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Approaching Bounce Point Deployment at golftraxx.com

If you watched the Ryder Cup this past weekend, you likely (or at least heard about) saw Bryson's 417 yard drive (at sea level!)

https://www.youtube.com/watch?v=TVRtR5ow7z4

For those that don't know, your ball just won't fly as far at sea level as it will at elevation.

This week he's playing in Mesquite Nevada at a National Long Drive competition at an elevation of 1600 feet.

Here's a bonus question to think about which is directly related to the upcoming discussion:

BONUS QUESTION #1: How far would Bryson's 417 yard drive from Ryder Cup have gone if he hit that the exact same shot there in Mesquite, Nevada both with the same 20 mph downwind?

If you don't know how to determine that answer, you're not alone. Read the rest of this article and gain an understanding of how to calculate the answer, and get a better understanding of the why and how of where we're heading next here at htttps://golftraxx.com.

The playing map page of golftraxx.com provides distances from the player's location to front, center, and back of green at 30,000 golf courses around the world as well as to other "extras."

While these GPS-based yardage calculations are helpful for selecting club, especailly when you have configured your club distances in your user profile at https://golftraxx.com/login , there are **several** other factors which if factored in will provide FAR better basis for determining the "**plays as**" distance to the **pin** instead of the actual distance to the **center** and **then** allow us to select appropriate club for the player and provide an adjusted "**plays as**" distance where it's allowed.

As a conceptual framework, we need only think of the **possible** scenarios given changes in ball flight distance/direction, ball bounce distance/direction:

1. weather (wind, temperature)
2. delta elevation between shot start and bounce point
3. (a) altitude change vs. sea level

(b) altitude change vs. home course

4. distance and direction of bounce and roll of ball after landing

(a) fairway firmness
(b) green firmness
(c) fairway slope

(d) green slope
(e) impact of current weather on fairway and green firmness

As must be obvious, the first of those improvements is the location of the pin on the green. This is often measured with two yardage distances from points on the green in yards and often provided on pin sheets. Distance in yards from the front (or back) and distance in yards from the left or right at that designated depth. We're adding in ability for user to set pin location on a hole and provide distances to the pin location as well.

We can also utilize extended GPS capabilities to obtain elevation and git API's to obtain real-time data, and utilize a user profile to obtain home course elevation and swing speed and spin rate and shot apex to support these calculations:

For example, https://rapidapi.com/ClimaCell/api/climacell/ has an API we can obtain realtime weather for specific locations.

```
var axios = require("axios").default;
var options = {
  method: 'GET',
  url: 'https://climacell-microweather-v1.p.rapidapi.com/weather/realtime',
  params: {lon: '-71.2216286', lat: '42.8237618', fields: 'precipitation'},
  headers: {
    'x-rapidapi-host': 'climacell-microweather-v1.p.rapidapi.com',
    'x-rapidapi-key': '7f377fc1a8mshc85fc3cc45a0209p1b2016jsn7bb269ebb49d'
  }
};

axios.request(options).then(function (response) {
      console.log(response.data);
}).catch(function (error) {
      console.error(error);
});
```

Obviously, real-time weather API's require internet capabilities ON THE COURSE. We already know that internet **isn't** available on many many courses so this **won't** be available everywhere**.** But with this API where internet is available, we can obtain current wind direction and current velocity as well as current temperature. Where it's not available, user will have option to input wind direction and heading.

We already calculate directional headings from user's current location to targets such as tee target or green center. So given real-time wind direction and speed along with golfer's heading, we can calculate downwind component, headwind component and crosswind component for a distance (as well as aim point)

https://www.golfmonthly.com/tips/golf-swing/how-to-calculate-distance-in-the-wind-108215

As a general rule for each 10mph of headwind the shot “plays like” distance increases by 10%. For each 10mph of downwind, the shot “plays like” distance decreases by 10%.

We can calculate the crosswind, downwind, and headwind components exactly as pilots calculate those for a runway when landing or taking off.

Let's take the example of a runway 36 with a landing directional heading of north and an aircraft approaching runway 36 from the south. Imagine now that this corresponds to a golfer on a nearby golf course playing from the his current location directly north to the center of the green. If the wind direction is coming directly from the north at 10 mph, then the headwind component is 10 mph, the downwind component is N/A, and the crosswind component is 0...and this is the case both for the aircraft AND the golfer.

BONUS QUESTION #2: If the golfer's remaining actual distance to the center of the green is 150 yards, and the green depth is 40 yards and the pin location is 10 from the back and 5 from the right what is the "plays like" distance at sea level? What if the headwind component is 10 mph?

If the wind shifts and now its coming directly from the east (90), we now have a headwind component of 0 and a crosswind component of 10. This has an impact on where the golfer aims. Playing towards a green to the north, a crosswind component coming from the east means he has to aim right of the green center. But how far right? As a general rule for each 10mph of crosswind, the shot plays 5% in the direction of the crosswind. So a 100 yard shot is aimed 5 hards to the right of the target expecting thast the wind blowing from the east will blow it back in the direction of the target.

Ordinarily, the wind is not coming directly as a headwind or tailwind nor is it coming directly from left or right, and therefore there are non-zero components both for head/tail wind as well as crosswind. The headwind component and crosswind component are allocated based on the angle created by the wind direction. Let's take the **simplest** example where the wind direction source shifts to 45 (NE). The angle created from our 360 degree North heading and wind direction is therefore halfway between headwind and FULL 90 degree crosswind. Therefore, the 10mph wind component is also divided equally between headwind component and crosswind component. 5 mph of headwind and 5mph of crosswind.

Using a slightly more complex example, let's switch the source of the wind to 30 (NNE). Applying the same principles as above, the angle formed in 30 degrees between heading and wind source, and wind direction is CLOSER to a direct headwind. Therefore, 2/3 of the 10 mph wind (6.67 mph) is headwind and the remaining 3.33 mph is crosswind.

Bryson hit his 417 yard drive with the help of a straight downwind, estimated at 20 mph.

https://finance.yahoo.com/finance/news/bryson-dechambeau-blasts-417-yard-202616931.html

BONUS QUESTION #3: Without the 20 mph downwind, how far would Bryson's 417 yard drive have gone at the Ryder Cup (sea level)?

While smart phones have GPS with basic elevation capabilities, as GARMIN notes, these elevation distances are only rough approximations within approx. 400 feet.

https://support.garmin.com/en-US/?faq=En8Ve2Q5VX7nbFL0Tkuub9

Google Maps provides an elevation API where we could pass a coordinate pair and receive back elevation for that coordinate pair.

https://developers.google.com/maps/documentation/elevation/overview

However, our application would make BILLIONS of API requests for specific elevation points on each course so its not really a workable option, especially given that many courses don't have internet consistently available on the course.

More workable than the Google Maps API is determining and storing a precise "base camp" elevation for the course (think user profile home course), then calibrate our app such that the base camp location of the course and user location elevation has zero variance. We can then utilize the now-calibrated GPS-supplied elevation to determine the delta elevation change (from zero) between any point on the course stored in the database as delta change from 0 (which therefore is also **its** delta elevation change from base camp) and thus delta between the two deltas shows the increase or decrease in elevation between the current location of the user and the stored point in the database.

To achieve this capability, we would store the corresponding elevation change for each stored point relative to the course "base camp" clubhouse elevation. By calibrating the app elevation to the specific course base camp elevation we can thereafter determine the delta elevation change (at elevation) from the user's present location and any stored point. The change in elevation between user location and target location in yards is added or subtracted to the shot distance. For example if the target distance is 100 yards but the target is 7 yards higher elevation that users location, then the "plays like" shot distance is 107.

https://golf-info-guide.com/golf-tips/playing-conditions/adjust-yardage-trust-swing-to-deal-with-elevation-changes/

Looking back to Bonus Question #2, we ask it again here in Bonus Question #4 with a change in elevation:

BONUS QUESTION #4: If the golfer's remaining actual distance to the center of the green is 150 yards, and the green depth is 40 yards and the pin location is 10 from the back and 5 from the right AND there is a 20 yard uphill elevation change from his location in the fairway and the pin, what is the "plays like" distance at sea level? What if the headwind component is 10 mph?

We also use the elevation change (versus sea level) of base camp for the current to adjust expected distances for clubs. For each 1,000 feet of elevation above sea level, the ball flies and additional 2%. Thus, a 200 yard shot at sea level flies another 4 yards at 1000 feet of elevation, while a 300 yard shot at sea level flies an additional 10% or another 30 yards at 5,000 feet of elevation. It will be more meaningful for the user to base the differences on the base camp elevation of the users home course versus the base camp elevation of the course being played to adjust expected distances for each club.

https://newmexicogolfnews.com/effect-of-altitude-heat-humidity-on-golf-ball-distance/

BONUS QUESTION #5: If the golfer's remaining actual distance to the center of the green is 170 yards, and the green depth is 40 yards and the pin location is 10 from the back and 5 from the right AND there is a 20 yard downhill elevation change from his location in the fairway and the pin, what is the "plays like" distance at 5,000 feet elevation? What if the headwind component is 10 mph?

When I first deployed GolfTraxx back in 2006, the focus was on shot distance to the center of the

green, under the belief at that point that the green center was ALWAYS a good place to aim/land. I grew up in Oregon where greens were smaller and softer and that was certainly true. In college back then I hit on average 12-14 greens in regulation per competitive round.

Fast forward 40 years, and now having played links style golf in Scotland for three weeks on firm fairways where your golfball's bounce point might be perhaps 30 yards short of the putting surface (from which it bounces and rolls right up to the pin), and played golf in mountain elevations of several thousand feet like Denver and Lake Tahoe and Chicago where the ball does in fact fly much further, and played golf in Vegas and Scotland with 30 mile an hour winds, and having watched pro golf played on greens like Augusta, but then seeing other courses during the same week on greens that the ball stops exactly where it lands, and having the data now being available for use, I decided it's time to provide better targets and incorporate that logic into club selection.

Fairway bounce factor and Green bounce point are two additional concepts that can be added to provide visual feedback and better performance for golfers considering their approach shots in their games. A fairway bounce factor on rain-soaked fairways is likely 0. The fairway bounce factor on OPEN fairways during a sun-scorched July could be 40 or more (yards). However, even on sunbaked fairways, the fairway bounce factor may approach 0 or even negative depending on where your ball lands as we saw at Royal St. George's earlier this summer where the bounce point kicked the ball backwards towards the tee.

Similarly, green bounce point may be the location of the pin where the green is soft enough to bounce and stop (as MANY courses in Oregon and Washington are) but may also be 40 (or more) yards, depending on pin location and green firmness. Of course, it also depends on what club was used to approach the green, and the distance from which the approach was made, and the club used for the approach, and the spin rate of the shot played, as well as the softness of the ball and its ability to BITE and or spin back.

BONUS QUESTION #6: Assuming a 20 yard downhill elevation change from tee to the bounce point in the fairway on Bryson's 417 yard drive, and assuming a 25 yard roll-out from the bounce point, how far would Bryson's 417 yard drive have flown at the Ryder Cup (sea level) without the downhill drop and without the 20 mph downwind if it had poured rain overnight Saturday night and the ball had plugged in the fairway exactly where it landed?

In the user profile at https://golftraxx.com/login , we're adding personalized factors that can be added to the user's profile for each club s/he puts in the bag besides the distances s/he hits them:

swing speed
apex
spin rate

These can be used to improve precision in predicting required bounce point to reach the pin location.

Some other personalized factors will be added to users profile: https://golftraxx.com/login

golfball type
golfball compression
spin rate
shot shape

If we know the "base camp" elevation of your home course, we can then adjust expected distances for each club in your bag based on the "base camp" elevation of any other course you're playing.

BONUS QUESTION #7: What must be known to about a green's topgraphy and the surrounding terrain to accurately determine bounce point?

BONUS QUESTION #8: What must be known to about a green's topography to find the portion of the green that will leave a reasonably level putt to the pin's current location?

BONUS QUESTION #9: What must be known to about a green's topography to find the safest bail-out area near the green or fringe that will leave a reasonably simple pitch or chip to the pin's current location?

For a given shot on a given course with ALL of these factors defined, we can far better predict not only the air flight distance from a specific location to the center of the green which should be thought of as **total travel distance** to reach the pin (whether through the air or bouncing along the fairway or rolling along the green), but also make a FAR better prediction of the required bounce point to produce the proper bounce and roll to reach the **current** pin location. The shot you plan and execute should be determined by the **"plays as" distance to reach the required bounce point** which if struck precisely should arrive at the current pin location. Neither the actual distance nor "plays as" distance from the point where you're standing to the pin will provide you with the correct answer unless you're fortunate enough to be playing somewhere where those distances are exactly the same.

We can recommend the **best club** for the upcoming shot taking into account all these factors after completing the deployment, thereby completing the rest of picture shown in the golftraxx logo from the bounce point to the pin location.

Wishing great golfing to everyone!

Frank
GolfTraxx.com

Answers:

1. *(a) 417 yards x 1.6 x 2% per 1000 ft = approx.13.3 yards further = 430 yards (excluding bounce and roll effects).*
2. *(a) 150 + 20 – 10 = 160 yards. (b) 160 x 10% = 16 + 160 yards = 176 yards.*
3. *Excluding downhill effects, 20% of 417 = 83.5 yards less = 343 yards.*
4. *(a) 180 yards. (b) 180 yards x 10% = 18 +180 = 198 yards.*
5. *(a) 170 + 20 – 10 - 20 = 160 yards. 160 yards * 10% = 160 – 16 = 144 yards. (b) 144 yards * 2% * 5 = 14.4 yards less. Therefore 129.6 yards (b). 129.6 yards x 10% = 13 yards + 129.6 = 143 yards.*
6. *417 yards – 25 – 20 = 372 x 20% = 74.4. 372 yards – 74.4 = 297 yards.*