Analysis of the Potential Implementation of an Automatic Strike Zone

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Project Overview

The MLB currently possesses the ability to implement an Automatic Strike Zone, eliminating the need for an umpire to be calling balls and strikes. Before using it, however, it is important to know how this addition might change the game.

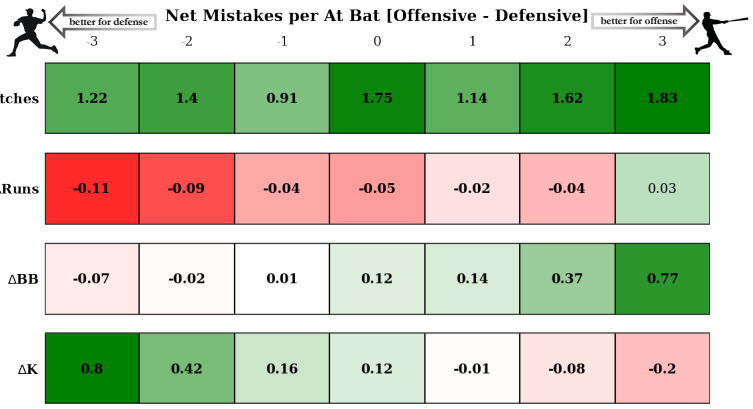
The main objective is to quantify the impact of the automatic strike zone. In order to accomplish this task, our team analyzed the difference between existing innings, grouped by their mistake characteristics, and created a predictive model to allow us to analyze how a game, if called correctly, may have ended differently.

Methodology & Approach

I. Existing Discrepancies: After determining that our metrics of focus would be **strikeouts**, **walks**, **runs scored**, and **pitches thrown**, we grouped at bats by the number of offensive and defensive mistakes they contained. **Offensive mistakes** (true strikes that had been called balls) are advantageous for the batting team, or while **defensive mistakes** (true balls that have been called strikes) aid the fielding team. We defined a **true strike** as a ball that was inside, or touched any part of, the strike zone, which was 17 inches across the plate and customized on each pitch to the height of the batter, using top and bottom data provided. This breakout allowed us to compare the average number of each metric with the average number in a perfect, mistake-free at bats in order to quantify the impact

II. Predicted Changes: We created a **predictive model** that steps through each pitch. When it finds an umpire error, it corrects the state (ex. if the third pitch took the count to 2-1, but it was an incorrectly called ball, the new count would be 1-2). From there, it predicts the **next most likely state** for the game to enter, and so on, until we reach the end of the at bat. From there, there are three possibilities: the outcome could be the same, the batter could get out when he previously got on base, or the batter could get on base when he previously got out. We adjust runners and insert new batters where necessary, and stitch on reality as soon as possible. The model returns a full, **error-free game**. We compared our "corrected" games with the original versions to determine the difference the mistakes made in the metric outcomes.

Results: Existing Discrepancies

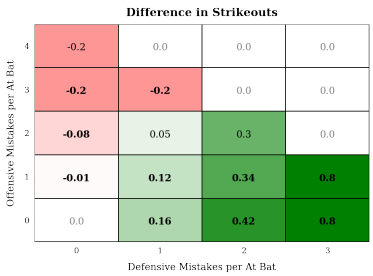


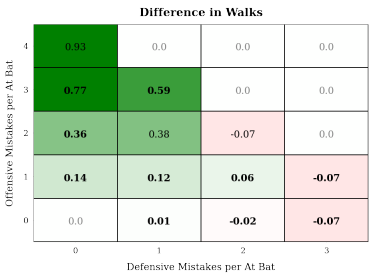
Note: Δ values calculated as [X Mistake Inning Average - 0 Mistake Inning Average]
Non-bolded statistics have a p-value of greater than 0.05, and thus have been deemed statistically insignificant.

For each at bat, we took the net mistakes (offensive minus defensive) in order to get a broad strokes picture of the impact. **Strikeouts** and **walks** had **clear and opposite trends**, while runs and pitches had weaker patterns.

In order to increase granularity, we then classified at bats by the combination of offensive and defensive mistakes they contained, so we could get a clearer picture of how each type of mistake was changing the outcomes.

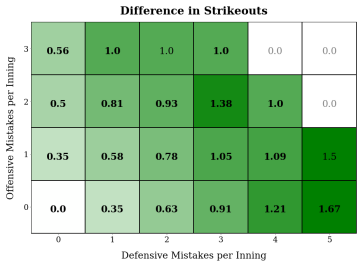
The mistakes in one team's **favor** have a **greater impact** than the mistakes **against** a team. When there are more offensive mistakes, or net positive, there are a great deal more walks, but a smaller decrease in strikeouts. The same goes for defensive mistakes.

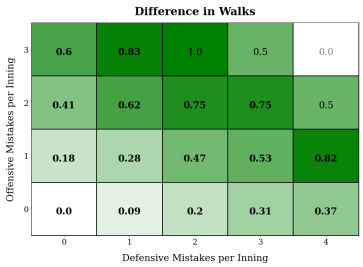


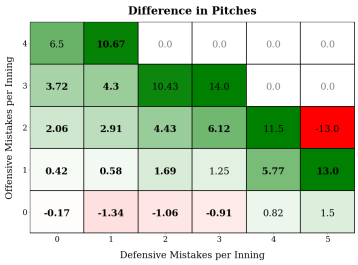


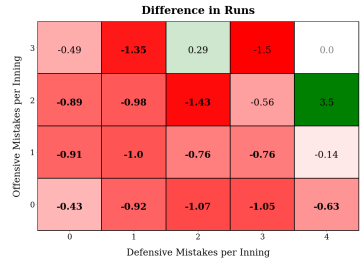
Results: Predicted Changes

The following metrics are calculated as the original innings **with mistakes** minus the new, **corrected** innings.









Strikeouts and walks both decrease in the corrected games, likely due to an undercounting in the model. Pitches follow an anticipated trend; **fewer pitches are thrown** after correcting **offensive** mistakes but **more are thrown** after correcting **defensive** mistakes. Runs are a more confusing trend, increasing in all corrected games, no matter the mistake combination.

Conclusions & Moving Forward

Our analysis of existing innings shows that umpires have a **tangible effect** on the outcome of at bats, and our corrected inning pitch trend leads us to conclude that the model does eliminate some of the unfair advantages from mistaken calls.

This introduces a lot of interesting possibilities about the implementation of the automatic strike zone, and could enable future experiments that allow for the **manipulation** of the shape or consistency of the zone.