Introduction

UltraHardCore is a gamemode in the sandbox game Minecraft, popularized by the gaming community Mindcrack. The Diorite Experts started organizing their own seasons in 2014 and have now passed the total amount of seasons Mindcrack has hosted.
Since this gamemode is highly competitive, it is interesting to find the best player overall. Along with the straightforward results of the matches also a model has been developed by /u/MisterSplendid on the /r/mindcrack subreddit. [1] In this document, this model will be explained in detail.

1 The Model

1.1 Formalism

Of course the first question one can ask when thinking about a ranking is "What makes one player better than the other?" In UltraHardCore this comes down to two things: ability to survive and ability to eliminate other players. The quantities that will be assigned to these objectives are finishing position in a season n and the amount of kills a player made during a season k. To compare finishing positions between players, the survival rate s will be introduced (see section 1.2). This is then enhanced with the amount of kills a player has made to form the performance score p (see section 1.3). Which leads to a final ranking score r that can determine how well a player performs (see section 1.4).

1.2 Survival Rate

Let's look at a straightforward case first. Players who die later on in the game are usually better at surviving than players that die early on. Without including any external factors yet, a ratio can be computed between the total number of participants N and the finishing position of a player n. This ratio will be between 0 (indicating bad survival ability) and 1 (indicating perfect survival ability). Keeping this in mind, the nominator of the ratio has to increase for a decreasing n. These conditions lead to the following equation which is called the survival rate s.

$$s = \frac{N - n}{N - 1} \tag{1}$$

After several seasons the mean of these survival rate scores can already give a good indication of a player's survival ability. That is

$$\bar{s} = \frac{\sum_i s_i}{M} \tag{2}$$

where M is the amount of seasons in which the player has participated. Also for this mean value a score of 0 is considered as terrible and a score of 1 as amazing. As of season 30, the player with the highest mean survival rate (who participated in 3 or more matches) is MTM707 with a score of $\bar{s} = 0.72$.

1.3 Performance Score

To enhance this result, also the amount of kills a player has made during a season k and the contribution of the player to the team's performance $Ш$ are used to calculate the so called player ability a. $Ш$ is defined as follows

$$Ш = \begin{cases} s, & \texttt{if team won} \\ 0, & \texttt{if team did not win} \end{cases} \tag{3}$$

In order to now calculate the player ability a, k and $Ш$ are now weighted with the total amount of kills in the match K and the total number of winners on the team W as

$$a = \frac{Ш + k}{W + K} \tag{4}$$

This needs to scale with the survival rate, so a multiplication with $\frac{N}{2}$ is required before it is added to the survival rate to form the performance score p

$$p = a\frac{N}{2} + s \tag{5}$$

Currently, after 30 seasons, the highest achieved performance score was $p = 4.00$ by Tiba101 in season 13.

1.4 Ranking Score

An average of these performance scores now leads to a final ranking. However, older performances are less representative of a player's current ability than performances during newer seasons. Thus, the average must be weighted over time. For this a time period of 48 months (4 years) is selected, making the weights less powerful every month. With m being the amount of months since that season, the weights x are calculated by

$$x = \frac{48 - m}{48} \tag{6}$$

This leads to the final result, the ranking score r

$$r = 100\frac{\sum_i x_i p_i}{\sum_j x_j + 2.5} \tag{7}$$

This weighted sum is multiplied by 100 to make it easier on the eye. The last term that stands out is the 2.5 term in the denominator. This term has been added to incorporate luck in the model and eliminate irregular performance scores. So far, the highest ranking score belongs to Snodog627 who managed a peak ranking score of $r = 166$ after season 28.

2 Progression of the ranking score

In the following image the progression of every player's ranking score over the years is shown.

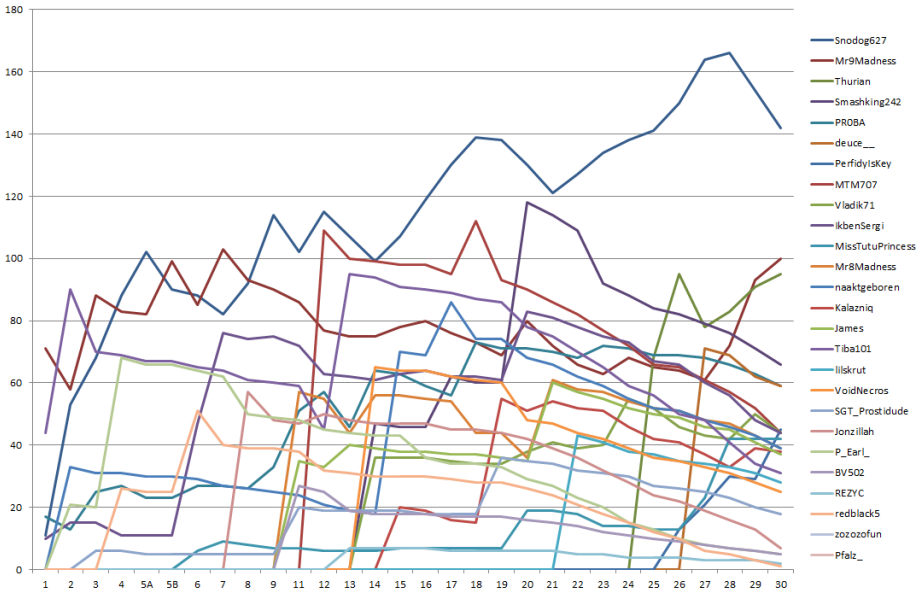

Figure 1: Progression of the ranking scores from season 1 to season 30.

References

[1] /u/MisterSplendid. (2014). Unofficial Ranking System for UHC[UHC]. Retrieved from https://www.reddit.com/r/mindcrack/comments/2ijnrz/unofficial_ranking_system_for_uhcuhc/