**Crowd Analysis**

**This is to determine major programs of the day through exploring distribution of attendees in different locations. Floor Choropleth Map will be used to demonstrate how does crowd density change according to the program.**

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| Action | Observation & Insights |
| Select Main Convention & Sub-convention | In the **morning**, all visitors in **Main Convention Hall**  In the **afternoon**, breakout sessions -> visitors cluster in **sub-conventions**.  3 events in **sub-convention a** and 2 events in **sub-convention b, c, d**  These are the major programs of the event of this use case. |
| Select Room 1 | **Room 1** is only occupied from 3pm – 4.30pm.  Compare **Room 1** with **sub-convention halls**.  Room 1 is next to sub-convention halls. (refer to floor plan)  No of attendees in **Room 1** starts to pick up **after the 1st break** in **sub-convention a**  Room 1 is used for refreshments in the afternoon for breakouts. |
| Remove Room 1  Select Room 3 | **Room 3** is at Level 1.  Compare **Room 3** with **Main Convention**.  Room 3 is next to entrance of Main Convention (refer to floor plan)  2 peaks in Room 3 vs 2 troughs in Main Convention.  Room 3 is used for refreshments for programs in Main Convention. |
| Remove Room 3  Select Room 5 | Less fluctuations in crowd distribution -> some program happening here. If refer to program schedule, there is a Hackathon held in Room 5.  Starting from **3pm** in the afternoon, **batches of people leaving Room 5 ->** some of them leave earlier after finishing the Hackathon. |
| Remove Room 5 | Comparing Main Convention and Sub-convention halls, there is a gap around 12pm. We hypothesize it is the lunch break. |
| Add Restaurant | Sharp increase at 12pm -> The restaurant is only open at 12pm.  Only occupied in between 12pm – 2.15pm. |

Next, we explore how crowd move across levels. We select the lunch break period as there are heavy movement from Level 1 Main Convention to level 2 Restaurant.

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| Action | Observation & Insights |
| Add North Stairway **(2nd floor)** & South Stairway | Significantly large flow volume in the South stairway as compared to North stairway.  North stairway (2nd floor) is only accessible from 9am onwards -> reserved for other purposes, i.e. VIPs. |
| Remove North Stairway -> zoom in | During **break** in the **Main Convention** in the morning -> peaks in South Stairway -> Attendees move to Level 2 restroom.  **Another peak starts at 12pm** -> attendees move to Level 2 for lunch.  **High value during lunch break** as attendees are moving around.  Peaks at break in **Sub-convention** -> Attendees move to Level 1 restroom.  **Insights** -> capacity of restroom not enough -> attendees move to restrooms in other levels -> Solutions: 1. Re-arrange the program to have even distribution of crowd across 2 levels. 2. Increase the capacity of current restrooms. |
| Add Poster Area | Similar pattern with Stairways -> attendees visit Poster Area when they are free. |

1. Move slider to 7.30am -> only a few people

2. Run Animation at 7:40am -> main convention + exhibition hall + poster area start to pick up

3. Stop animation at 9am -> cluster in Main Convention Hall -> **highlight where entrance is**

4**.** Fast forward to 10:20 -> still in Main Convention

5. Move slider to 10:30 -> start to come out

6. Move slider to 10:40 -> Dense color in Room 3, exhibition hall & poster area

7. Move slider to 11:10 -> Going back to Main Convention

8. Continue with animation

9. From 12pm, attendees start to move out from Main Convention to Restaurant

10. High density in Restaurant and Rest Area

**Network Analysis**

By controlling the nodes position by a dataframe, the network diagram is plotted with nodes showing their relative locations on the floor plan.

Time duration: 12pm – 12.30pm

**Edge width represents flow volume** 🡪 Highlight a route with high flow: Main Convention -> South Stairway (1st floor) -> South Stairway (2nd floor) -> Restaurant

Select In-degree -> Highlight 3 nodes of high score.

* Main Convention small in size -> ppl are moving out
* Restaurant large in size -> ppl are moving in

Select Out-degree -> Main Convention increase in size due to high out-flows

Select Betweenness -> 2 South stairways stand out as they are the key linkages between Level 1 and Level 2.

Select Closeness -> as it measures average length from a node to all other nodes. Locations at Level 1 are larger than those at Level 2 due to large number of locations in Level 1.

Time duration: 9:40 – 10:10am (for example)

Recall: Main program happening in Main Convention -> all edges are very thin -> minimal movement throughout the event space

Time duration: zoom out to entire day. **Select in-degree**

Highlight routes that are most frequently visited.

Besides stairways, **Poster Area is also a popular place with high in-degree centrality score.**

**Path Analysis**

**Sunburst**

Choose a starting point with **orange color (Main Convention)**

* Paths next to each other are more similar -> a portion of the path is similar.
* Verbally describe some paths taken

Choose a starting point with **light orange color (Poster Area)**

**Find a path with multiple Poster Areas** -> align with the observation in Network Analysis. Poster Area has high in-degree centrality throughout the entire day. Attendees may visit a few times.

**Chord Diagram**

Highlight stairways -> South to South & North to North -> intuitive, as they should come in pairs

Hover cursor to Room 3

* correlate to Main Convention (Refreshment)
* correlate to stairway -> go to Level 2 restroom during breaks
* correlate to Poster Area & Exhibition Hall -> visit during breaks

Hover cursor to Sub-convention a, b, c, d

* highly correlate to Poster Area -> due to proximity -> could also mean that these group is more interested in Poster exhibition, etc.