Data Visualization Assignment 1
Analyzing and Visualizing Player Behaviour in DOTA2

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December 16, 2015

1 Goal of analysis and visualization choices

Given the dataset 5 analysis has been performed in this paper:

a) Average team distance
The average distance between team mates during a game per tier level. Winning and losing teams are visualized separately. This analysis is the same as in [1], but the visualization is significantly different since one second moving average of the average team distance (team spread) was plotted in [1], whereas in this paper the simple average is visualized.

b) Number of zone changes per minute
The number of zone changes per player per minute, differentiating by tier level. A box and whisker plot has been used to visualize this data.

c) Map of heroes' deaths
Heat map of deaths, differentiating by tier level and by winners/losers, it would have been extremely interesting to also visualize an heat map of heroes' kills (and especially heroes' kills of other heroes), but unfortunately the dataset does not allow this. A heatmap has been chosen to visualize this analysis.

d, e) First spawn position and Last player's position
In d) the first position of players is plotted on the map. Since player can choose where to spawn the first time, it is interesting to notice if there is a significant difference between skill tiers. A color has been chosen for each tier level, winning and loosing players are identified respectively by dark and light hues. e) shows the last recorded position of each Heroes with the same criteria.

2 Technique and Results

2.1 a) Average team distance

Figure 1 shows the average team distance in the beginning of matches, whereas Figure 2 shows the same value in the last part of matches. The unit used in the X axis is the in-game metric for distance.

In the early stages of the game it's pretty clear that more skilled players in a team move way closer to each other, and less skilled player tend to have a higher distance. Also, for all tiers excluding Normal, winning players tend to stay closer than loosing players. In the last stages of the game though this pattern is not present anymore and all tiers show a similar distance. What remains is the difference between winning and loosing players of every tier level. A common thing between the two figures is that Normal tier does not seem to follow any pattern described above.

2.2 b) Number of zone-type changes

Figure 3 shows the number of zone changes per minute. This analysis gives the same results as [1]. The higher the skill level the more the player changes zone in a minute. This data are visualized through a box and whisker plot.

2.3 c) Map of heroes' deaths

Figure 4 is a heatmap of players' death. From this map it's clear that most battles take place in the centre of the map, in the central part of the middle lane. Other hot spots are the central parts of the external lanes and the zones right outside teams' bases. There is no significant difference between skill tiers and winning and losing teams, therefore only one map is showed.

2.4 d) First spawn position

In DOTA2 players can choose wherever they want to spawn when a match begins. The first spawn position has been determined by looking at the x and y coordinates from the file `master-zones.csv` for each player when the value of `tsync` is equal to 0. 1960 entries (196 matches * 10 players per match) have been used for this analysis. Results of this analysis can be seen in Figure 5. This Figures have been created after preprocessing the data set.

A pattern emerges clearly: more skilled players tend to spawn closer to their base, whereas less skilled player tend to spawn randomly across the map. There is no significant difference between winning (darker color) and loser players (lighter color).

2.5 e) Last player's position

Results of this analysis can be seen in Figure 6. Pro players tend to play the last instants of their games spreaded between the two bases, the central lane and

partially in the jungle; other tiers, though, don't show this pattern and most of them end the match in the two bases: only a few players are in the central lane.

References

[1] A. Drachen, M. Yancey, J. Maguire, D. Chu, I. Y. Wang, T. Mahlmann, M. Schubert, and D. Klabajan, "Skill-based differences in spatio-temporal team behaviour in defence of the ancients 2 (dota 2)," in *Games Media Entertainment (GEM), 2014 IEEE*. IEEE, 2014, pp. 1–8.

3 Figures

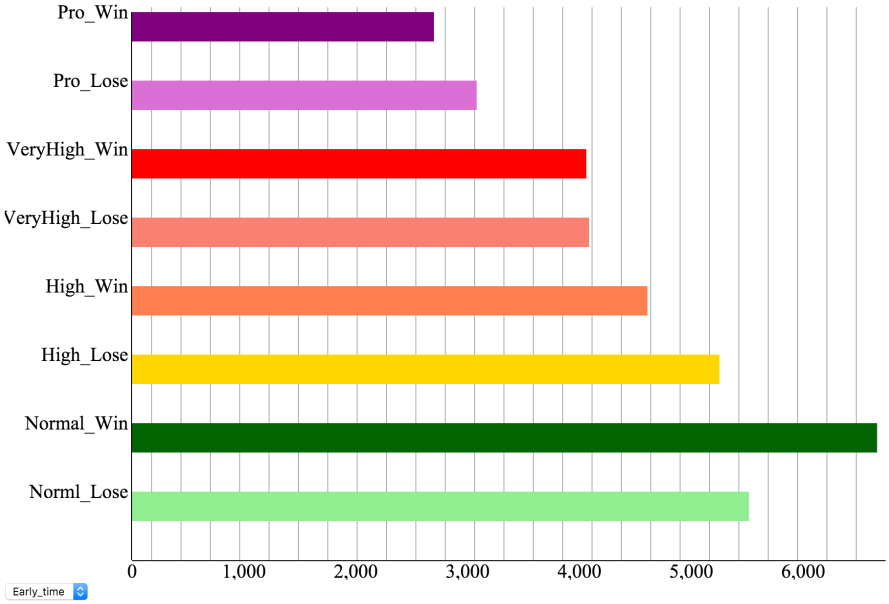

Figure 1: Average team distance between members of a team in the beginning of matches (from time 0 to time 1000, first 25%).

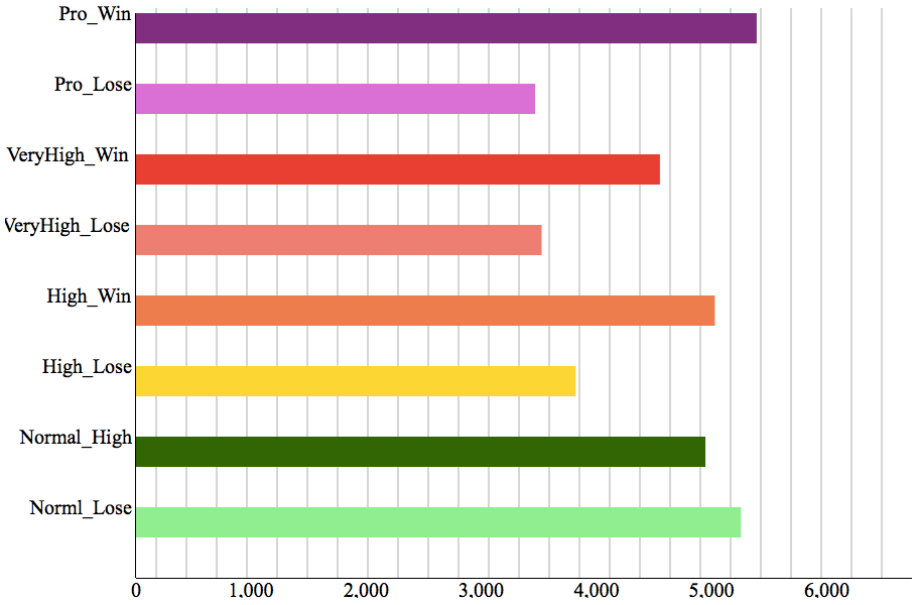

Figure 2: Average team distance between members of a team in the last part of matches (from time 3000 to time 4000, last 25%).

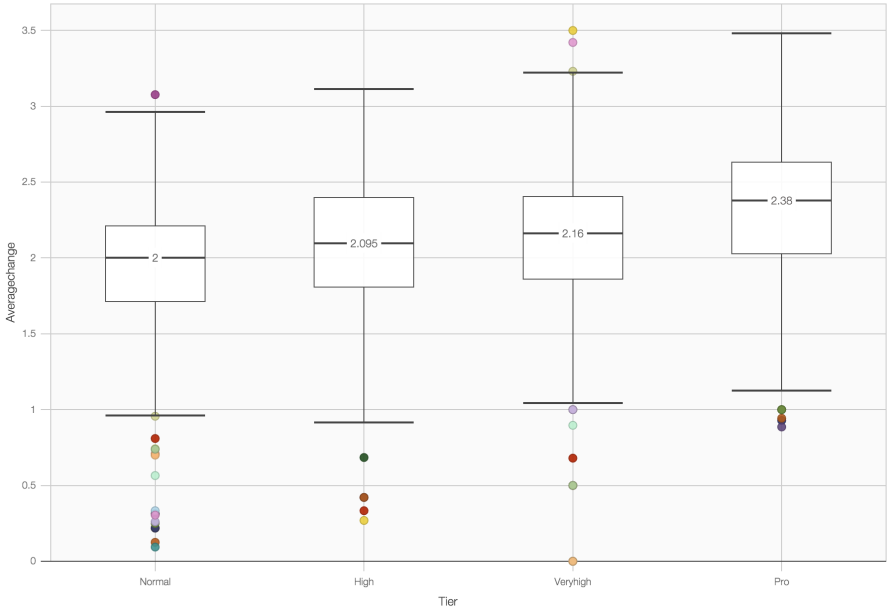

Figure 3: This boxplot shows the number of zone changes per minute

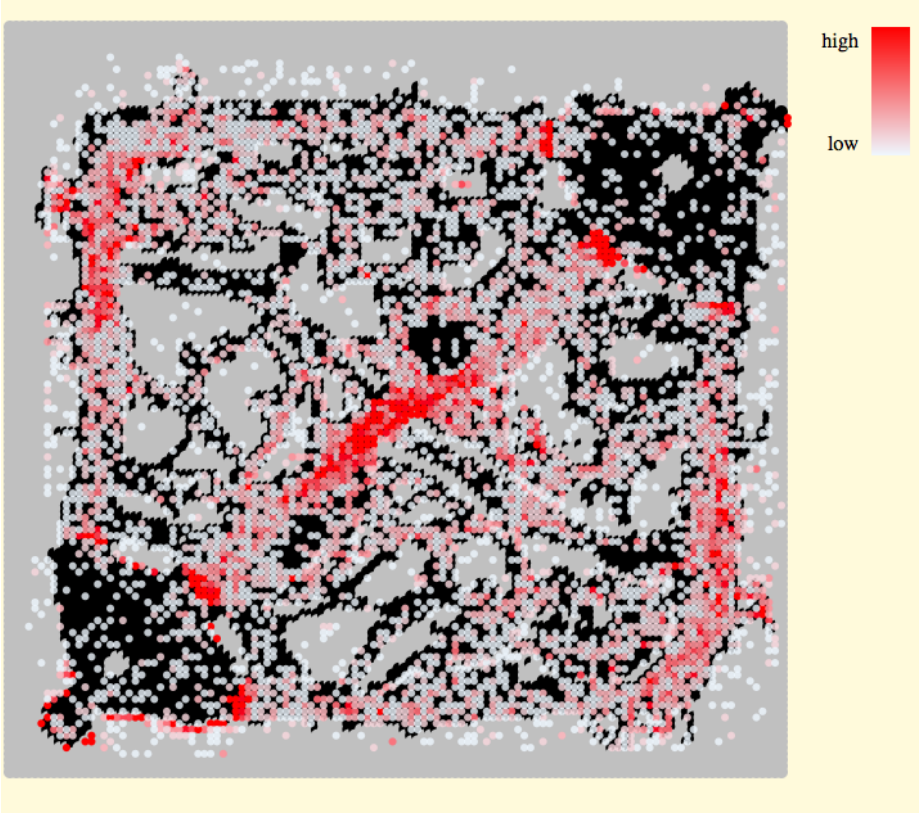

Figure 4: Heatmap of players' deaths.

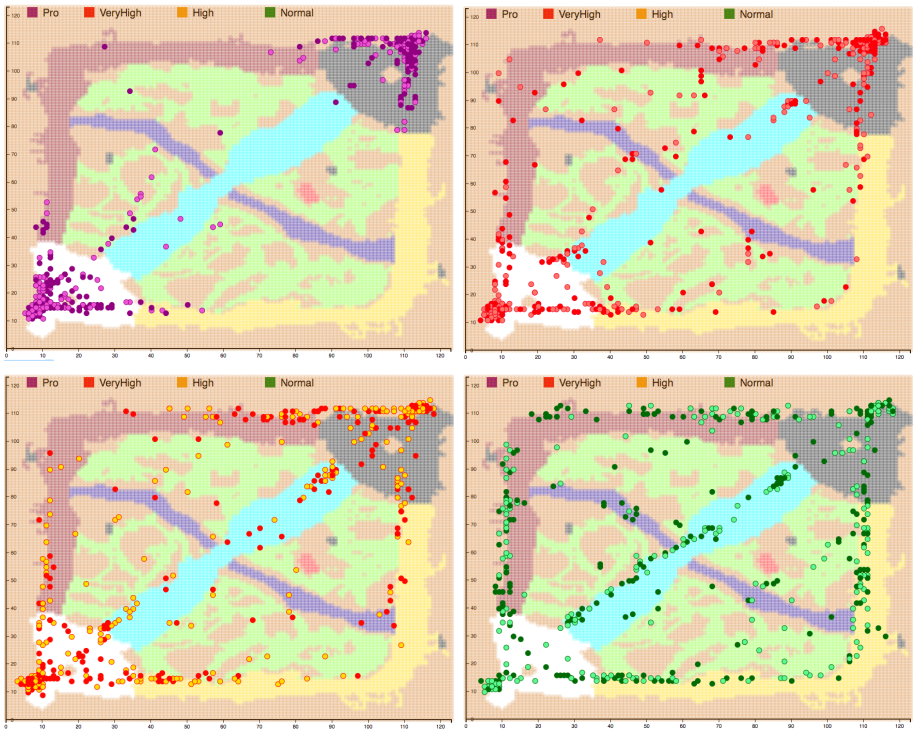

Figure 5: First spawn position of players. From top left clockwise: Pro, Very High, High, Normal. Darker hue indicates winning players, lighter hue indicates loosing players.

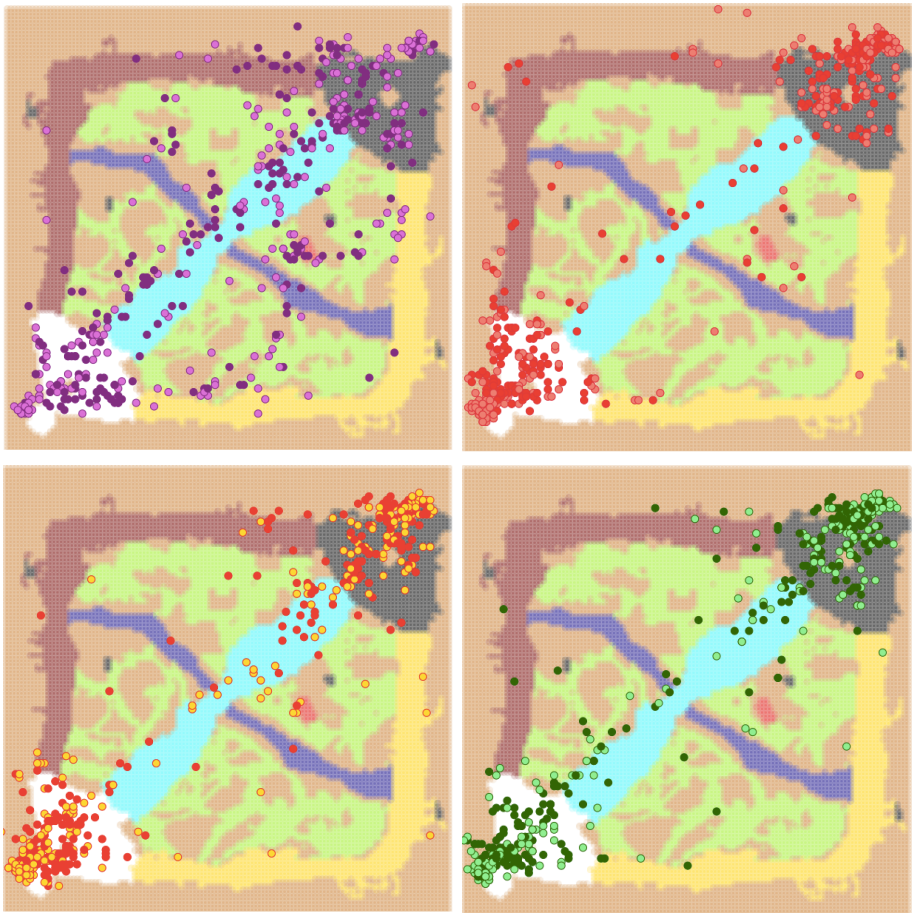

Figure 6: Last recorded position of players. From top left clockwise: Pro, Very High, High, Normal. Darker hue indicates winning players, lighter hue indicates loosing players.