

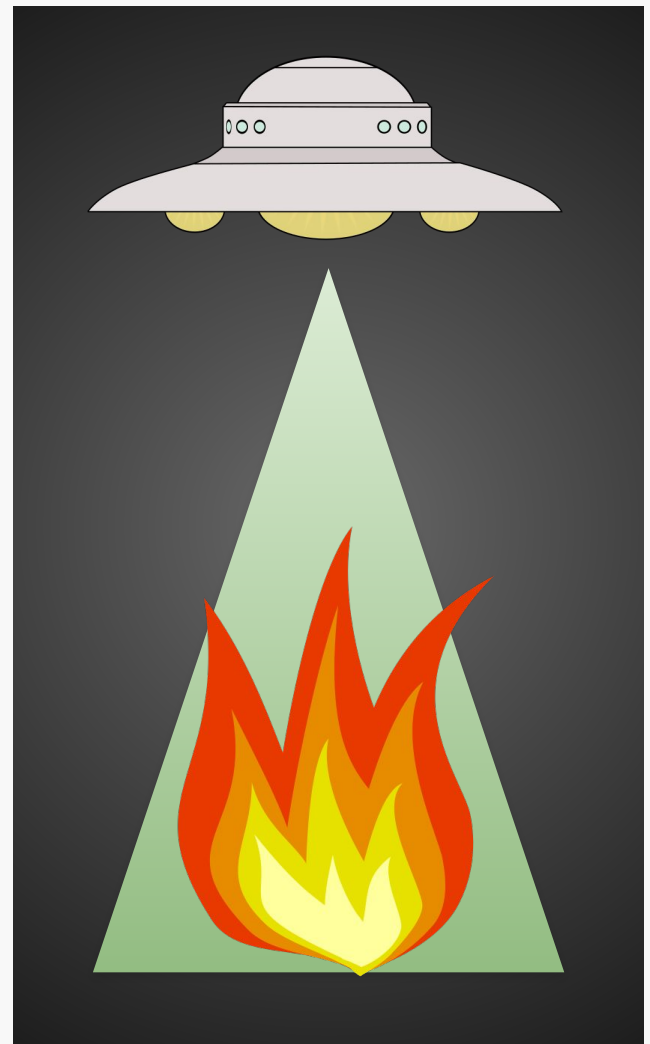
Toio Wildfire Mapping

Oliver Fong

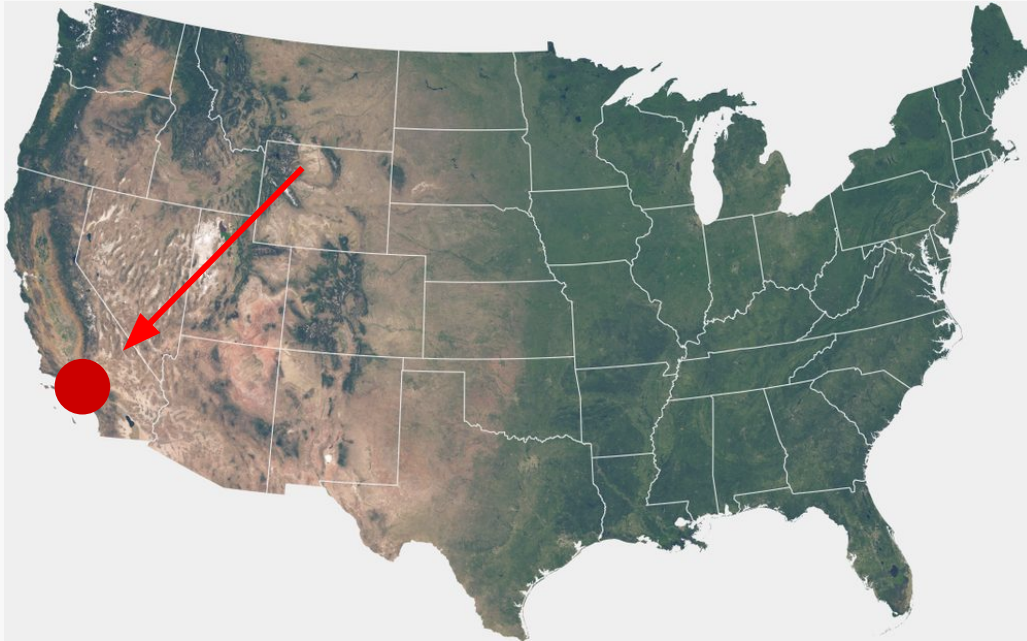
Red Atagi

Chi Wang

CMSC 20380's Project 2 | 02.20.2025



Motivation



The recent wildfires in Los Angeles were our initial motivation for creating an interactive mapping system to keep track of national wildfires.

After looking at the available datasets, we were surprised to see the extent and daily prevalence of wildfires in the US alone.

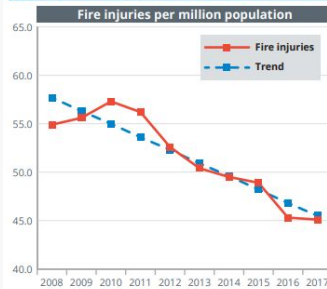
We thought toiois would be a good way to capture the prevalence of wildfires occurring at any given moment in the nation while emphasizing their physicality.

Datasets

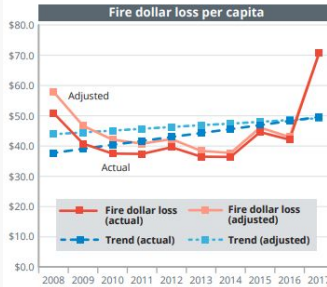
FEMA (US Fire Administration)

2008-2017 Fire Report on Fire Loss pg. 135

Figure 2. Fire loss rates (2008-2017) — continued



Injuries	
Year	Value
2008	54.9
2009	55.6
2010	57.3
2011	56.2
2012	52.6
2013	50.4
2014	49.5
2015	48.9
2016	45.3
2017	45.1
10-year trend (%)	
-21.2%	



Dollar loss per capita		
Year	Actual	Adjusted to 2017 dollars
2008	\$50.9	\$57.9
2009	\$40.8	\$46.7
2010	\$37.5	\$42.1
2011	\$37.4	\$40.8
2012	\$39.6	\$42.3
2013	\$36.5	\$38.4
2014	\$36.4	\$37.7
2015	\$44.6	\$46.1
2016	\$42.1	\$43.0
2017	\$70.7	\$70.7
10-year trend (%)	31.3%	11.9%

Sources: NFPA, CPI and U.S. Census Bureau.

Note: The large increase in the dollar loss per capita trend is partially attributed to the increase in the 2017 dollar loss estimate which reflects the Northern California wildfires.

	A	B	C	D	E	F	G	H	I	J	K	L
1	latitude	longitude	brightness	track	acq_date	acq_time	satellite	conden	version	bright_3	frp	day
2	-10.76	-44.34	305.5	1.03	1.02	#####	30 T	6.6	INRT	234.04	6.4 N	
3	-25.02	-42.67	319.93	1.16	1.07	#####	26 T	100.6	INRT	237.96	20.55 N	
4	-11.25	-49	313.1	2	1.38	#####	30 T	86.6	INRT	230.88	28.86 N	
5	-24.75	-43.2	311.57	1.13	1.06	#####	26 T	75.6	INRT	238.86	8.83 N	
6	-11.25	-43.2	305.62	2.01	1.38	#####	30 T	65.6	INRT	230.88	14.33 N	
7	-22.91	-43.73	312.83	1.25	1.11	#####	26 T	84.6	INRT	230.48	11.48 N	
8	-11.26	-43.01	304.73	2	1.38	#####	30 T	61.6	INRT	230.33	12.79 N	
9	-22.9	-43.73	311.05	1.25	1.11	#####	26 T	79.6	INRT	239.8	9.69 N	
10	-11.5	-43.01	312.1	2	1.38	#####	30 T	84.6	INRT	230.23	26.51 N	
11	-1.61	-45.11	360.89	1.09	1.04	#####	30 T	100.6	INRT	231.79	100.51 N	
12	-2.08	-39.83	315.52	1.02	1.01	#####	26 T	88.6	INRT	239.69	10.62 N	
13	-21.09	-43.14	307.36	1.12	1.05	#####	26 T	71.6	INRT	233.17	1.54 N	
14	-10.61	-45.12	354.26	1.09	1.04	#####	30 T	100.6	INRT	230.82	8.47 N	
15	-8.129	-43.14	313.02	1.01	1.01	#####	30 T	86.6	INRT	232.93	10.8 N	
16	-21.42	-48.54	311.76	2.58	1.54	#####	26 T	83.6	INRT	233.03	36.79 N	
17	-21.42	-48.57	307.67	2.6	1.55	#####	26 T	72.6	INRT	232.59	25.71 N	
18	-6.695	-42.13	306.1	1.12	1.05	#####	32 T	67.6	INRT	233.35	6.63 N	
19	-21.38	-48.57	328.23	2.6	1.55	#####	26 T	100.6	INRT	233.05	98.75 N	
20	-21.41	-48.55	303.88	2.58	1.54	#####	26 T	78.6	INRT	232.85	28.85 N	
21	-21.39	-48.58	313.81	2.6	1.55	#####	26 T	99.6	INRT	232.32	62.07 N	
22	-21.37	-48.53	304.07	2.57	1.54	#####	26 T	59.6	INRT	232.83	16.63 N	
23	-21.37	-48.56	302.88	2.58	1.54	#####	26 T	52.6	INRT	232.51	13.93 N	
24	-21.37	-48.58	311.47	2.6	1.55	#####	26 T	83.6	INRT	232.77	35.65 N	
25	-20.24	-40.24	325.21	1.02	1.01	#####	26 T	100.6	INRT	239.33	18.84 N	
26	-20.21	-40.73	303.98	1.01	1	#####	26 T	58.6	INRT	232.88	5.21 N	
27	-20.55	-43.77	303.78	1.18	1.08	#####	26 T	57.6	INRT	233.74	6.61 N	
28	-20.19	-41.24	310.15	1	1	#####	26 T	79.6	INRT	233.43	3.19 N	
29	-19.82	-43.13	305.22	1.09	1.04	#####	26 T	63.6	INRT	234.07	6.23 N	
30	-19.17	-40.13	308.02	1.04	1.02	#####	26 T	70.6	INRT	234.76	7.38 N	
31	-16.9	-43.66	305.41	1.08	1.04	#####	28 T	64.6	INRT	230.73	6.47 N	
32	-15.6	-41.8	308.85	1	1	#####	28 T	76.6	INRT	231.71	8.09 N	
33	-14.7	-43.87	301.96	2.64	1.56	#####	28 T	46.6	INRT	231.08	15.17 N	
34	-12.85	-43.82	305.39	1.03	1.01	#####	28 T	64.6	INRT	234.53	5.68 N	
35	-12.85	-43.83	306.74	1.03	1.01	#####	28 T	63.6	INRT	234.28	6.84 N	
36	-12.04	-41.39	305.13	1.07	1.03	#####	28 T	63.6	INRT	230.09	6.84 N	
37	-11.6	-44.85	314.33	1.09	1.04	#####	28 T	63.6	INRT	233.85	19.5 N	
38	-1.396	-29.217	302.49	2.54	1.53	#####	5 A	16.6	INRT	271.94	29.24 N	
39	-4.815	-33.305	303.7	2.2	1.44	#####	2 A	57.6	INRT	232.12	1.67 N	
40	-3.407	-29.195	374.46	2.55	1.54	#####	5 A	100.6	INRT	277.94	5.215 N	
41	-4.1	-29.216	394.12	2.54	1.53	#####	5 A	100.6	INRT	283.86	261.87 N	
42	-11.61	-41.578	303.34	1.18	1.08	#####	2 A	55.6	INRT	231.82	6.93 N	
43	-14	-23.192	310.62	2.55	1.54	#####	5 A	55.6	INRT	273.1	46.4 N	
44	-12.634	-30.236	304.86	3.57	1.77	#####	2 A	39.6	INRT	283.28	41.83 N	
45	-14.26	-31.81	306.06	2.55	1.54	#####	5 A	58.6	INRT	271.89	37.48 N	
46	-12.618	-30.394	309.81	3.57	1.77	#####	2 A	78.6	INRT	289.72	63.92 N	
47	-3.142	-35.15	304.41	1.01	1.01	#####	7 A	60.6	INRT	286.41	8.68 N	
48	-12.603	-30.232	310.32	3.57	1.77	#####	2 A	79.6	INRT	289.97	65.65 N	
49	-11.84	-32.327	305.58	2.37	1.49	#####	2 A	23.6	INRT	287.74	20.82 N	
50	-11.841	-32.32	307.7	2.37	1.49	#####	2 A	57.6	INRT	287.16	24.62 N	
51	-11.831	-32.318	311.77	2.37	1.49	#####	2 A	63.6	INRT	288.28	35.01 N	
52	-11.1	-36.365	308.83	1.18	1.08	#####	2 A	76.6	INRT	287.54	12.16 N	

NASA-FIRMS (Fire Information for Resource Management System)

MTBS (Monitoring Trends in Burn Severity) Map

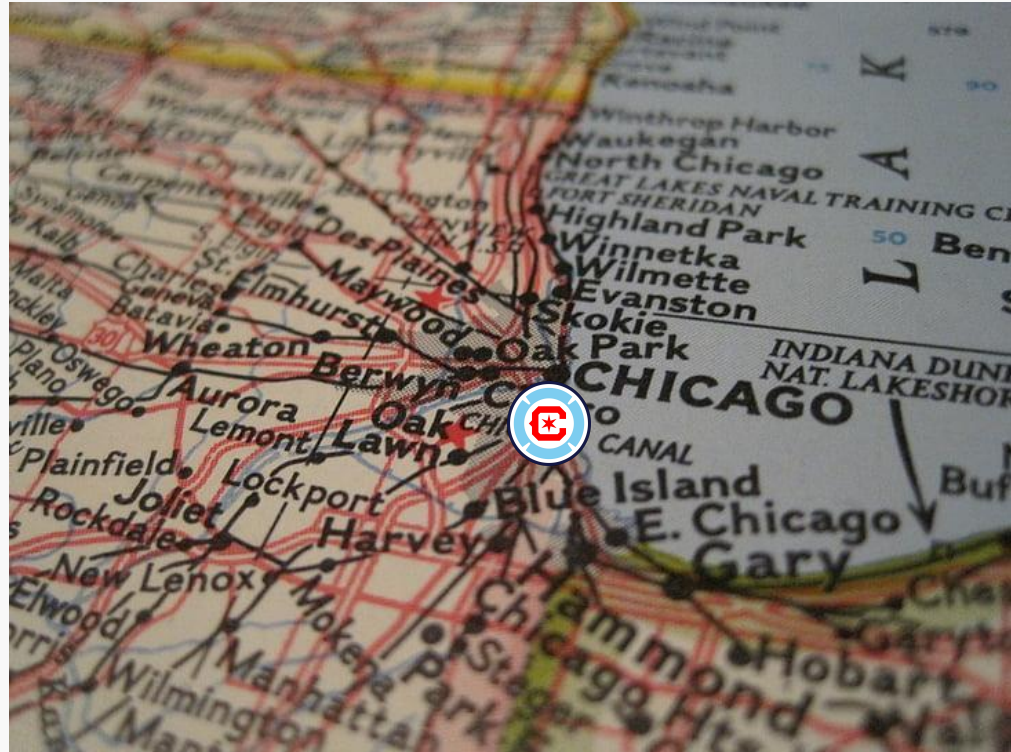


FEMA Example Data

* Coordinates **41.8°,
87.6°**

* FRP **350**

* Start Time **0325**



Implementation



Features:

Clustering

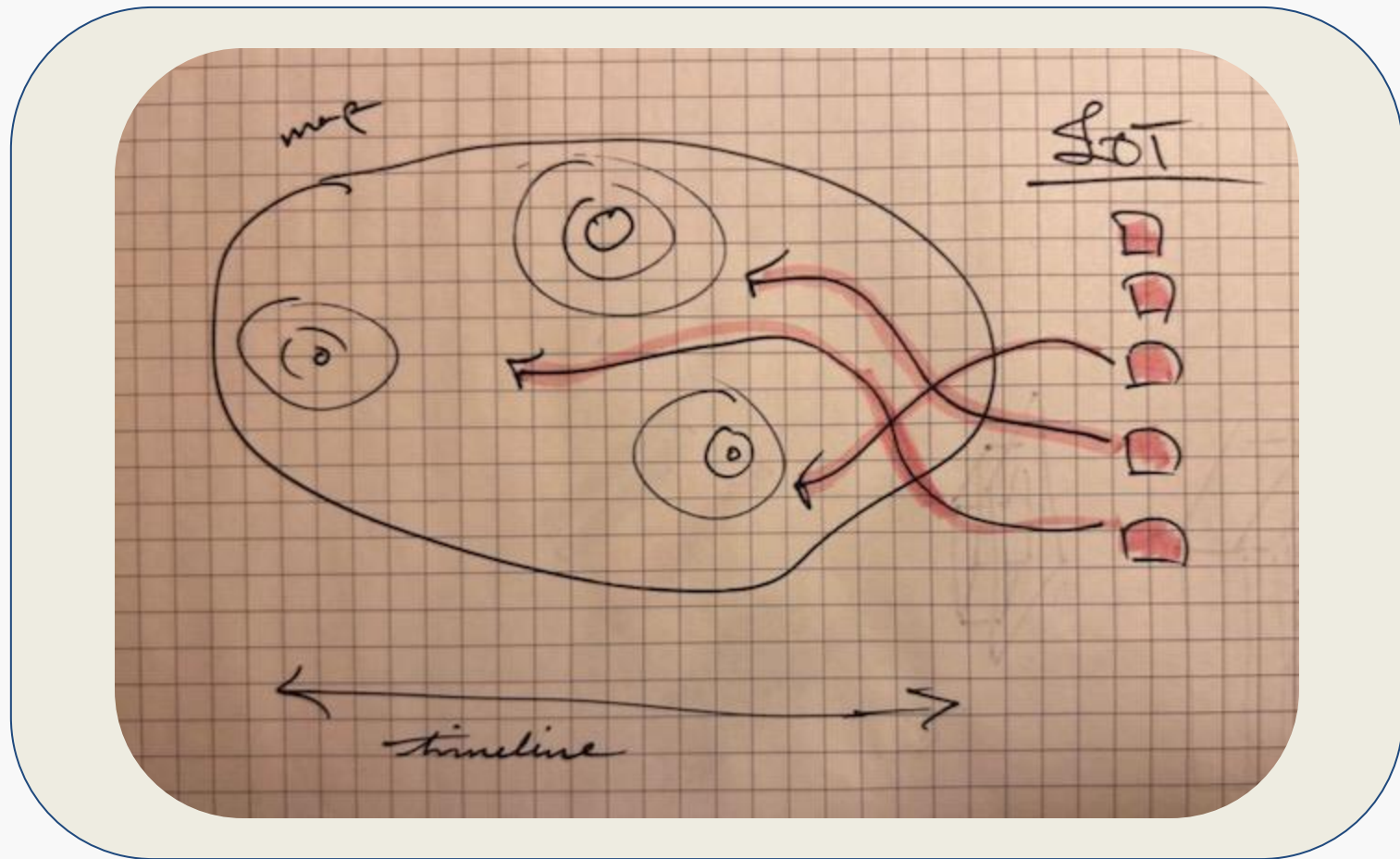
Data Display

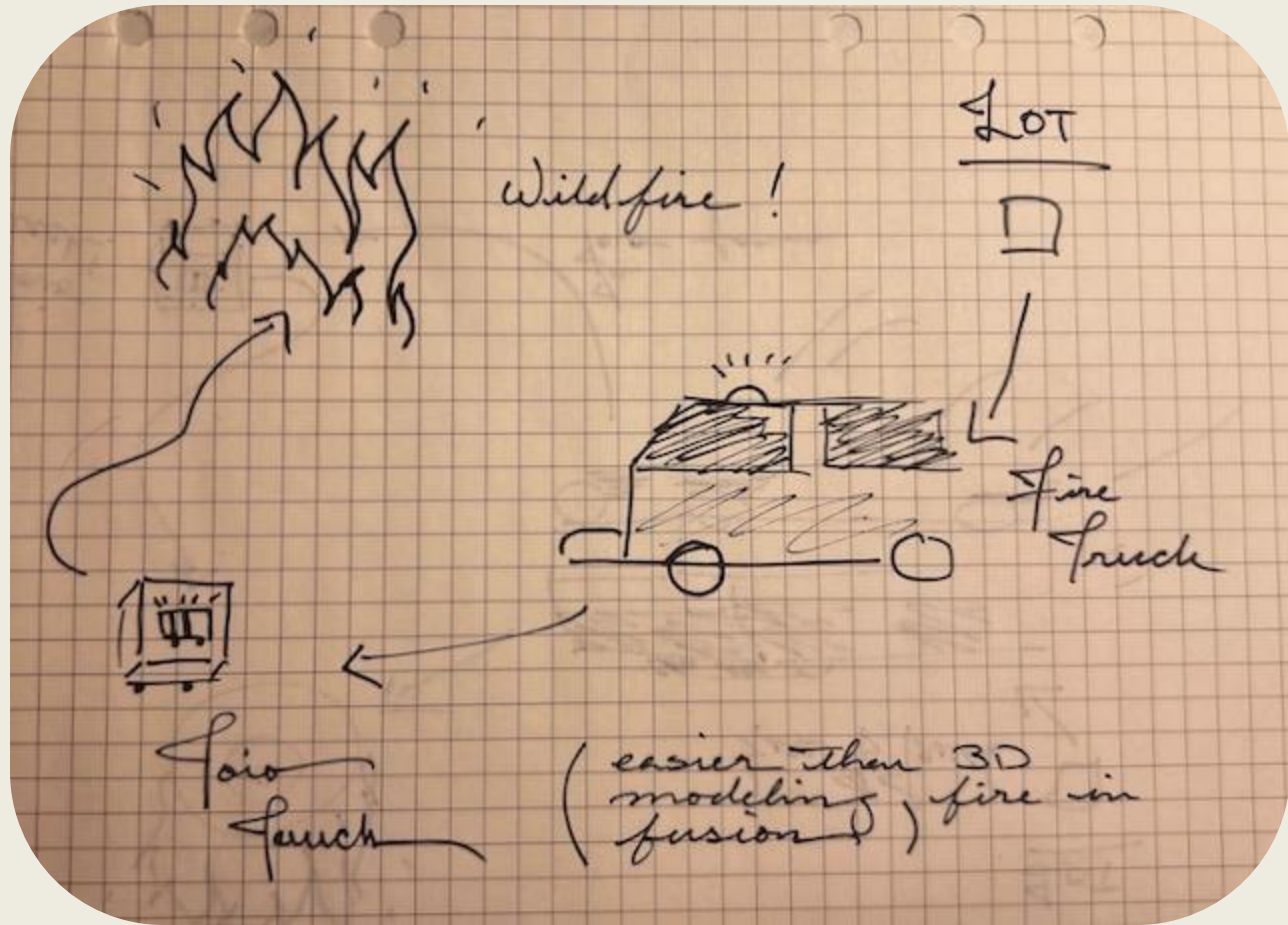
toio Spinning

Timeline

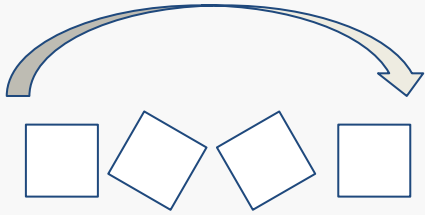
Parking Lot

US Map





Reflection: Pros



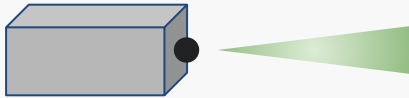
Toio Responsiveness

- Toios were snappy
- Responded to function calls quickly
- Led to satisfying movement



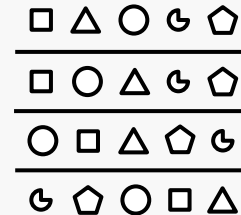
Shape Animation

- draw() function's high frame rate led to fluid animation
- Integrated shape drawing - easy to use
- Built in doesn't look too bad!



Projector

- No - nonsense
- Apart from physically setting up, minimal technical difficulty
- Worked how it should! Only takes one button for HDMI



Public Fire Data

- Easy to work with
- Legible
- There was a lot of data
- Very informative!
- Clear importance

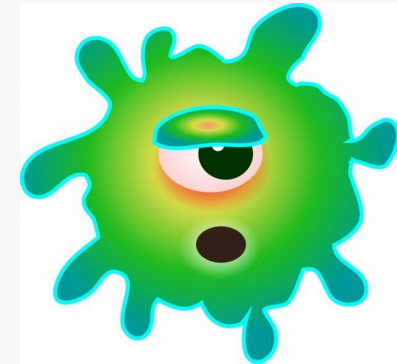
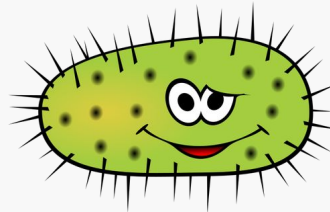
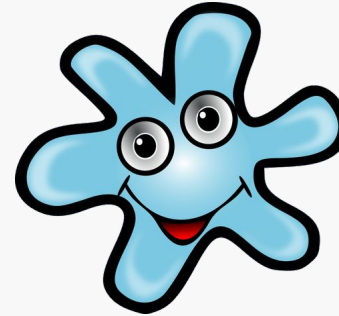
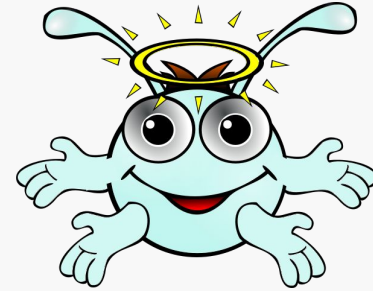
Reflection: What went wrong?

Sickness! Two of three of our group members got sick which certainly hampered our ability to work together under this tight time frame.

Work in CSIL as a group is always tough due to busy schedules and location

Toios were sometimes difficult to work with - charging, mats, input sensitivity

Processing! Poor UI and legibility. Had some problems with Windows



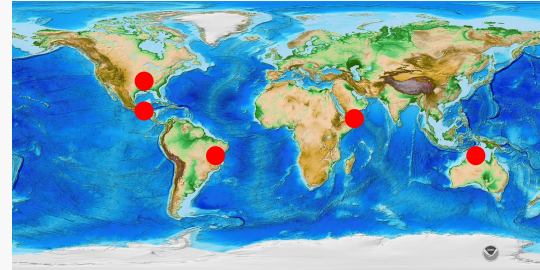
Future Implementation

More toio interactivity apart from just the timeline and the tapping

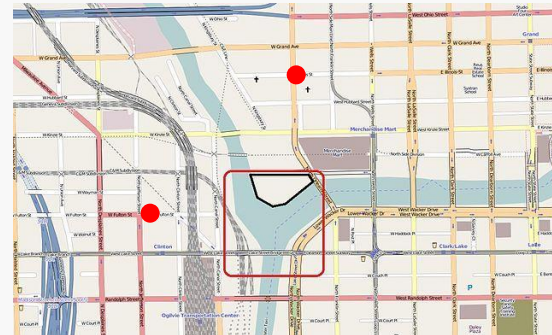
Wildfire simulation through Sims-like city: build it yourself and protect yourself from the fire

Larger scale - worldwide depiction of total wildfires in real time, and accurate dot scaling to represent severity

08



On a local scale - for a small area (like Chicago), and with local fire data, use toios as real fire trucks and deliver them to the fire



Thanks!



CMSC 20380

Fire Mapping

Oliver

Chi

Red

