Hemisphere®

BENEFITS OF TILTED POLE MEASUREMENTS

HGNSS.COM

BENEFITS OF TILTED POLE MEASUREMENTS

Using a survey rover with RTK corrections has a position accurate to within a centimeter of your antenna in some environments. The bubble feature on a survey pole helps you see if your pole makes a right-angle with the ground before you store a point. If your pole makes a 90-degree right angle with the ground, the horizontal position at the antenna is equal to the horizontal position at the ground. That leaves only the elevation to be determined.

If you know the measurements from the phase center of the antenna to the base of the antenna and the length of your pole, you can subtract these measurements from the antenna elevation to calculate the ground elevation.

You could question the efficiency of this method. If it takes several seconds to look at your bubble and adjust the pole until it makes a right angle with the ground, and you have hundreds of points to store, how much time will this take? Is there a better way to do this? Is there any guarantee that you can always do this? How would you measure a building corner? You could use a total station, or you could measure a point nearby and apply an offset. Both options sound time-consuming.

Survey rovers began to include built-in tilt sensors and magnetometers used for orientation. If the angle and orientation of the pole could accurately be calculated, the software could easily apply any compensation and remove the requirement to position the pole to make a right angle with the ground.

To use these built-in magnetometers, users had to conduct long and complicated calibration routines since geomagnetic strength is inconsistent. Not only is it inconsistent based on location, but a magnetometer is also impacted by metallic objects such as

Without needing to focus on a bubble, more time can be spent measuring points.

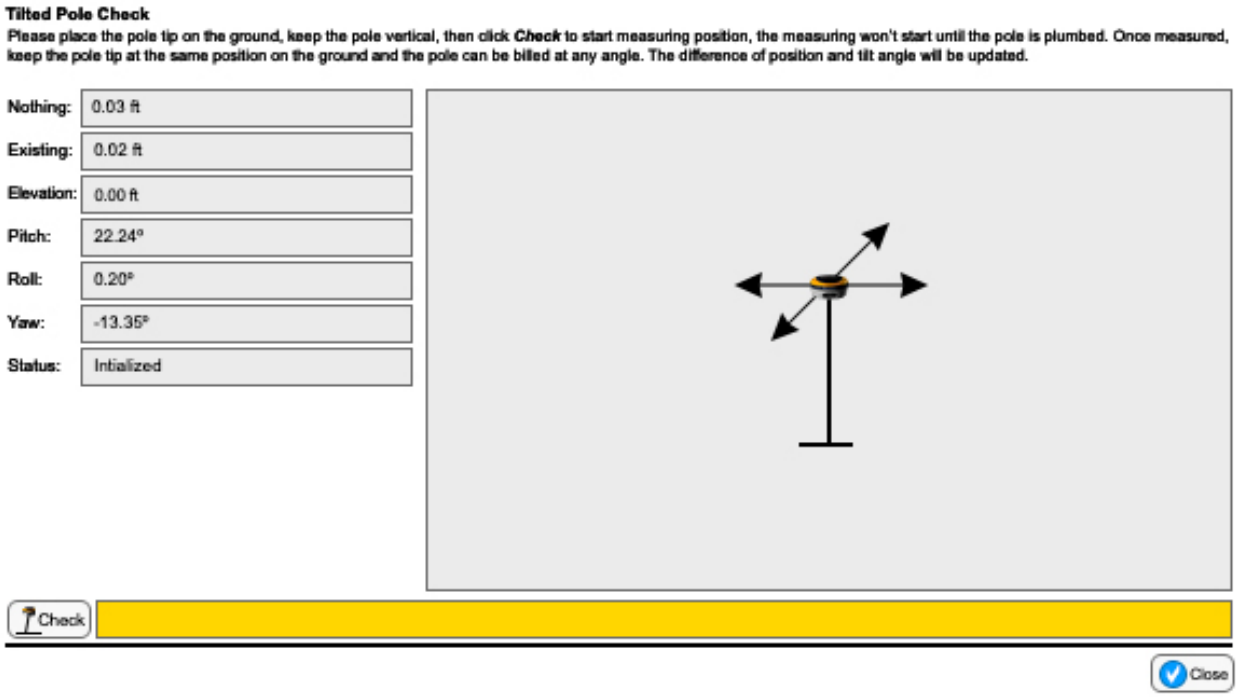
vehicles, stop signs, fences, construction equipment, and other items regularly found at every construction site. These factors lead to very inconsistent results and a skeptical public.

The concept of tilted pole measurements was fantastic – perhaps even revolutionary! Productivity would be improved if you never worry about a level pole. A simple routine topographical survey or stakeout can finish quickly if you do not need to look at your bubble. You can look at your data collector, store a measurement, stake a point, and not worry if your pole is plumb. Calculate the amount of time you spend leveling your pole and storing hundreds of points during a topographic survey. Even using only a few seconds for each, the time quickly adds up. Think about how much easier a stakeout would be if the tip of your pole is your only concern.

The corners of buildings and points under a heavy canopy can be measured if you can tilt your receiver out and away from the canopy, making it easier to get hard-to-reach points. Safety is also greatly enhanced. You can measure a point on a busy road without stepping into the oncoming traffic. Obstacles are easier to divert, enabling you to make more use of your GNSS receiver.

The market demanded something better; enter the Inertial Measurement Units (IMUs). An IMU (Inertial Measurement Unit) uses accelerometers and gyroscopes to calculate linear motion and angular rotation. Combining IMU data with the RTK GNSS position allows for accurate yaw, pitch, and roll calculations not subjected to magnetic interference and not requiring long and complicated calibration routines.

Hard to reach points are easier to get to.



A position check shows that with a Hemisphere C631 Smart Antenna tilted over 20 degrees, Northing and Easting are each within a few hundredths of a foot from the point measured with the pole plumb.

By 2018, modern survey rovers began using IMUs to reduce the effect of magnetic interference with fantastic results. Depending on the use case, productivity can improve by 50% or more.

As the availability of tilted pole measurements has increased, and the reliability of these systems has improved, the market demand has increased. Building corners, canopy, and roads all became fair game for GNSS.

Performance in all GNSS systems varies based variables like environment, ionosphere, and location. However, in environments suited for GNSS, exceptionally accurate results are possible.

A position check shows that with a Hemisphere C631 Smart Antenna tilted over 20 degrees, Northing and Easting are each within a few hundredths of a foot from the point measured with the pole plumb.

Hemisphere GNSS' C631 Smart Antenna offers a built-in IMU to consistently track the angle and orientation, making tilted pole measurements easy and effective every time. With the additional constellations of GLONASS, GALILEO, BeiDou, and QZSS, the C631 can use more satellites than most other receivers on the market – allowing the C631 to perform significantly better under a canopy and within an urban canyon environment. The C631 Smart Antenna's world-class RTK performance with the IMU is advancing to surpass all historical GNSS productivity levels.

Hemisphere®

Hemisphere®

HGNSS.COM

8515 E. ANDERSON DRIVE
SCOTTSDALE, AZ 85255
480-348-6380