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WINNING AND SCORE PREDICTOR (WASP) TOOL

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ABSTRACT

Winning and Score Predictor (WASP) is a calculation tool used in cricket to predict the scores and possible results of a limited over match format, e.g. One Day and Twenty-20 (T-20) matches. The prediction is based on the factors such as the ease of scoring on the day, according to the pitch, weather and boundary size. For the team batting first, it gives the prediction of the final total. For the team batting second, it gives the probability of the chasing team winning, although it does not take the match situation into the equation. Predictions are based on the average team playing against the average team in those conditions. Here we have proposed an advanced and modified method for calculating the score.

Keywords: Dynamic Programming, Predictor tool, ODIs, T-20, WASP.

I. INTRODUCTION

For years while watching limited overs cricket, we have seen projected scores at different intervals being displayed on our television screens. But in one of the match played between New Zeland and India, something different in the form of WASP (Winning and Score Prediction) was shown. In this paper, we have a look to differentiate between the two and explain what WASP brings to the table.

WASP was first introduced by Sky Sport New Zealand on November 2012 during Auckland's HRV Cup Twenty20 game against Wellington. The WASP technique is a product of some extensive research from PhD graduate Dr. Scott Brooker and his supervisor Dr. Seamus Hogan at the University Of Canterbury (UC) in Christchurch, New Zealand. They worked on this project for four years and started after they received a phone call from the university's economics department asking them to investigate alternatives to the Duckworth–Lewis method.

The models are based on a database of all non-shortened One Day International (ODI) matches and Twenty20 games played between top-eight countries since late 2006 (slightly further back for Twenty20 games). The batting-first model estimates the additional runs likely to be scored as a function of the number of balls and wickets remaining. The batting-second model estimates the probability of winning as a function of balls and wickets remaining, runs scored to date, and the target

Score. Projected score or required run-rate will not qualitatively show the real picture as they fail to take into the account the quality of the batting team and the quality of the bowling attack. WASP is a very good quantitative parameter.

Winning and score predictor (WASP) is used as a mathematical tool for predicting runs and outcomes of games in restricted overs cricket, that is, One Day Internationals (ODIs) and T-Twenty matches. The following features are taken into consideration for the calculations:

- The pitch
- Climate
- Boundary Dimensions

During the first innings, it evaluates the final score after all over being bowled based on the given parameters. And during the second innings, it gives the probability of winning for the second batting team. The advantage in the latter event was the match situation is not the only factor to be taken into account. The estimates are established in the mediocre team playing in those conditions against a mediocre opponent.

But there are certain downsides of the current method which need to be overcome. E.g.

- As this model does not work when a batsman changes his order, in a case when a batsman gets retired out, this tool won't work perfectly because the position is unpredictable.
- WASP tool also flops in a case when a team passes the projected score batting first.

So, through this paper, a new approach towards WASP has been suggested.

II. FACTORS AFFECTING WASP

Pitch conditions, weather condition, boundary size, the average team scores, opponent bowler's performance and ground average score are the essential parts need to be taken into consideration.

The factors affecting the model are batsman's records, ground's records, bowler's records, pitch records, weather records, etc.

Total average = (natural factors + players' records + others) / 3

Total average = ((Pitch condition + weather records)/2 + (batsman's records + bowler's records)/2 + other factors) / 3

Detailed sub-factors for each of the factors are mentioned below:

Grounds average score = (Last 5 matches average score (independent of teams) + Last 5 matches average score on that ground by that team) / 2

Weather Condition **= (**Last 5 matches score in that weather all over the world + Last 5 matches score in that weather in the particular continent) / 2

Batsman's Records = (Last 5 matches record (regardless of team) + Last 5 matches record on that ground + Last 5 matches record against that opponent + Last 5 matches record against that bowler) / 4

Bowler's Records = (Last 5 matches record (regardless of team) + Last 5 matches record on that ground + Last 5 matches record against that opponent + Last 5 matches record against that bowler)/4

III. ALGORITHM FOR WASP

The WASP tool basically works on the concept of DP (Dynamic Programming). It takes data from the past records and evaluates current match's situation. Also, in predicting the next ball outcome, it needs to run

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backwards for previous outcomes. Definition: As per the original explanation by Dr. Seamus Hogan, Suppose V (b, w) is the predictable further runs for the rest of the innings when b (legitimate) balls have been already bowled and w wickets have been already fallen. Also, suppose E (b, w) and R (b, w) are the predictable runs and the probability of a wicket on the upcoming delivery in that state, respectively.

Hence, we can describe the whole thing into an equation as

$$V(b, w) = E(b,w) + R(b,w)*V(b+1,w+1) + (1-R(b,w))*V(b+1,w)$$

After all the legit deliveries are bowled, the model will be V (b*, w) = 0 and the system works towards the back. This implies that the approximations for V (b, w) in occasional circumstances can be determined by, only to some extent on the projected runs and the likelihood of falling a wicket on that ball, and more about the values of V (b + 1, w) and V (b + 1, w + 1), which will mostly be dogged by dense data points. The model for the team batting second is a bit more complex, but uses fundamentally the same logic.

IV. PSEUDO CODE FOR PREDICTION

We have a function V (b, w) to judge the score in the rest of the; 2^{nd} innings as earlier, but unlike the same function for the all the overs, the function will be divided into 3 parts:

- First power-play overs
- Second power-play overs
- Remaining overs

$$V (b, w) = V1 (b1, w1) + V2 (b2, w2) + V3 (b3, w3)$$

Where,

V1 (b1, w1) = Prediction for first power-play overs

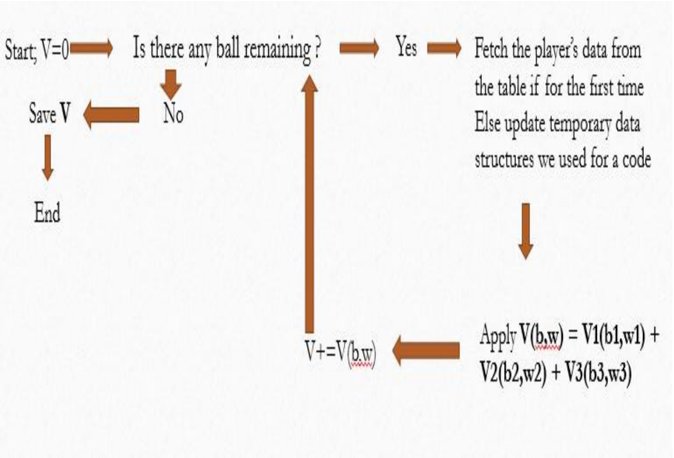
V2 (b2, w2) = Prediction for second power-play overs

V3 (b3, w3) = Prediction for overs without power-play

Here, we have prepared an algorithm about how the new function will actually work.

```
While (There are balls remaining)
{
        V1 (b1, w1) = 0;
        V2 (b2, w2) = 0;
        V3 (b3, w3) = 0;
        If (overs in the 1st power-play)
        {
                V1 (b1, w1) = 1;
                Operation process;
                V1 (b1, w1) = 0;
        }
        Else if (overs in the 2nd power-play)
        {
                V2 (b2, w2) = 1;
                Operation process;
```

```
                V2 (b2, w2) = 0;
         }
        Else
        {
                V3 (b3, w3) = 1;
                Operation process;
                V2 (b3, w3) = 0;
        }
}
```



During this code, there are some important entities which are needed to be saved at every step:

- Actually_happened = to save what has happened on a particular ball
- Next_ball_prediction=E(b, w) + R(b, w)*V(b+1,w+1) + (1-R(b, w))*V(b+1,w)
- Total_score_sofar = to save the total score
- Predicted_score_remaining = to predict total score for the remaining match
- Projected_score=total_score_sofar+ Predicted_score_remaining.

V. ADVANTAGES

There are certain drawbacks of the previously defined methods, which can be solved by using the new approach. E.g.,

- As the data would be saved on the basis of batsman's ability & bowler's ability, the number of batting order would not matter.
- On a higher & detailed extent, the individual batsman's ability to score runs on the next ball can also be judged.

VI. TECHNICAL PERSPECTIVE

An excel sheet will be prepared in which the data will be imported from the website. The data in that list will be updated after every match which will resolve the matter of using old data. This data will be used as an input for the source program written for this tool. Every player will be given a unique ID, so that each of they can be uniquely identified. So, we will have a table containing player's runs, wickets, matches played, etc. After every ball, this table updated using queries. For example, simple query is,

Update table set runs = (runs + a) where ID=b;

Apart from the overall table, temporary data structures are used in a particular match to predict the outcome. The best data structures apart from a table that is used for individual entity is a hash table or array. As we will be knowing the player ID for entry or updating purposes, we will be able to access the array in O (1) time. To find the data according to the query, the hash table is the optimal structures to be used.

VII. CONCLUSION

According to analytics provided throughout this report, it can be derived that, there are loopholes in the existing method and it needs to be resolved for better judgement. Also, different parameters analyzed during the new method suggest that it is an improved method than before and can be implemented at a higher platform like international cricket with some changes being done.

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