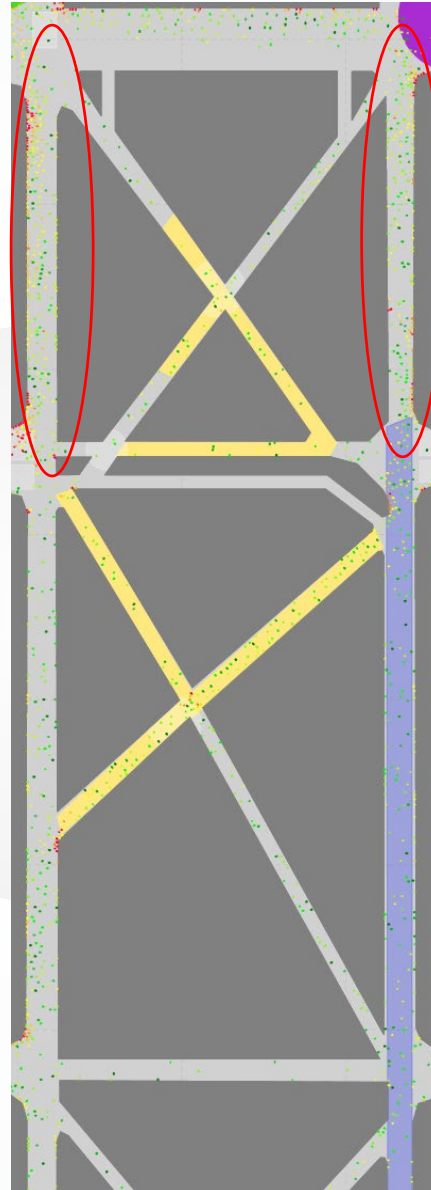
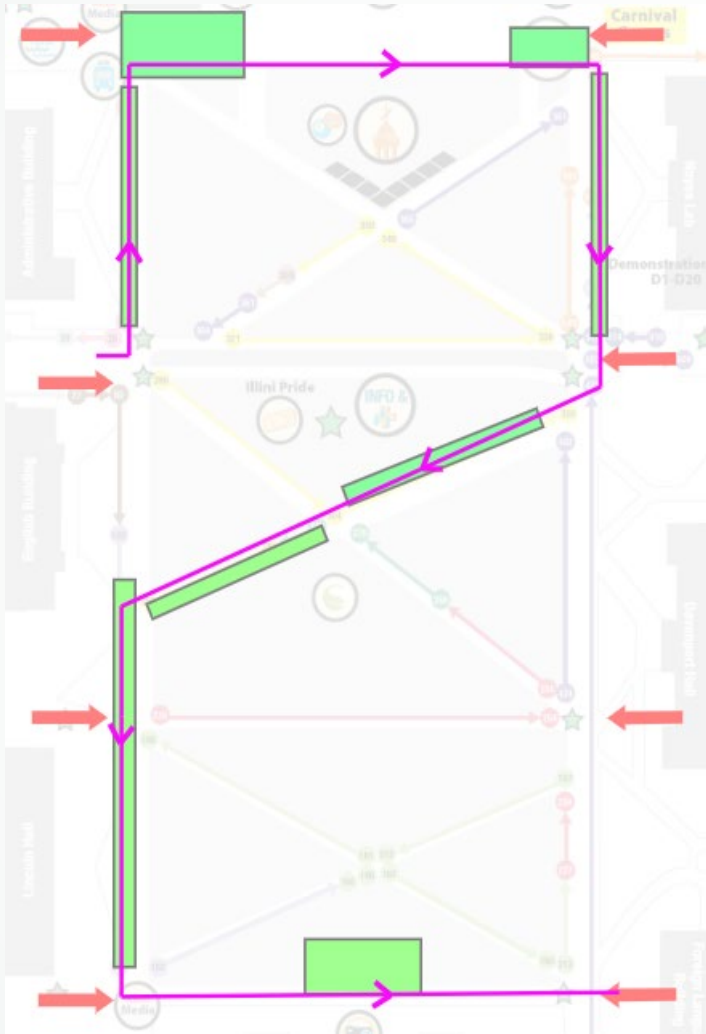


Benchmarking – Touring 1



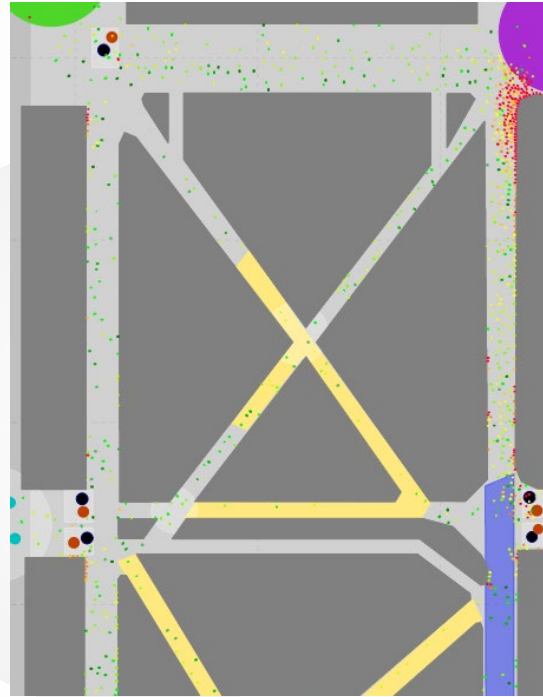
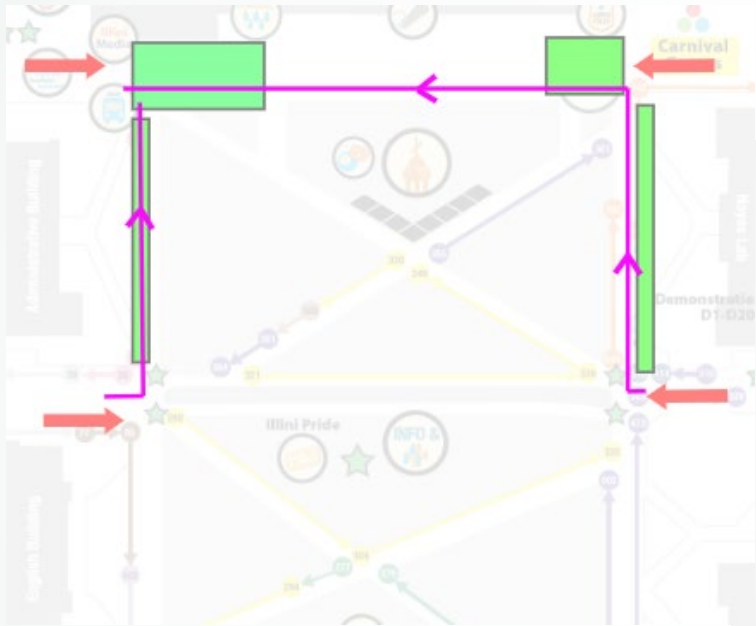
Metric	Measure
Max Density	0.15 (#/ft ²)
Max Delay	82 (sec)
% Stopping	6%
Median Speed	2.82(ft/sec)

Benchmarking – Touring 2



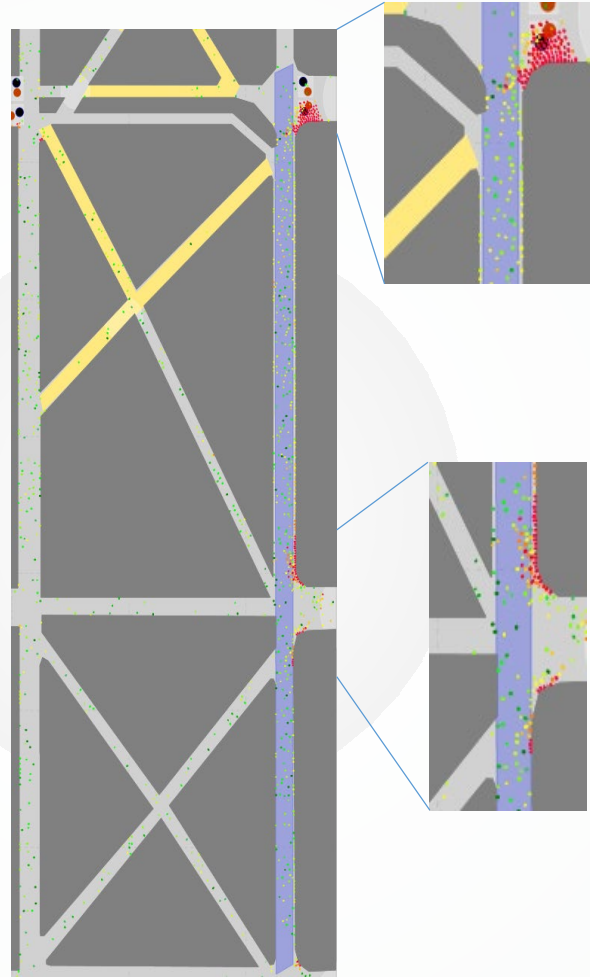
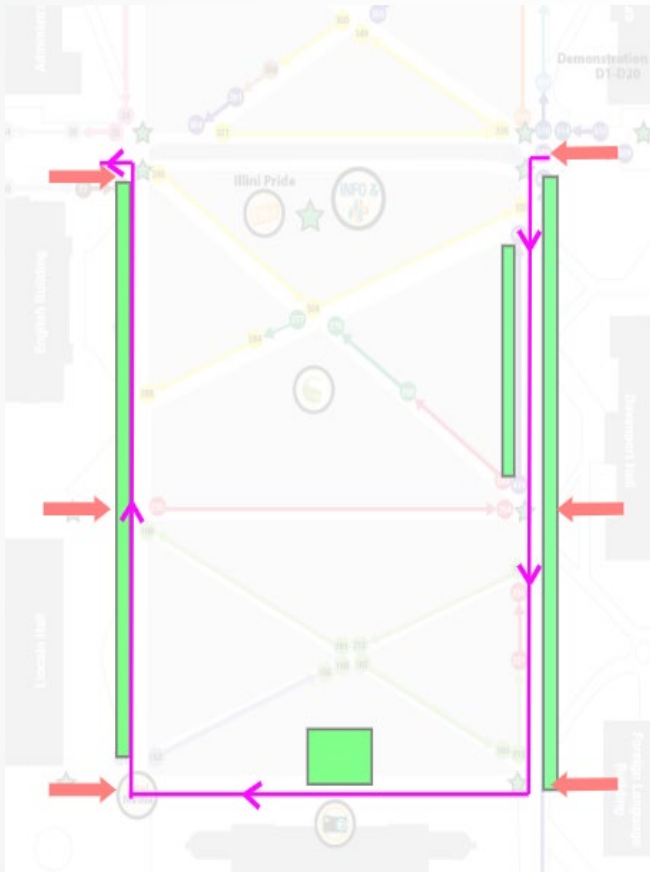
Metric	Measure
Max Density	0.15 (#/ft ²)
Max Delay	113 (sec)
% Stopping	12%
Median Speed	2.67(ft/sec)

Benchmarking – Carnival games & Food



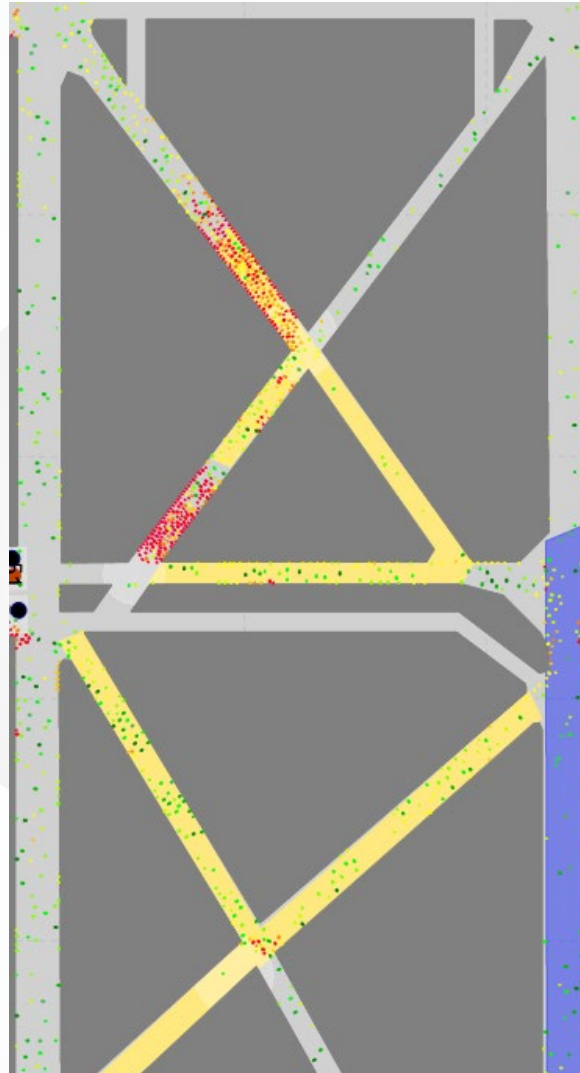
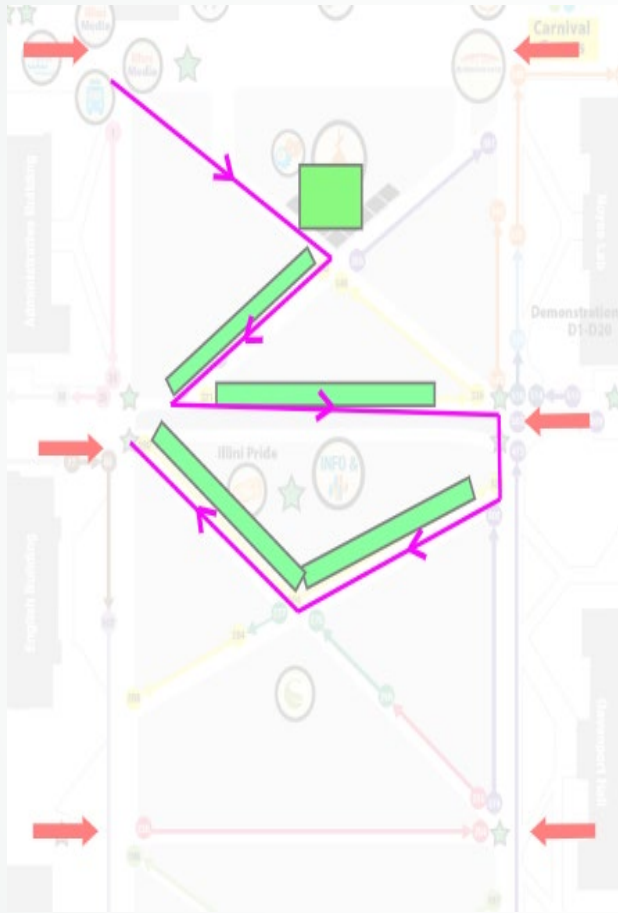
Metric	Measure
Max Density	0.17 (#/ft ²)
Max Delay	169 (sec)
% Stopping	19%
Median Speed	2.32(ft/sec)

Benchmarking – Pre-professional and Academic



Metric	Measure
Max Density	0.18 (#/ft ²)
Max Delay	147 (sec)
% Stopping	15%
Median Speed	2.21(ft/sec)

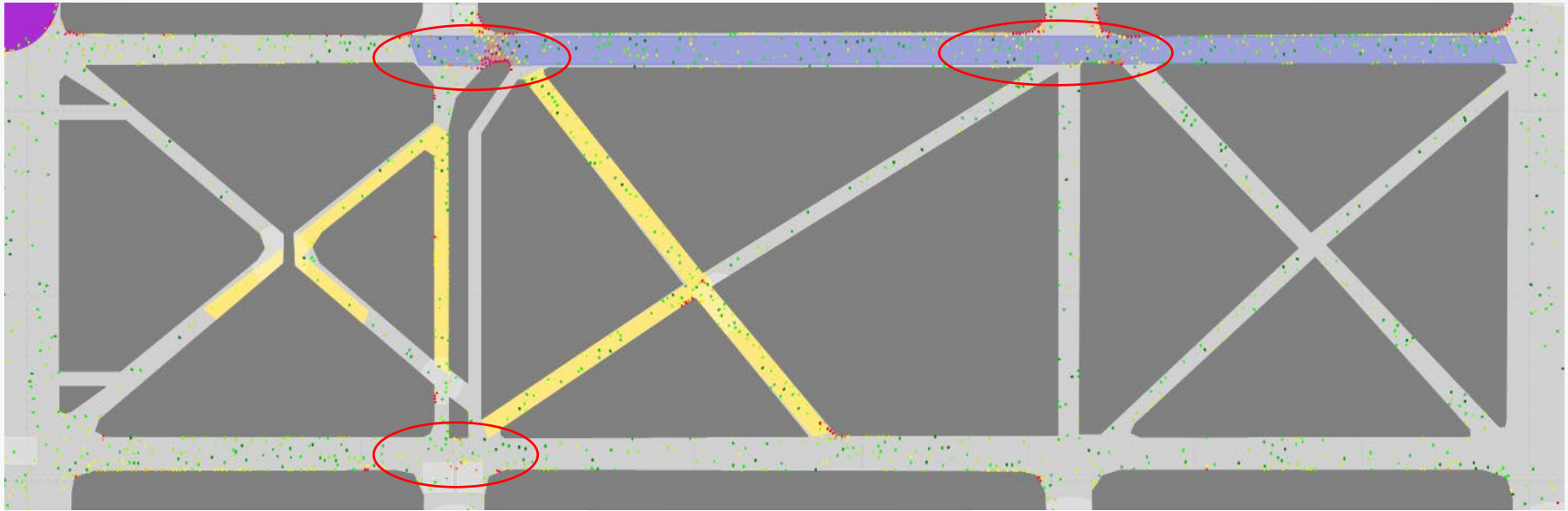
Benchmarking – Athletic & Recreation



Metric	Measure
Max Density	0.18 (#/ft ²)
Max Delay	237 (sec)
% Stopping	36%
Median Speed	1.37(ft/sec)

Benchmarking – Combination

Uniform combination of the 5 routes + background traffic



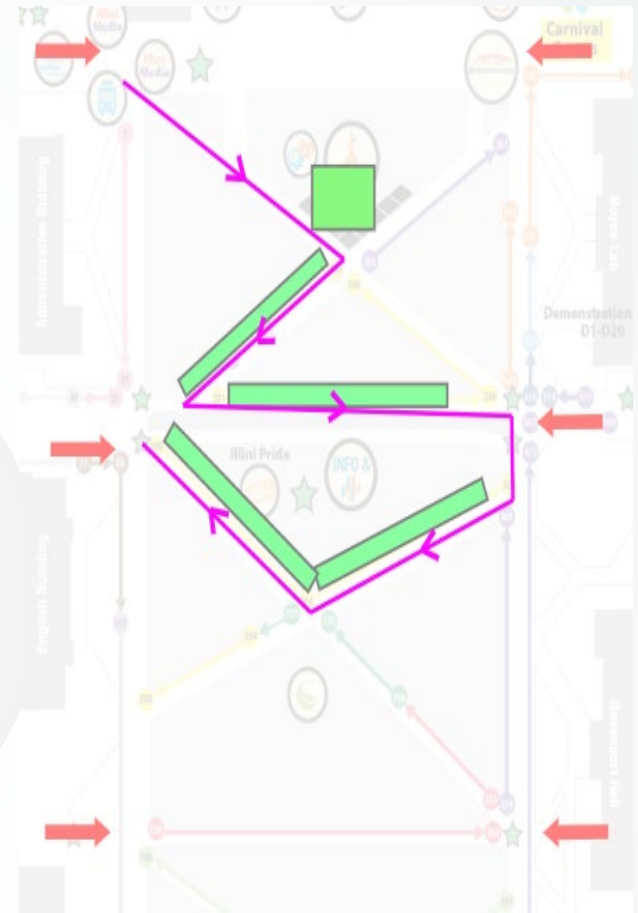
Metric	Measure
Max Density	0.18 (#/ft ²)
Max Delay	142(sec)
% Stopping	14%
Median Speed	2.31(ft/sec)

Proposed Solutions

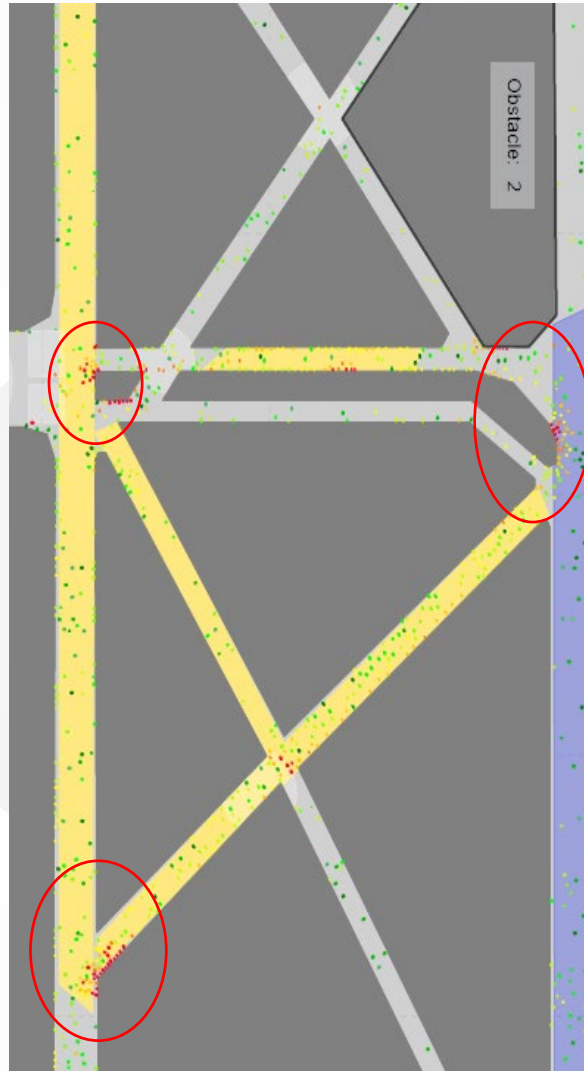
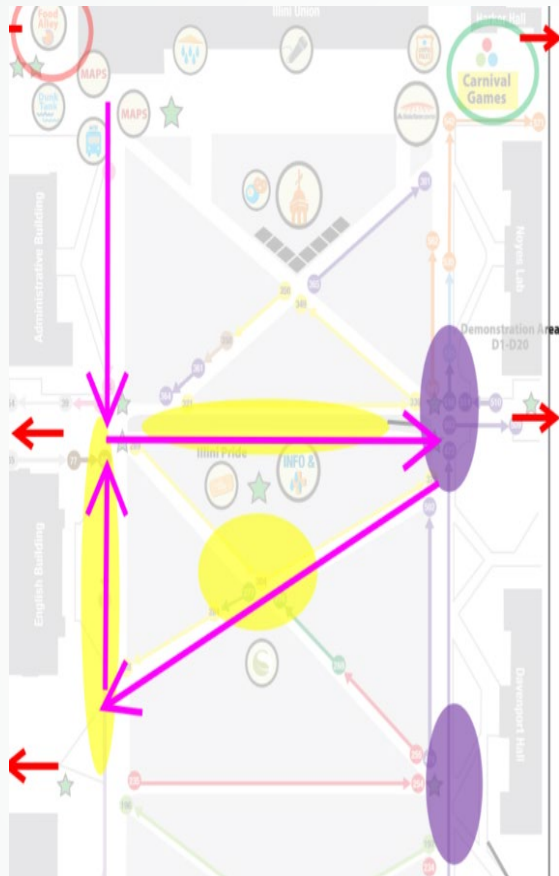
- We use the **Athletic & Recreational route** as illustration, with intuitive rearrangement.
- The optimization procedure will be designed to achieve optimality.

Options:

- Relocating booths
 - Consider allocating popular booths on wide walkways / closer to entrance for easier access.
 - Consider further clustering relevant booths to form short routes for dedicated visitor groups.
- Adding barriers
 - Use barriers to reject some “bad” routes that are likely to generate counterflow and queue.
 - Block over-popular links/entrances (such as one next to a bus stop) to avoid concentration.

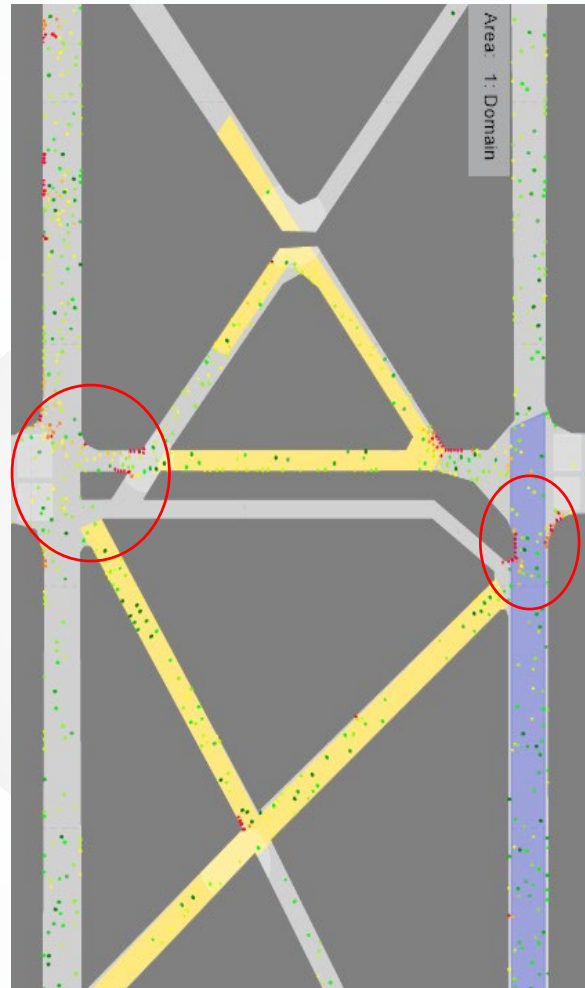
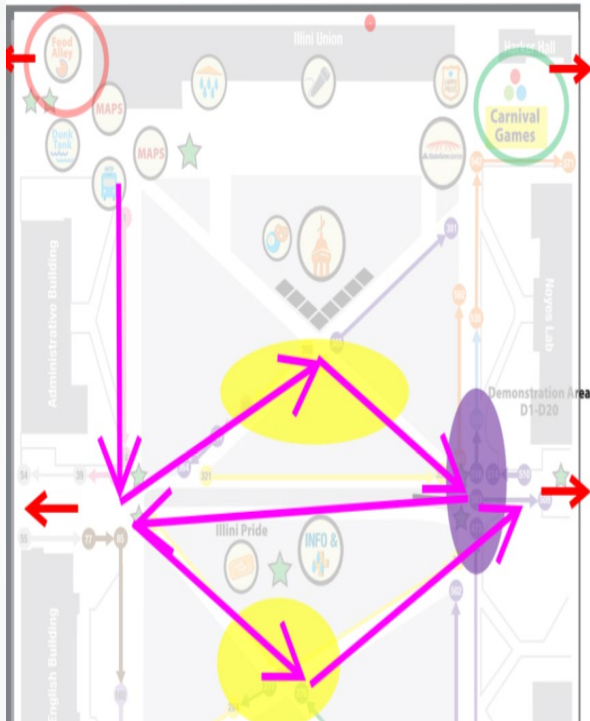


Proposed Solutions – Relocating booths



Metric	Measure
Max Density	0.18 (#/ft ²)
Max Delay	127 (sec)
% Stopping	8%
Median Speed	2.35(ft/sec)

Proposed Solutions – Adding Barriers



Metric	Measure
Max Density	0.15 (#/ft ²)
Max Delay	113(sec)
% Stopping	9%
Median Speed	2.41(ft/sec)

Further Questions and Suggestions

- **Improvement options**
 - Provide students with proposed routes (with flyers or map stands)
- **Data Needs**
 - Quantified origin-destination demand
 - Number of registered members of each RSO (this indicates popularity, and can be used adjoint with the map from last year to estimate traffic)
 - Number of food/drinks/other giveaways distributed in previous years as indicators of number of attendees.
 - Relative popularity of booths
 - Relative popularity of entrances
 - Specific range/layout if extending activity area
 - Budgets and restrictions
 - Lawn restoration if using lawn area is considered
 - Utilizing south quad if considered (Power extension, generators, etc.)