Navigation for Amusement park

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Agenda

- Introduction
- Problem Formulation
- Methods/ Solutions
- Results
- Future Scope

Introduction

TOP 10 THEME PARK GROUPS WORLDWIDE

	GROUP	CHANGE	2013	2012
1	WALT DISNEY ATTRACTIONS	4.8%	132,549,000	126,479,000
2	MERLIN ENTERTAINMENTS GROUP	10.7%	59,800,000	54,000,000
3	UNIVERSAL PARKS AND RESORTS	5.3%	36,360,000	34,515,000
4	OCT PARKS CHINA	12.7%	26,320,000	23,359,000
5	SIX FLAGS INC.	1.4%	26,100,000	25,750,000
6	PARQUES REUNIDOS	-4.1%	26,017,000	27,130,000
7	CEDAR FAIR ENTERTAINMENT COMPANY	0.9%	23,519,000	23,300,000
8	SEAWORLD PARKS & ENTERTAINMENT	-4.1%	23,400,000	24,391,000
9	FANTAWILD GROUP (NEW)	42.7%	13,118,000	9,193,000
10	HAICHANG GROUP	7.4%	10,096,000	9,400,000
TOTAL		5.4%	377,279,000	357,843,000

Figure 1: Top 10 theme park attendance [1]

Reasons for solving this problem

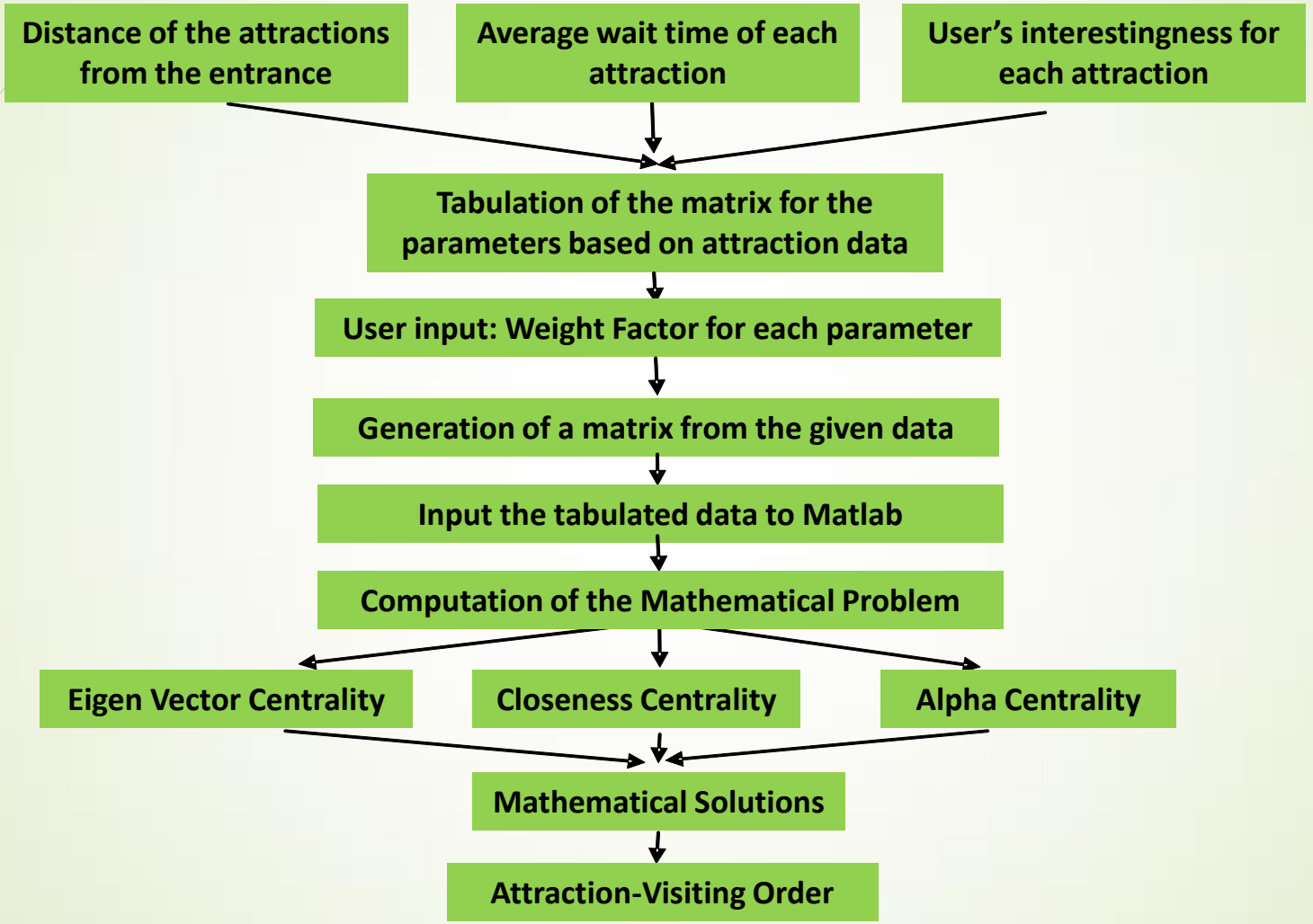
- Allows the users to plan ahead before going to an amusement park
- Time Saving
- User Convenience

Goal of the Project

- The main aim of the project is to design a map based on the user preferences by taking a survey because people are confused to pick up the rides with in their time

- Survey includes waiting time, interestingness, distance in to consideration.

Process Flow



Parameters of the System

- Distance
  - Walking distance from entrance to each ride
- Wait Time
  - Wait time for each attraction
- Interestingness
  - Entered by the user according to his/her preferences

By using Adjacency Matrix And Weight Factors from the survey to plan the path using different methods

Map of the Amusement Park

L1

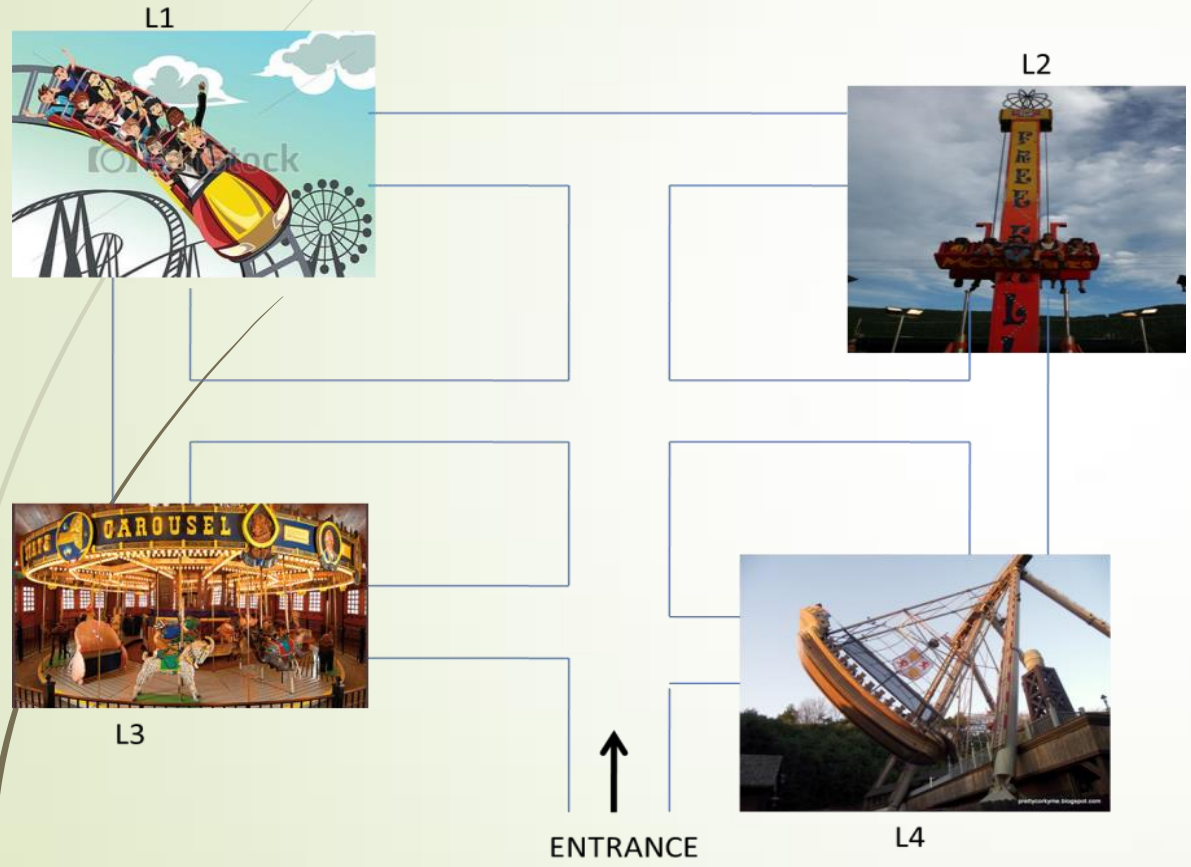
L2

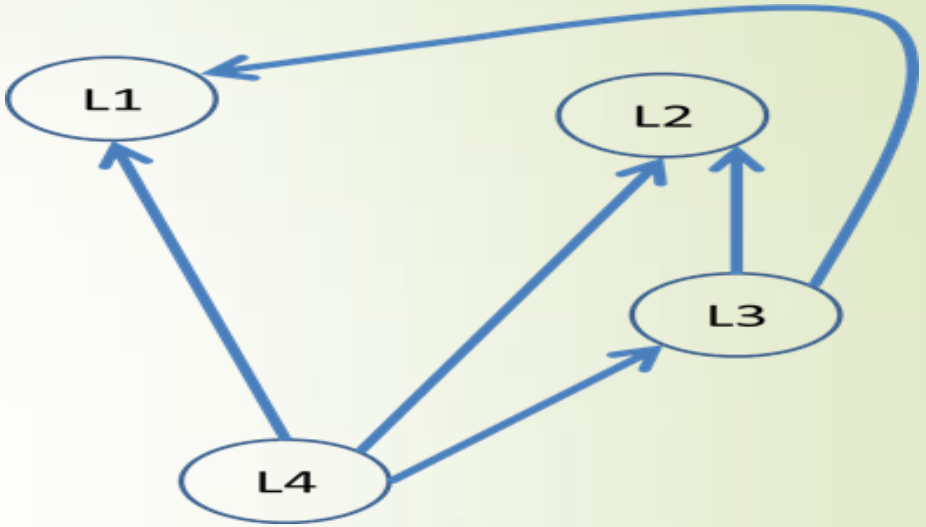
L3

L4

ENTRANCE

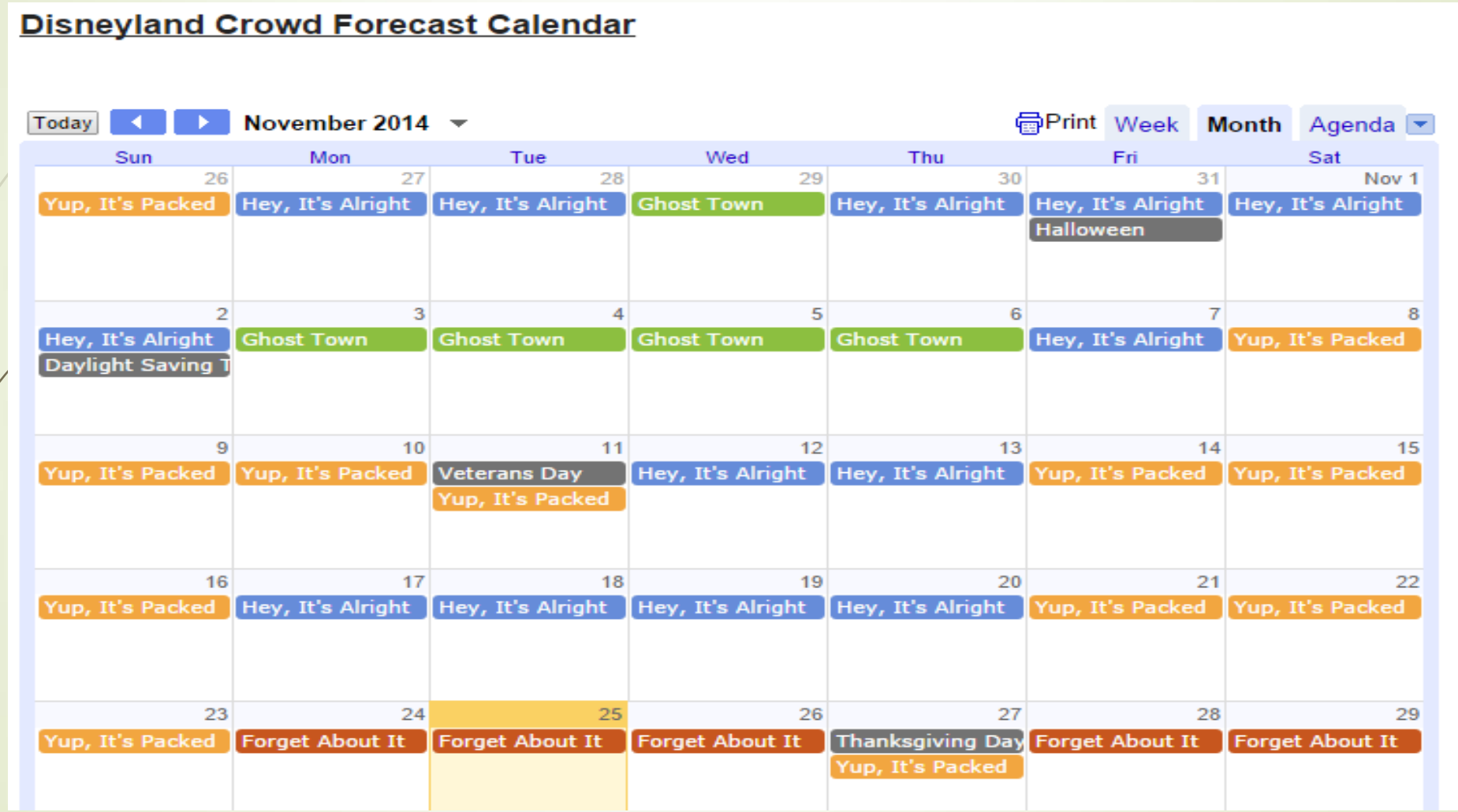
Parameter 1: Distance





D	L1	L2	L3	L4
L1	0	0	0	0
L2	1	0	0	0
L3	1	1	0	0
L4	1	1	1	0

Parameter 2: Wait Time



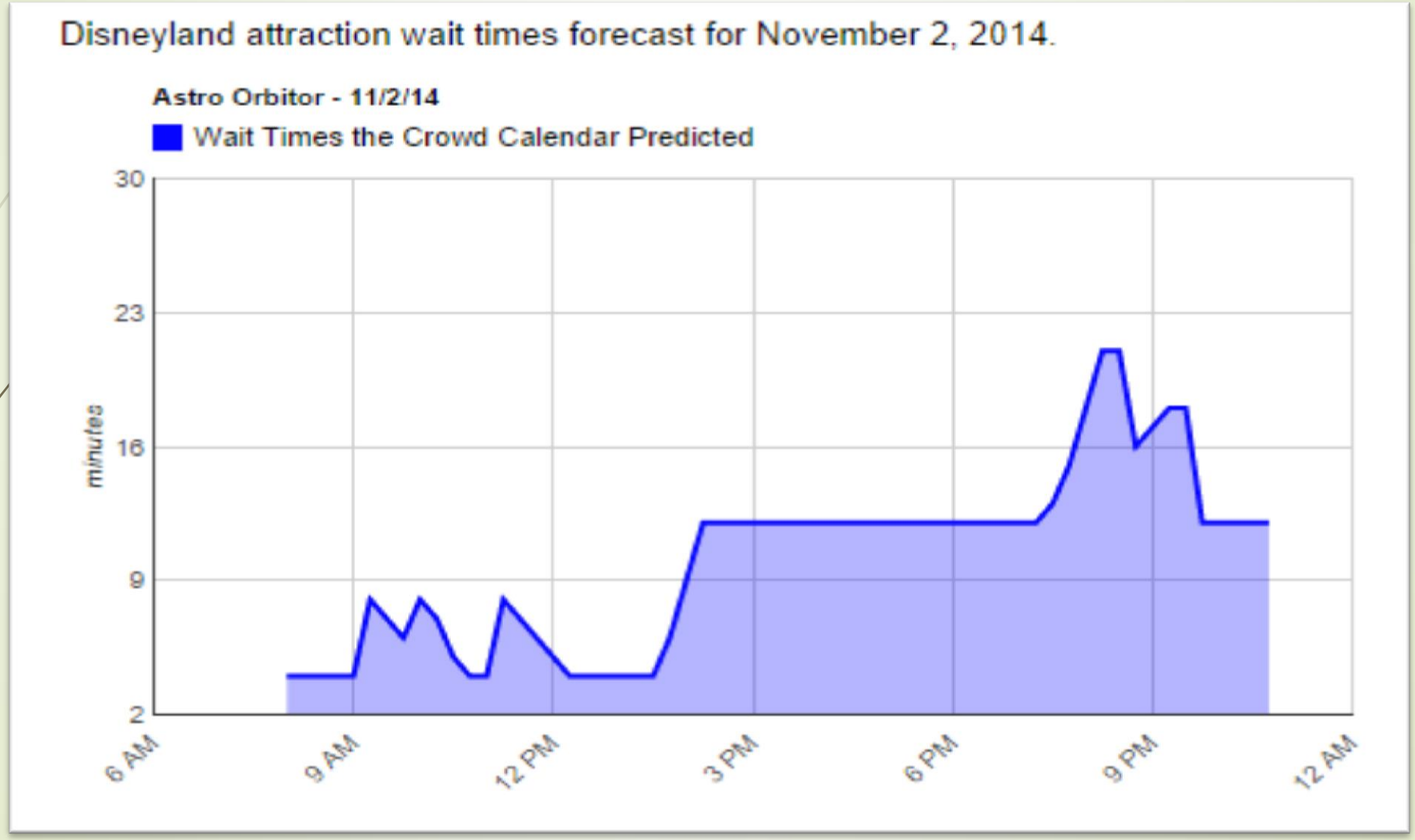
Source: http://www.isitpacked.com/disneyland-crowd-forecast-predictor-calendar/

Disneyland Crowded Levels

Disneyland Crowd Levels to Wait Times										
ATTRACTION	LEV. 1	LEV. 2	LEV. 3	LEV. 4	LEV. 5	LEV. 6	LEV. 7	LEV. 8	LEV. 9	LEV. 10
Alice in Wonderland	12-17 min	16-21	16-21	20-25	20-25	24-25	24-29	24-29	28-33	28-46
Astro Orbitor	8-9 min	8-13	12-13	12-13	12-17	16-21	16-21	20-21	20-27	24-37
Autopia	12-17 min	12-17	16-17	16-21	16-21	16-25	20-25	22-29	24-29	28-37
Big Thunder Mtn	8-13 min	8-13	12-13	12-17	16-21	16-21	20-25	20-29	24-29	32-46
Buzz Lightyear	4-5 min	4-9	8-13	8-13	12-13	12-13	12-13	12-17	16-19	16-25
Casey Jr Train	8-9 min	8-9	8-9	8-13	8-13	8-13	8-13	8-13	8-13	12-17
Dumbo	12-13 min	12-17	16-17	16-21	16-21	20-25	20-25	24-25	24-33	32-46
Finding Nemo Subs	12-13 min	12-17	16-21	16-25	16-33	24-37	24-37	30-37	32-46	41-50
Gadget's Go Coaster	8-13 min	12-17	12-17	16-17	16-21	16-21	20-25	20-25	24-31	24-37
Haunted Mansion	4-9 min	8-13	8-17	12-25	12-29	12-29	12-29	16-29	16-33	36-46
Indiana Jones Adv	12-21 min	16-25	20-33	24-37	32-41	36-41	36-46	41-50	45-54	53-74
it's a small world	4-9 min	4-9	4-13	4-17	8-21	8-21	8-21	8-25	12-37	20-62
Jungle Cruise	12-13 min	12-17	16-21	16-21	20-21	20-25	24-25	24-27	24-33	28-33
King Arthur Carrousel	4-5 min	4-5	4-5	4-5	4-9	4-9	4-9	8-9	8-9	8-17
Mad Tea Party	4-5 min	4-9	8-9	8-9	8-9	8-9	8-13	8-13	8-13	12-17
Mark Twain Riverboat	8-9 min	8-9	8-9	8-9	8-9	8-9	8-13	8-13	8-13	8-13

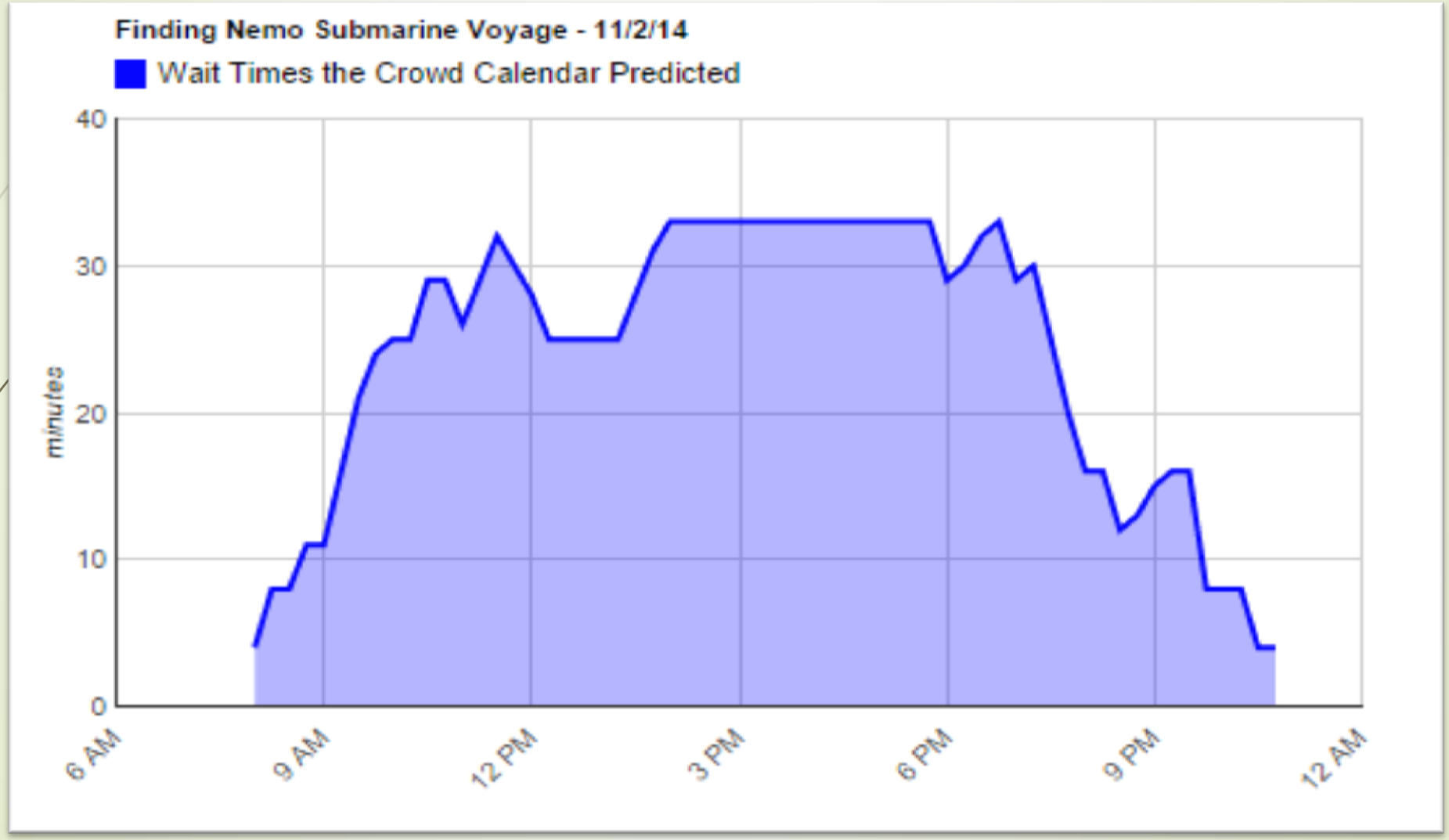
Source: http://touringplans.com/disneyland/crowd-levels#

Wait Time Data #1



Source: http://touringplans.com/disneyland/wait-times/date/2014-11-01

Wait Time Data #2



Source: http://touringplans.com/disneyland/wait-times/date/2014-11-01

Parameter 3: Interestingness

Every attraction with appeal by age group.
Attraction ratings are on a scale from 0 (very bad) to 5 (excellent).
Click on the header links to sort!

Disneyland Attractions

NAME	PRE-SCHOOL	GRADE SCHOOL	TEENS	YOUNG ADULTS	OVER 30	SENIORS	OUR RATING
Alice in Wonderland **Fantasyland** Track ride in the dark *When to go: Before 11:00 a.m. or after 5:00 p.m.*	4	3.5	3.5	4	3.5	4	3.5
Astro Orbitor **Tomorrowland** Very mild midway-type thrill ride *When to go: Before 10:00 a.m. or during the hour before the park closes.*	4	4	3.5	3.5	3	2.5	2
Autopia **Tomorrowland** Drive-'em-yourself miniature cars *When to go: Before 10:00 a.m. and after 5:00 p.m. or use FASTPASS.*	4.5	4	3.5	3	3	2.5	2.5
Big Thunder Mountain Railroad **Frontierland** Tame roller coaster with exciting special effects *When to go: Before 10:30 a.m. and after 6:30 p.m. or use FASTPASS*	3.5	4.5	4.5	5	4.5	4	4

Source: http://touringplans.com/disneyland/attractions

Parameter 3: Interestingness

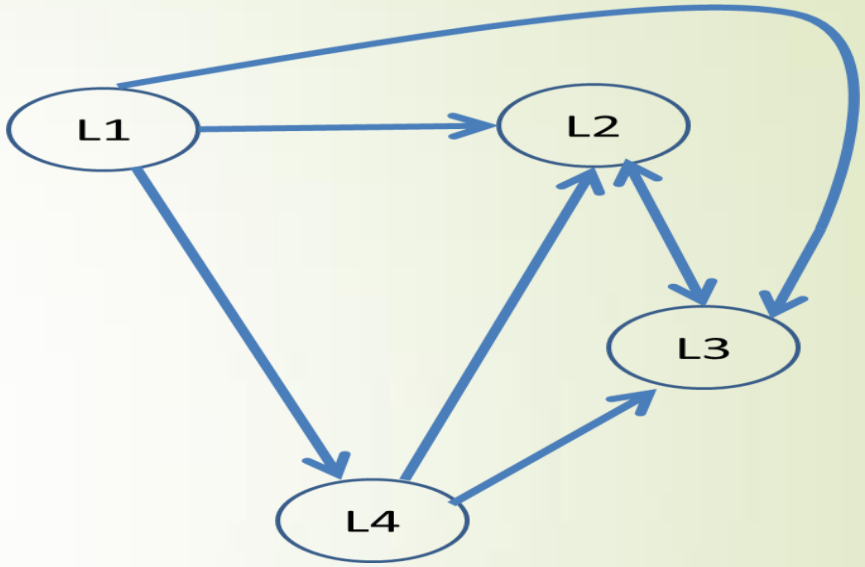
For Peter:

L1: ★★★★★

L2: ★★★★★

L3: ★★★★★

L4: ★★★★★



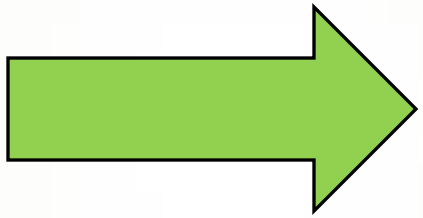
	L1	L2	L3	L4
L1	0	1	1	1
L2	0	0	1	0
L3	0	1	0	0
L4	0	1	1	0

Get User preferences Using Matlab

```
display('There are three parameters to determine the best path for amusement park visit,')
display('including interestingness, wait time and distance.')
display('Please enter the weight factor(the sum of the factors is 1)for each parameter based on your preferences')
Distance_Weight= input('Weight Factor for Distance = ');
Interesting_Weight= input('Weight Factor for Interestingness = ');
WaitTime_Weight= input('Weight Factor for Wait Time = ');
%form adjacency matrix by the input info
display('Please enter your interest to the following attractions at the scale out of 10.')
a=input('please enter your interest to attraction 1 = ');
b=input('please enter your interest to attraction 2 = ');
c=input('please enter your interest to attraction 3 = ');
d=input('please enter your interest to attraction 4 = ');
```

Matlab: Form interestingness Matrix

```
%for the elements a12 and a21
if (a>b)
    a12=1;a21=0;
end
if (a==b)
    a12=1;a21=1;
end
if (a<b)
   a12=0;a21=1;
end
```



```
Interestingness=
[a11 a12 a13 a14;
 a21 a22 a23 a24;
 a31 a32 a33 a34;
 a41 a42 a43 a44;]
```

Methods Used:

- Eigen Vector Centrality
- Closeness Method
- Alpha Method

Eigen Vector Centrality

- Computing the "centrality", or approximate importance
- Nodes with the highest score contribute more to the network
- Largest Eigen Value results in the desired centrality measure.

For example, Eigenvector method = $\begin{bmatrix} 0.3026 \\ 0.4582 \\ 0.4415 \\ 0.7096 \end{bmatrix}$ ← **Least important** ← **Most important**

Closeness Centrality

- The inverse of farness → the sum of distances to all other nodes
- In other words, the smaller the value it is, the better

For example, closeness method = $\begin{bmatrix} 1.2500 \\ 0.6250 \\ 0.7143 \\ 0.4167 \end{bmatrix}$ ← **Least important**

← **Most important**

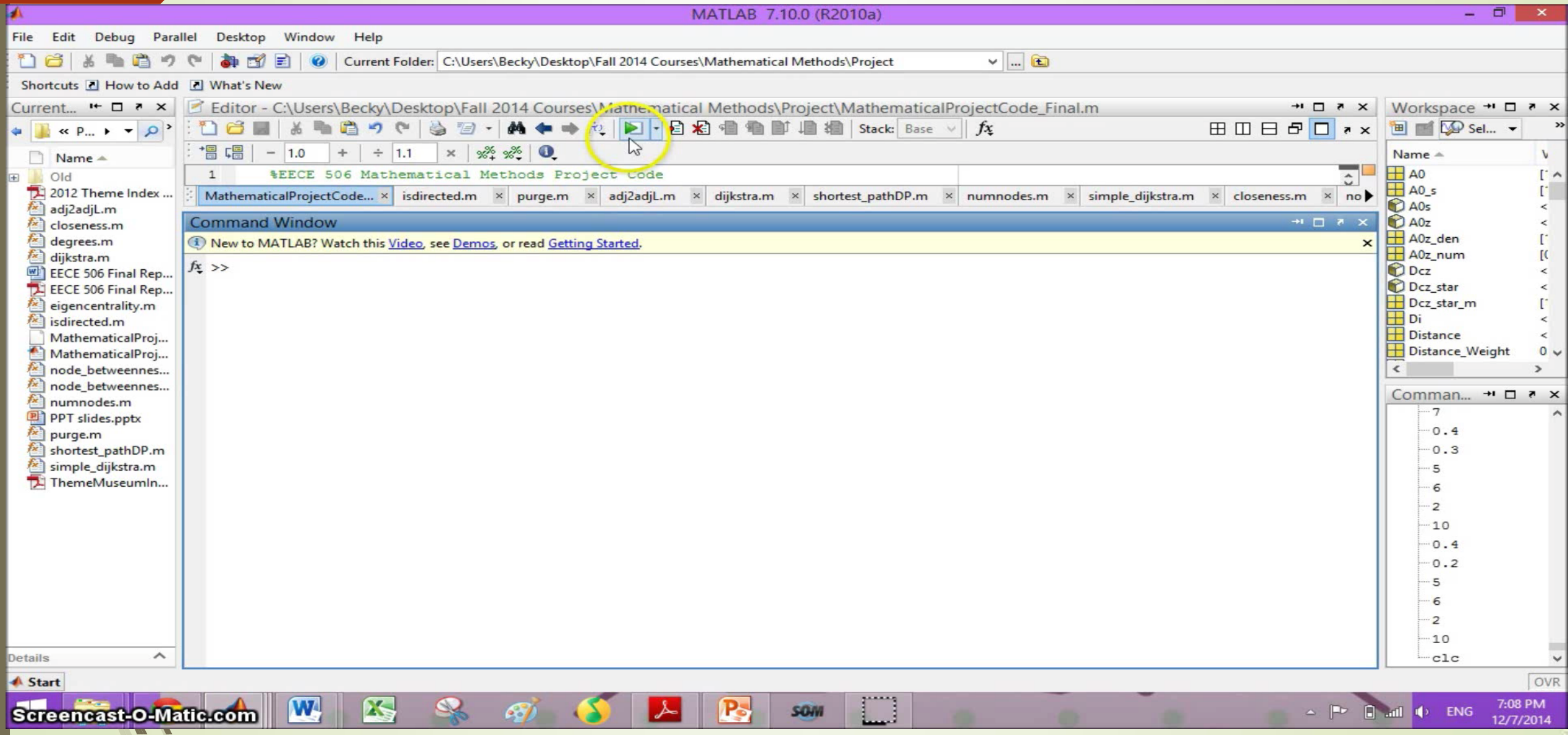
Alpha Centrality

- Enhances the process of Eigen Vector centrality
- Allows nodes to have external sources of influence on the network

For example, alpha method = $\begin{bmatrix} 0.9562 \\ 1.8155 \\ 1.6213 \\ 2.7514 \end{bmatrix}$ ← **Least important**

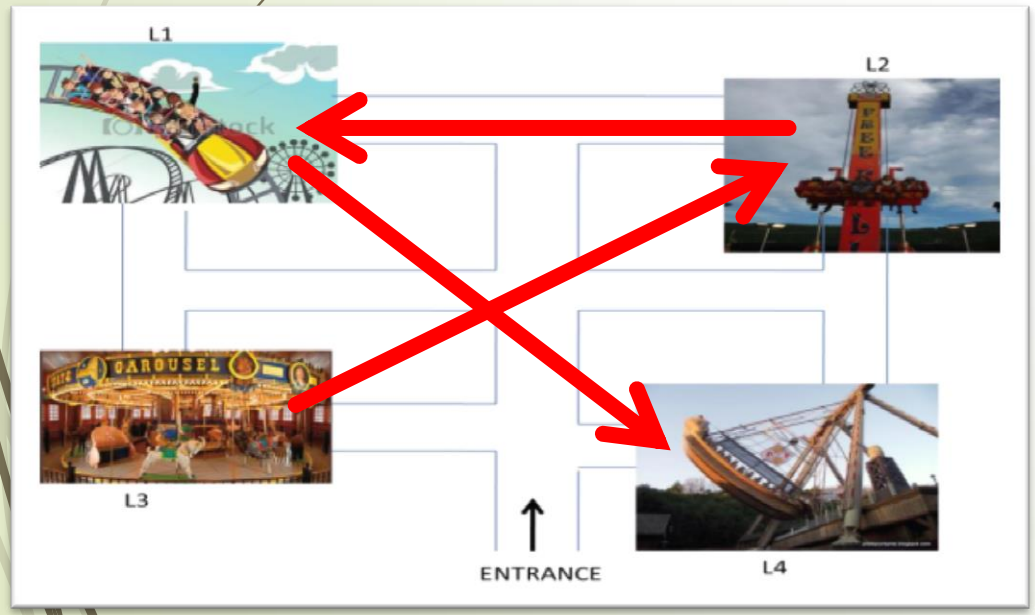
← **Most important**

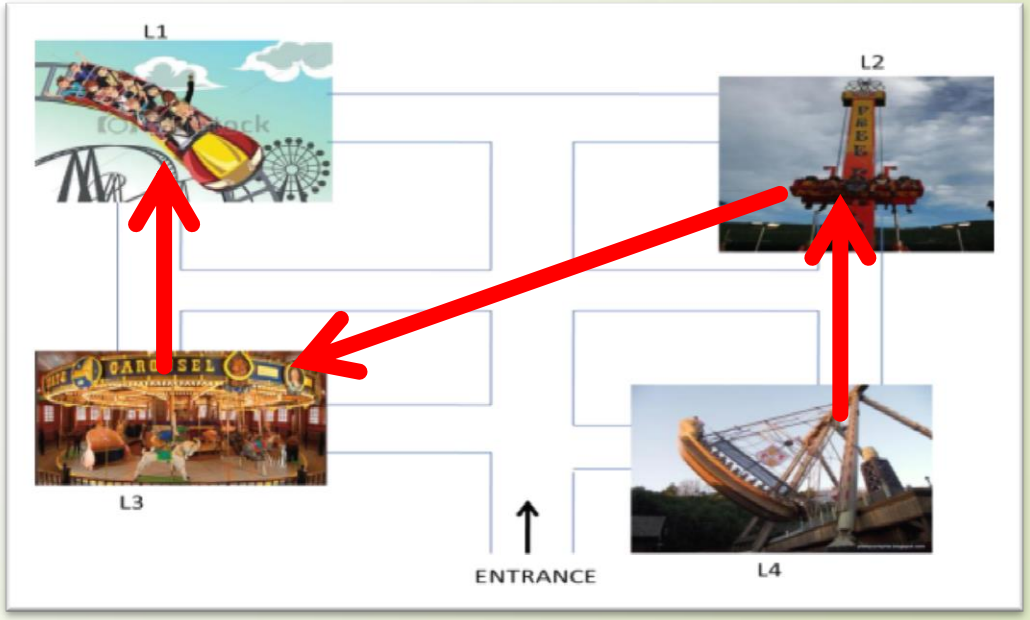
Video: Matlab Simulation



Simulation Results

- Three methods generate the same result:
  - Experiment #1: L3→L2→L1→L4
  - Experiment #2: L4→L2→L3→L1





Run-time comparison

	Parameters			Weight Factor	Methods		
	Distance	Wait Time	Interesting-ness		Eigen Vector	Close-ness	Alpha
Experiment #1	Fixed	Fixed	10,9,8,7	0.3,0.2,0.5	2.041 e-3	6.392 e-3	**3.10 e-4**
Experiment #2	Fixed	Fixed	5,6,2,10	0.4,0.4,0.2	6.00 e-4	3.856 e-3	**2.96 e-4**

Future Scope

The current implementation of the idea works well for the static parameters like distance, fixed wait time and simple user preferences. However, when dynamic parameters are considered, the current model is inefficient in providing the required solution.

Future Scope and enhancements

- Design of an automated system to implement the current model:
  - User data collection form
  - Business Logic implementation system
  - Emailing system

References

- [1] Judith Rubin , "Global Attractions Attendance Report", TEA/AECOM 2013 Publised.
- [2] Website: Touring Plans.
- [3] Judith Rubin, "Global Attractions Attendance Report", TEA/AECOM 2012 Publised.
- [4] "Matlab Tools For Network Analysis",Presentation, Massachusetts Institute of Technology 2011.

Questions?