HYPACK® Precision Events

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The automatic events in the HYPACK® SURVEY program have been used for years but I don't think our method has ever been explained. Within the HYPACK® SURVEY program there is the option to create an event based upon a time interval or a distance interval.

The timed interval is the easiest to understand because it is based upon a time. Once the specified amount of time has passed, SURVEY marks an event.

The distance events are a little more complicated. The distance events happened just like the timed events originally. You entered a distance and as soon as that distance had passed, the event was triggered. This meant that the event happened at the first position update after the distance had passed. That works when you are generally concerned with events but, as one group of users found, it is not exactly at the point that the event is requested.

The event is recorded at the time when the event occurred. In versions previous to the new HYPACK® 2011, the event was placed in the file at the time it occurred and the next sounding would inherit the event number in post-processing. This presented a problem when the event was processed. Not all of the items in a HYPACK® RAW file are stored in time order due to when the record was posted to the SURVEY program. The most accurate processing was not possible in this manner. It was close, but the new HYPACK® 2011 method is better at aligning the events to the time that they occurred.

At the end of the HYPACK conference, I spent a few hours with the USACE- New Orleans testing the events on an actual survey boat with HYPACK® 2011. The results are impressive. Out of 300 events that I processed, excluding the start and stop events, the average distance from the desired 25 foot interval was 0.14 feet. That is not to say that there weren't any outliers in the dataset. The maximum deviation was 1.37 feet. If the events were run from start to finish they tended to be a little higher; instead of 50' they may be 50.33'. If the line was run backward, the distance tended to be a little lower; instead of 50' the DBL was 49.56', for example. Throughout the test, the distance was consistent and repeatable, which is what we were trying to achieve.

It probably seems odd that I am talking about precision events, but I am not worried that some events were 1.37 feet from the even distance. This is what I am going to explain next. The old method had events that, at times, were up to 10 feet off of the distance desired. In the new method, this should never happen.

The reason that the events cannot be placed in exactly 25' intervals is that the sounding is the most important part of the process. We will not move the sounding to match the point where the boat crossed the interval and trying to time the sonar to take a reading exactly at a point is impossible. The sounder works on a ping interval. Lets look at an example.

A boat travels 33 yards per minute per knot. That is 1.62 feet per second per knot. A survey boat traveling at 10 knots moves 16.2 feet per second. If they have a sonar that is taking 10 pings per second,a the distance between pings is 1.62 feet.

Where the sounding was taken is not normally moved since it happened at a time and location. Normally HYPACK® takes the time of the two positions in the file that occurred both before and after the sounding. The distance between the soundings is computed as is the delta distance. The time between the two positions are subtracted to determine the delta

time. With these two values we have the maximum distance that the boat traveled over that amount of time.

Next the time of the first position is subtracted from the time of the sounding to provide a relationship between the sounding and the total distance traveled. This time is divided by the position delta time to get a percentage. That percentage is multiplied by the total distance to determine how far along the boats travel the sounding occurred. Once all of the soundings have been properly located in this manner the events are then inserted at the proper location in time to the first sounding after the event occurred. The programmer looked at locating the closest sounding to the event but that sometimes allows the event to be short of the desired distance by a small amount.

All of this took more words to describe than the programming code that handles it.

In Figure 1, the horizontal lines are the surveyed lines, the vertical lines are offset every 25 feet to show the position at which the event was specified. The top track shows the boat offline a little at the left edge, but the events are based on intersecting the planned line with the desired interval so the event still falls on the 25' offset line.

FIGURE 1. *Sample Data with Events Every 25 Feet*