

### Level Design Analysis: Google Chrome Dinosaur Game

The Google Chrome Dinosaur game also known as “T-Rex Runner” was designed as an Easter-egg game for Google Chrome users that cannot connect to the internet [1]. An interesting fact about this game is that the high score is in relation to years and the game maxes out at 17 million years in relation to the amount of time that the T-rex was alive on Earth according to the designers [1]. This level design analysis will specifically look at my recorded gameplay from scores 0 – 1700, using this recording to make a spreadsheet that indicates obstacles, distance between obstacles and time taken from one obstacle to another. The spreadsheet is divided into four categories, namely: beginning, middle, end and overall breakdown, using this spreadsheet this paper will analyse emerging patterns, pacing, dynamics and overall level design, from which I designed a new level that maintains the general game feel, but differs from the recorded data in a meaningful and interesting way.

OBSTACLE KEYS:	OBSTACLES	Number Of Cactus
s_C= Small Cactus	s_C1	1 = one cactus
m_C= Medium Cactus	s_C2	2 = two cactus
l_C= Large Catus	s_C3	3 = three cactus
l_B = low Bird		4 = four cactus
h_B = high Bird	m_C1	
Time between Obstacles:	I_C1	
	I_C2	
t_short	I_C4 (this combination includes 3 large cactus and 1 small cactus)	
t_medium		
t_long	I_B	
	h_B	
Distance between Obstacles:	d_short	
	d_medium	
	d_long	

(figure 1: screenshot of the spreadsheet)

	A	B	C	D	E	F	G	H	I	J	K	L	M
Break down of Beginning, middle, End													
Beginning(1 sec - 15 sec)													
d_long	I_C1	d_short	I_C1	d_short	s_C2	d_medium	s_C2	d_medium	I_C1	d_medium	s_C2	d_medium	
t_long		t_long		t_long		t_long		t_long		t_long		t_long	
Middle(50 sec - 65 sec)													
d_long	I_C2	d_long	I_C2	d_long	s_C1	d_medium	I_B	d_long	s_C1	d_short	s_C3	d_long	
t_long		t_medium		t_medium		t_medium		t_medium		t_short		t_medium	
End( 93 sec - 108 secs)													
I_C4 (this combination includes 3 la	d_long	s_C2	d_long	h_B	d_long	s_C3	d_long	I_B	I_C4 (this cor	d_long	s_C1	d_short	
	t_short		t_short		t_short		t_short		t_short		t_short		t_short
Overall breakdown:													
t_long	t_long	t_medium	t_medium	t_medium	t_short	t_short							
d_short	d_medium	d_long	d_medium	d_long	d_long	d_medium							

(figure 2: screenshot of the spreadsheet)

Figure 1 is a screenshot that provides the naming conventions that the obstacles and other variables such as time and distance are indicated as in the mapping of the level( as seen in figure 2). The

recorded data in figure 2 is a screenshot of a fraction of the data collected from the recorded gameplay. The level was mapped out as follows:

1. Size of the obstacles.
2. Distance between the obstacles.
3. Time between one obstacle to another obstacle.
4. The relationship between distance and time.

1.1 When mapping out the level on the spreadsheet it was evident that there were 10 main obstacles in the recorded gameplay, these obstacles varied in size, numbers and position. Figure 3 below is an indication of the difference in size and numbers, on the left side of the screenshot there is a single large cactus (key l\_C1) and on the right two small cactus(key s\_C2).



*(figure 3: screenshot of obstacles from recording)*

2.1 When drawing up the spreadsheet the biggest aspect of the game that stood out to me was the increase in overall distance between obstacles as the game progresses. The distance between obstacles started of short and medium, as the game progresses the overall distance between obstacles were medium and long and the pattern continued. There were a few outliers in distance which kept the game interesting and the players attentive.

3.1 The time between obstacles in this game is straight forward, as the games pace increases at every 100 years the time between obstacles fastens. Time between obstacle may be affected by the distance between them but if obstacles are at the same distance the time between obstacles that appear later in the game will be shorter.

4.1 The relationship between distance and time, as the game progresses the overall distance between them increases and time between them decreases relatively. We can relate this to the theory of Flow by Mihaly Csikszentmihalyi, the graph of boredom and anxiety [2]. The level of the game despite being procedurally generated follows a concise pattern. The game starts of slow, introducing most of the obstacles early in the game so that the player gets a feel and knows what to expect. As the game progresses the time between obstacle shortens but the distance is constant for a period before a small section of outliers are introduced, this part is generally more intense and pushes the bounds of anxiety in Mihaly's graph. This is then followed by a section where the distance is constant once again breaking that feeling of anxiety [2]. This pattern is repeated throughout the game.

New Level Design:

New Level Design		Beginning	
t_long	t_long	t_long	t_long
d_short	d_short	d_long	d_medium

(figure 4: new level screenshot)

Middle					
t_medium	t_medium	t_medium	t_medium	t_medium	t_medium
d_medium	d_long	d_medium	d_short	d_medium	d_long

(figure 5: new level screenshot)

End					
t_short	t_short	t_short	t_short	t_short	t_short
d_long	d_long	d_medium	d_short	d_medium	d_long

(figure 6: new level screenshot)

The main change to the level that I added was changing the relationship between time and distance, instead of keeping the constant tempo at one distance, change it so the player may get a feel for the game at constant tempos at different distances.

Overall breakdown:

t_long	t_long	t_medium	t_medium	t_medium	t_short	t_short
d_short	d_medium	d_long	d_medium	d_long	d_long	d_medium

(figure 7: spreadsheet of recorded level)

Figures 4, 5 and 6 is designed to allow players to experience as much attributes as possible while keeping the flow of the game. It does this by gradually transitioning distances “constantly” while keeping the general repetitive tempo of the game, but at different distances. The outliers and obstacle selection will remain the same. The general pattern in the level design is that single obstacles were the most common at later stages of the game. The change to the game is meaningful in the sense that it allows the players to fully explore the jumping mechanic of the game. If players are jumping at one constant distance it gets them into the habit of jumping at the same time all the time. Having them jump at different distances the player will get the feel for when they should jump early and when they should jump later, fully understanding the jumping mechanic. The game also has a ducking mechanic that can be utilized to cut the player characters jump but without utilizing this mechanic players are able to accomplish the exact same thing.

One of the most insightful aspects to me was the increase in distance as players progress the reason being is that I would generally expect all attribute of the game to get harder, in my head progression

of this game would be to make obstacles closer together while increasing the pace. In this respect the designers increase the difficulty one attribute while lightly decreasing the difficulty of another. The changes in the distance is what keeps players attentive and often the reason for their failure.

#### References:

[1]"T-Rex Runner", *T-Rex Runner Wiki*, 2020. [Online]. Available: [https://trex-runner.fandom.com/wiki/T-Rex\\_Runner](https://trex-runner.fandom.com/wiki/T-Rex_Runner). [Accessed: 19- Feb- 2020].

[2]"Beyond Boredom and Anxiety", *Google Books*, 2020. [Online]. Available: [https://books.google.com/books/about/Beyond\\_Boredom\\_and\\_Anxiety.html?id=afdGAAAAMAAJ](https://books.google.com/books/about/Beyond_Boredom_and_Anxiety.html?id=afdGAAAAMAAJ). [Accessed: 19- Feb- 2020].