ZUPT B-PINS

A Land Inertial Survey System

15 Years of Portable Inertial Survey

Zupt has been supplying systems since 2005

Why Inertial Survey?

High Survey Productivity

4 times the production of conventional survey when compared in the same survey environment

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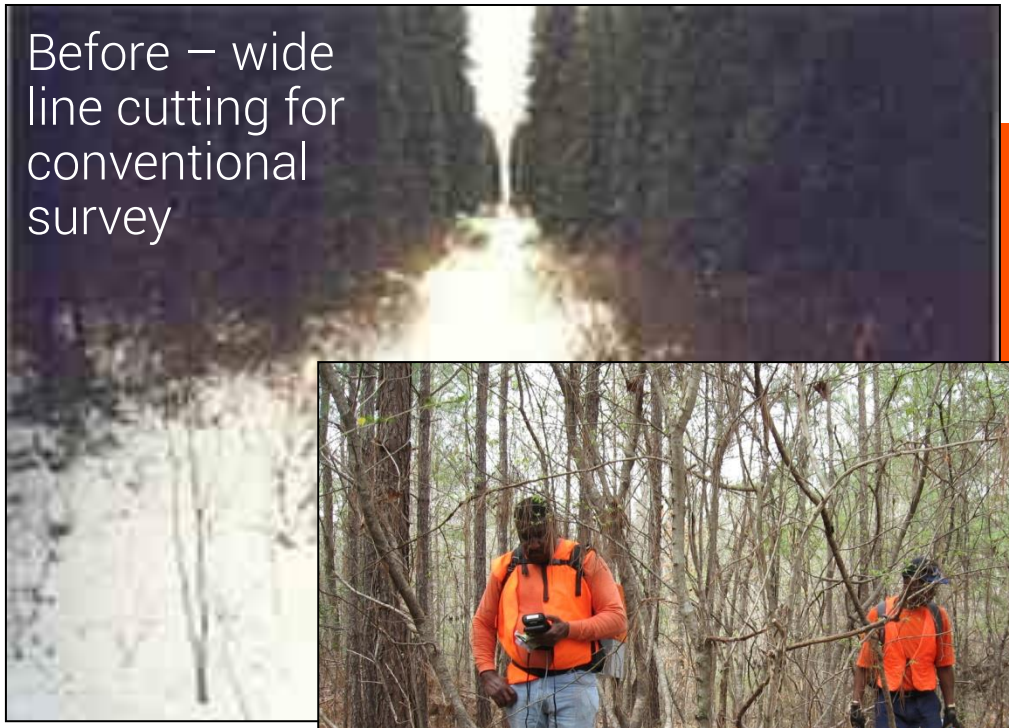
Why Inertial Survey?



Minimal Environmental Impact

Significantly less environmental impact – ideal for small footprint or zero impact surveys

Minimal to no cutting required

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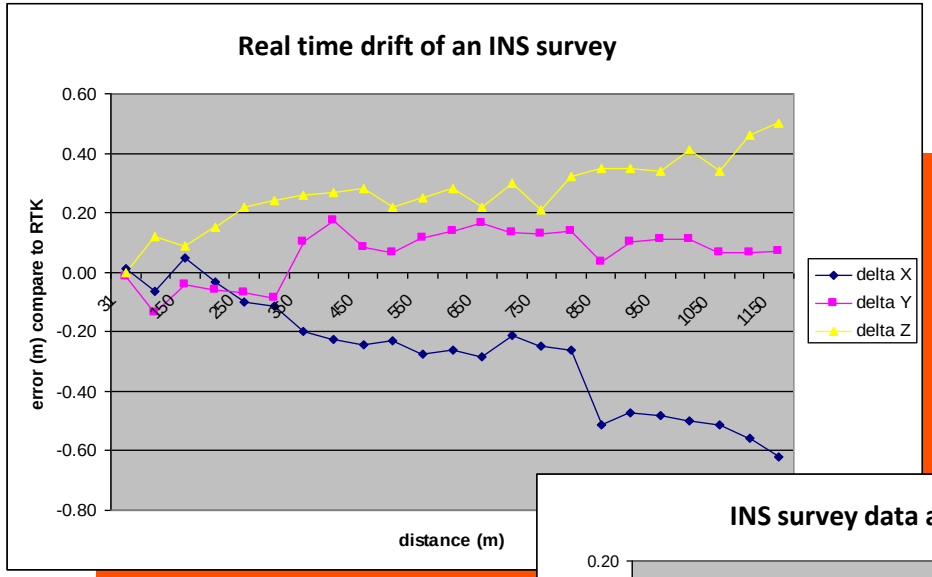
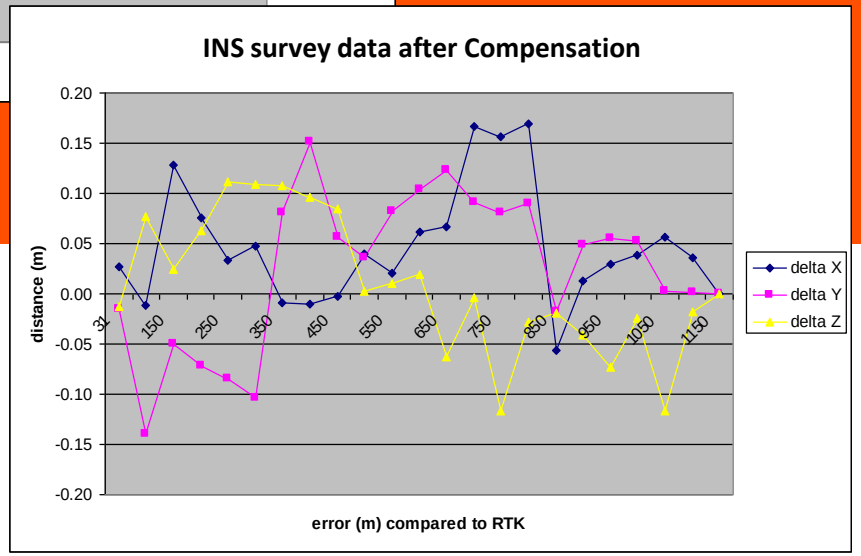
Why Inertial Survey?





Final Accuracy

Very comparable to RTK

Many 100's of thousands of hours of field survey with 1,000s of operators

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Real-Time versus Post-Processed Accuracy

In stake out survey there are 2 different accuracy requirements:

Real Time: the accuracy of the “stake-out”. If we are 1.3m off at the tie, the stake is up to 1.3m from the pre-plot coordinate.

Final (Post Processed) accuracy represents the precision of our survey data – where the post processed position of the stake is, within the required projection…

These two accuracies are not related…

Real-Time versus Post-Processed Accuracy

Real time points are commonly offset from the pre-plot points: usually 2m or 3m or less for seismic receivers… more for sources (15m radius)… i.e. away from points, houses, pipelines…

Final (Post-Plot)… The final coordinates need to be correct within <1m or less for geophysical processing reasons

What is the acceptable accuracy? It is an ongoing debate.. i.e. Real time 2m or 3m – Post Processed <30cm

Real-Time versus Post-Processed Accuracy

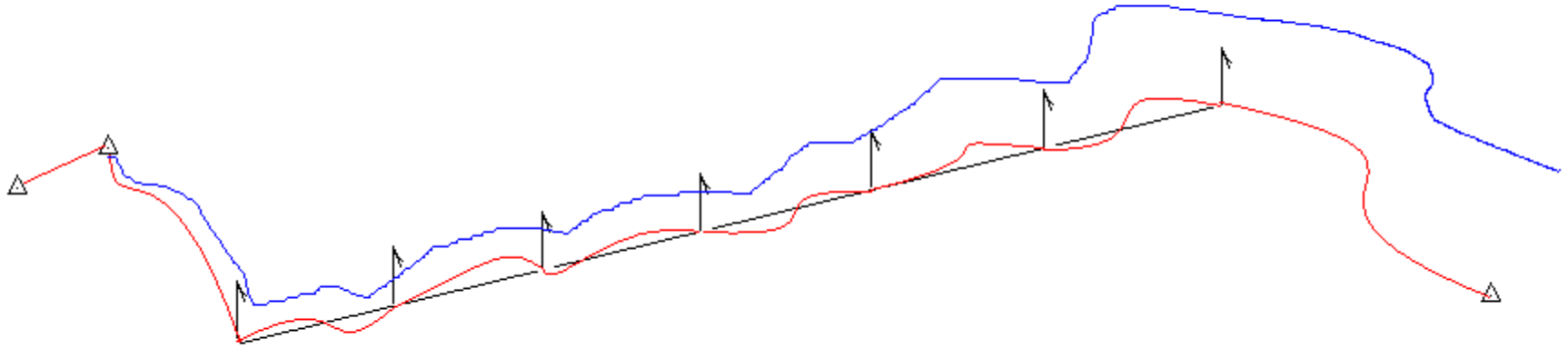
Conventional (optical) survey is very accurate in Real Time and Post-Processing. But the error is unknown

RTK and DGPS have no Post-Processing: Real Time is the final accuracy (error is random “noise”)

Inertial survey is more than 3 times more accurate after Post-Processing than the Real Time data. The error is regular inertial drift and is easy to model and compensate.

Re-Survey due to Tie Misclosure?

The inertial error is regular drift and the Real Time error is a function of distance between control points…



If the tie is 10% above tolerance, only the last 10% of the traverse should need to be resurveyed… (and only if it includes staked points)

Control Spacing versus Accuracy

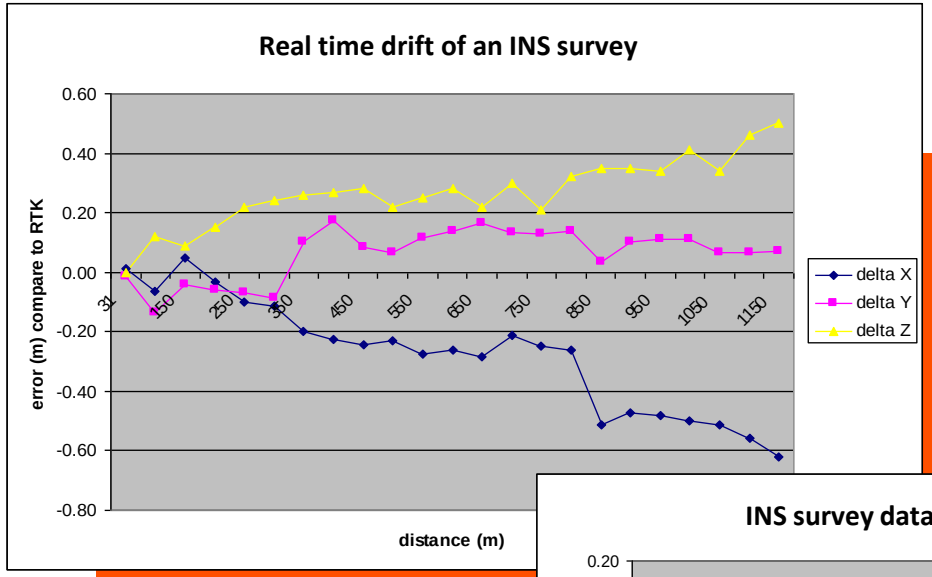
We need to establish control depending on the final accuracy required: Control spacing of <750m for <25cm final post processed accuracy, or every ~2km >0.75m final accuracy…

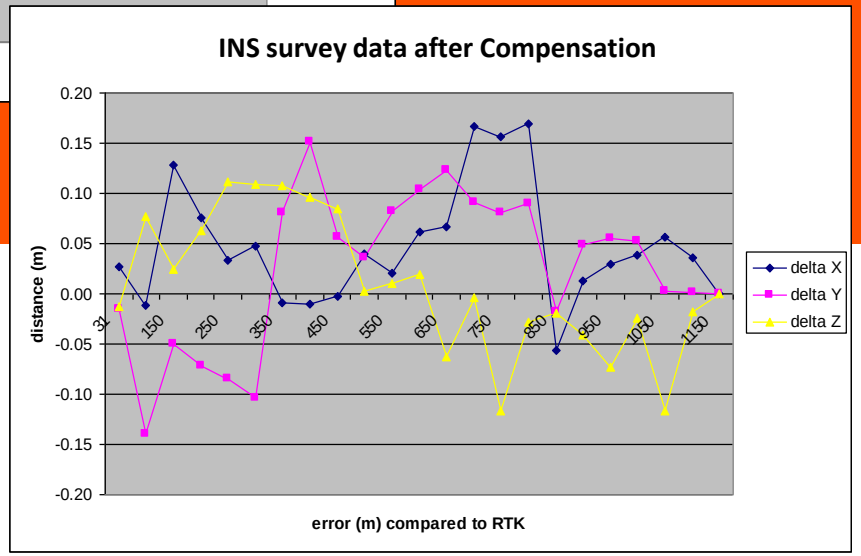
Again: Real Time accuracy (field offset) will be on average 3 times worse than the final accuracy (post processed coordinates).

Ideally, we are allowed 4m ties (RT) like most current INS users (4m is the average)… in particular in thick woods… in land seismic

That will mean a tie/control point every 1.5km or so as the crow flies (more than 2km traverse due to winding between trees etc)…

Real-Time versus Post-Processed Accuracy





The final INS survey accuracy is independent of the real-time accuracy (!)…

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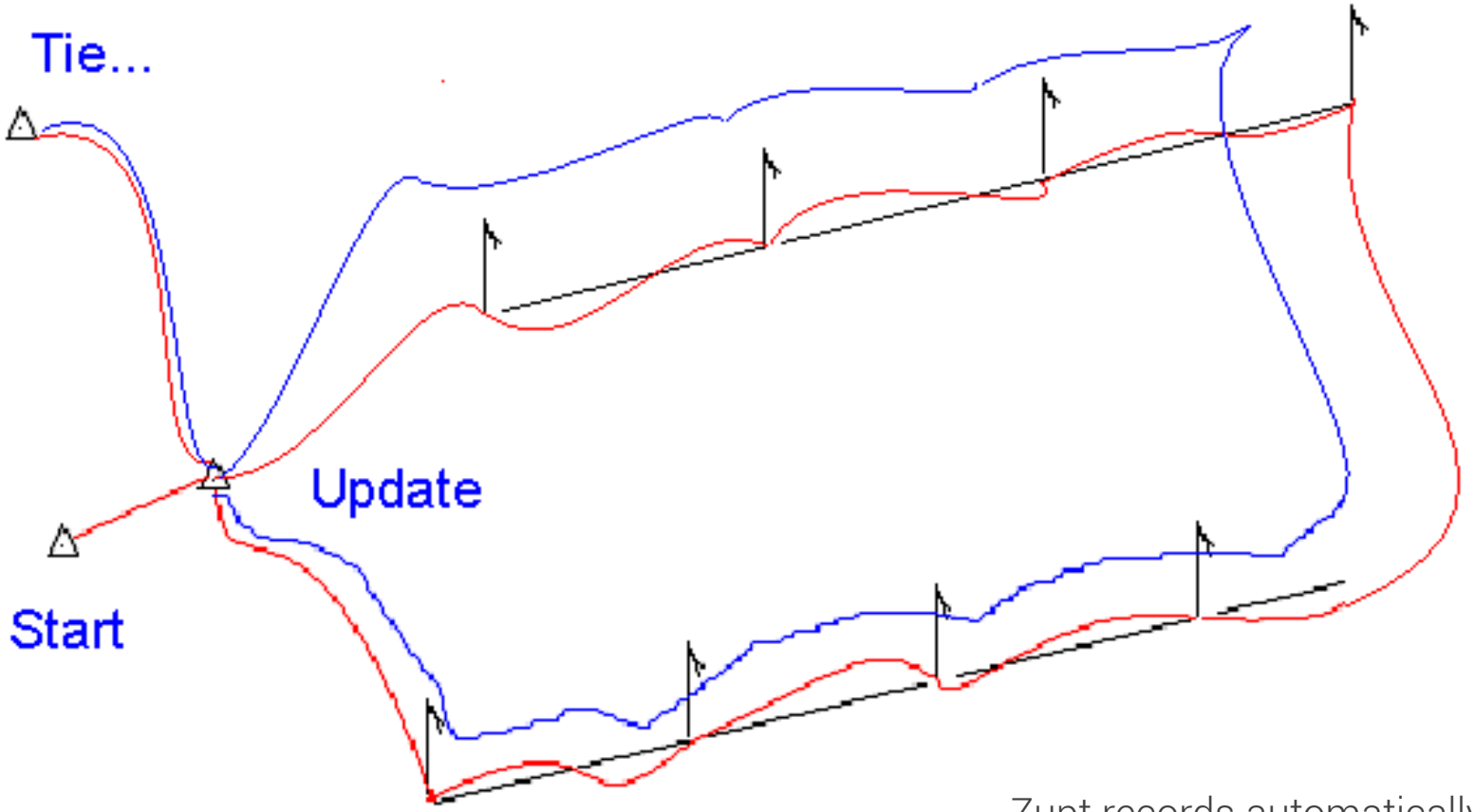
Update before Tie Scam

To avoid the “Update Before Tie” Scam…



Zupt records automatically the Updates…

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Field Operations

Good Start Point. An inertial system doesn't know where it is (Relative system). We do a check shot between the alignment and the 1st Survey Pt !

Good Alignment. The quality of the survey will depend of the quality of the alignment

Good zupt control. The control of the survey will also depend on the quality of the Zero Velocity Updates (zupt) and following timing guidance !

Good Tie (post-processing is based on ties).

1- Good Start Point

Backpack set on stable ground

Remember it will remain still for 20 minutes!

We make sure we are on the right start point (control)

Plug in batteries, cables, etc…

Connect Data Collector (wired or wireless)

1- Good Start Point

Make sure all batteries are charged, make sure you have your control and pre-plot points loaded

Batteries Connected

Turn on Data Collector (DC) – prepare for connection

Press Button for 10 flashes (the “online” battery lights are flashing)

Don't touch the backpack for 20 min.

Click “Start”, & “Zing” on DC

Recon


Pocket_PC
File Zoom Tools Help
ZING 10:13
WAITING TO CONNECT
ZUPT
Steps to Get Started:
1 - Enter Job Info (ZING)
2 - Connect to INS (ZING)
3 - Align (Nav)
4 - Choose a Mission (Mission)
Itinerary
Waypoint
Surveyed
Manual
ZING Nav Steer Mission
TDS
Pocket PC
RECON

2 – Good Alignment

The B-PINS must stay put first for 20 min

Alignment time will decrement to 0

“WE DO NOT MOVE THE PACK” at all during the first 20mins

At the end of 20′ a voice will say “Rotate”

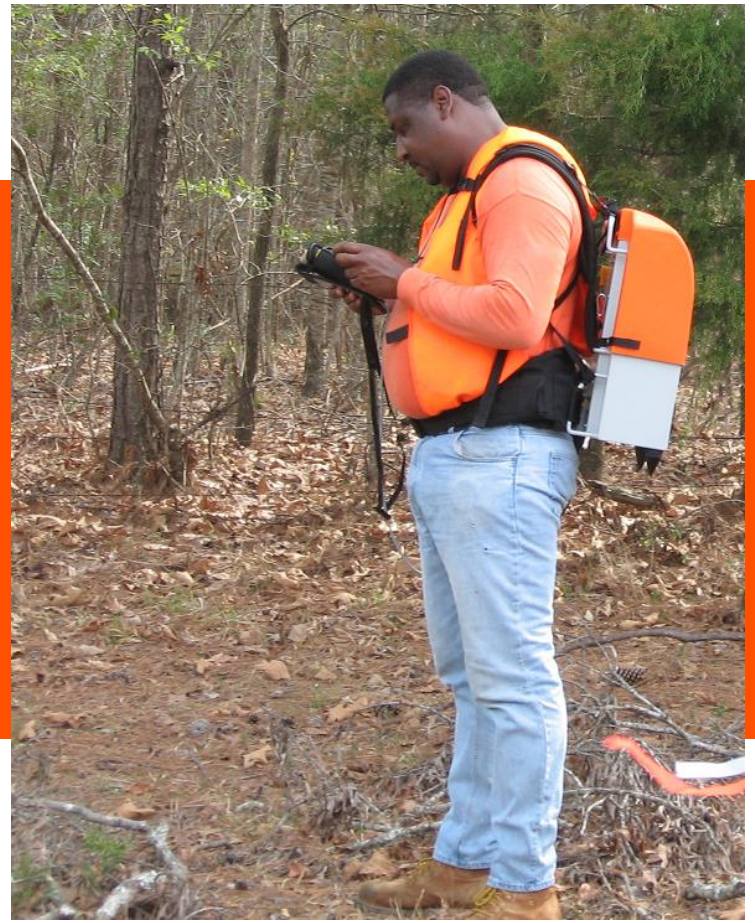
We move the pack ~5m and rotate it 90 degrees for 5 minutes

We do 2 more rotation, and 5-minute stops then come to Start point

It is good to place the pack flat on the ground for 1 of the rotations

If really tight vertical is needed, turn the pack upside down for one of these rotations, support the battery packs.

2 – Good Alignment



Check Zupt : To check a good alignment, we stop as soon as the pack is on our back and check that it zupts automatically

Check Slot: To check that we aligned (started) on the right control point we do a check shot: either on a 2nd control point nearby or a known surveyed point nearby

Check HI: We make sure when we Record, that we use the correct backpack height (HI) ~1m (~3ft)

3 – Good ZUPT

B-PINS delivers precise positioning as long as the velocity is well known

Velocity is best known when we are stopped, speed converges towards 0.00m/s on all axes

The pack “navigator” (computer) senses when it is stopped, and zeroes the velocity values

It is called a zero velocity update (zupt)

A voice will tell us regularly to “Stop for Zupt”, we must stop and be still for 15s

The voice will then tell us “Zupt Complete” and we can walk again…

4 – Finally a Good TIE

When we come to a control point to tie the survey:

We put the pack on the ground on the control point

Then we Tie (+record the final error on the first traverse and Update our position to start our next traverse)

When we are done, we put the pack on our back

We can now Re-Survey the point with the new values (Record)… check that the Vertical Offset (HI) is correct

Only then can we start a new traverse

B-PINS Next Generation, B-PINS X

Latest generation Li Ion technology (3.4AHr cells). Weight has been dropped from 24Kg to 16kg.

Updated Data Collector

Updated wireless connection to data collector

Integrated laser range finder to remove staking ambiguity

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Thank You

Please contact below for more information

sales@zupt.com

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