

# Paperless surveying workshop

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Polish Mountaineering Association

Asian TransKarst Conference  
Lichuan, P. R. C. 2015

# Scope

## Field trip

introduction

the hardware

the software

tips & warnings

our trip

after the trip

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caving committee of Polish Mountaineering Association

Linux systems since 2000

Caving since 2003

Basic caving course 2003

First expedition 2004

Expedition leader 2006 - ...

Caving instructor 2011

China projects 2012 - ...







Paperless surveying? Why is it any better?

Drawing on screen is **worse!**

Lots of batteries involved!

Post-processing improved only slightly

7L 1r

stavek 10  
20

1750

gärne p. 15

1,60,40,30

killa  
stavek  
20,10

1,15,60,40

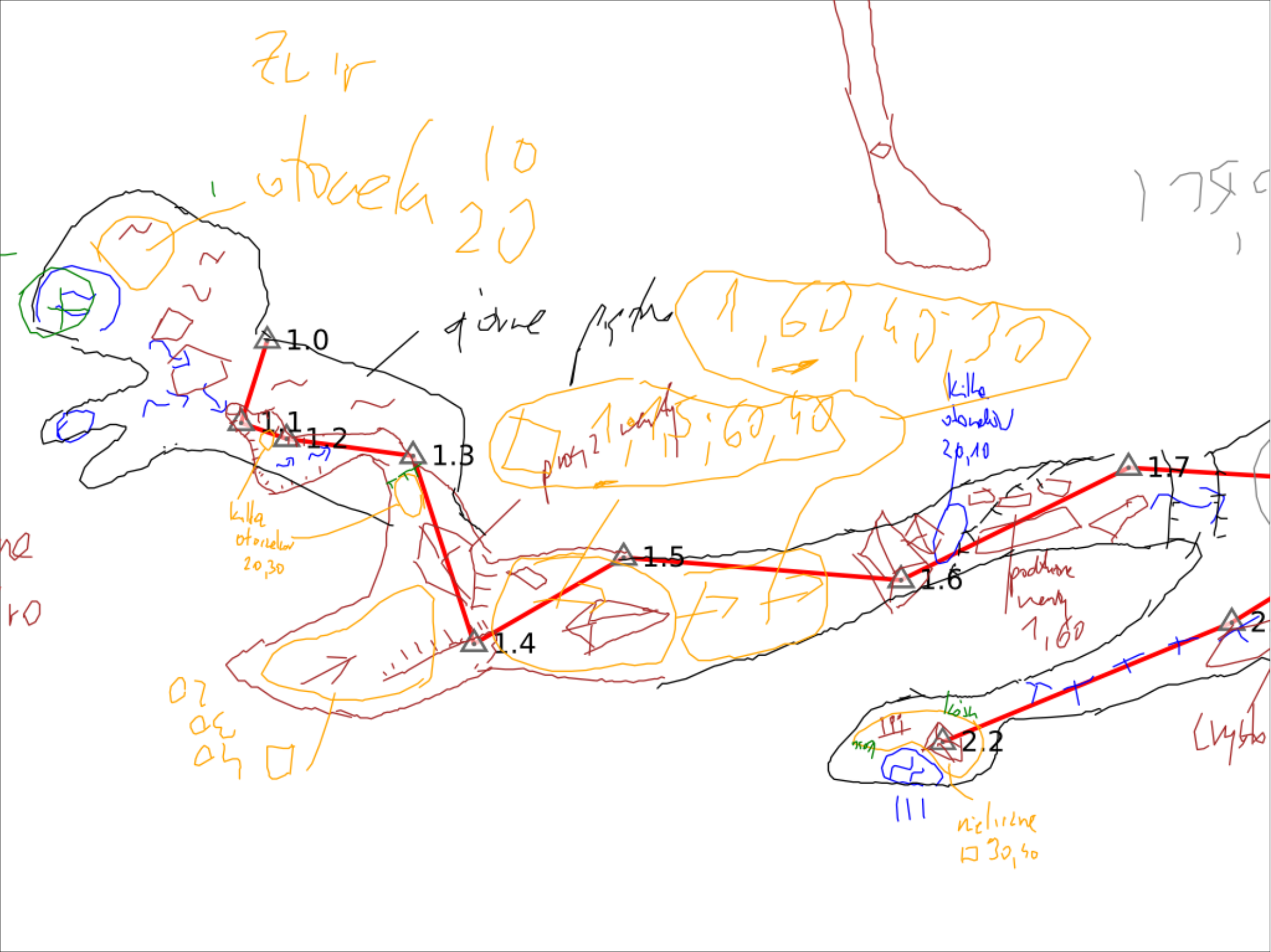
killa  
stavek  
20,30

probleme  
wenig  
1,60

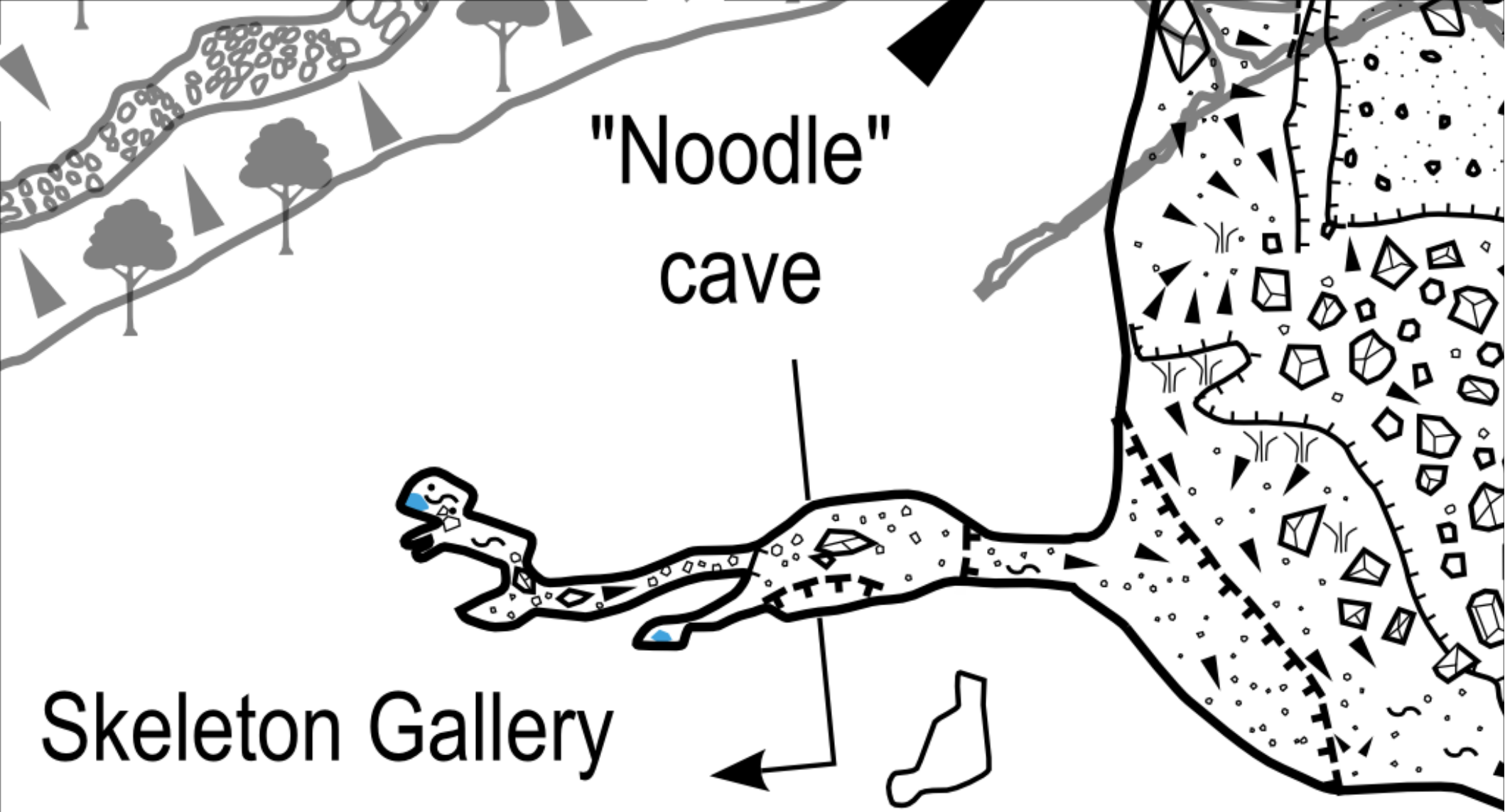
02  
06  
04

nicht  
30,40

1750



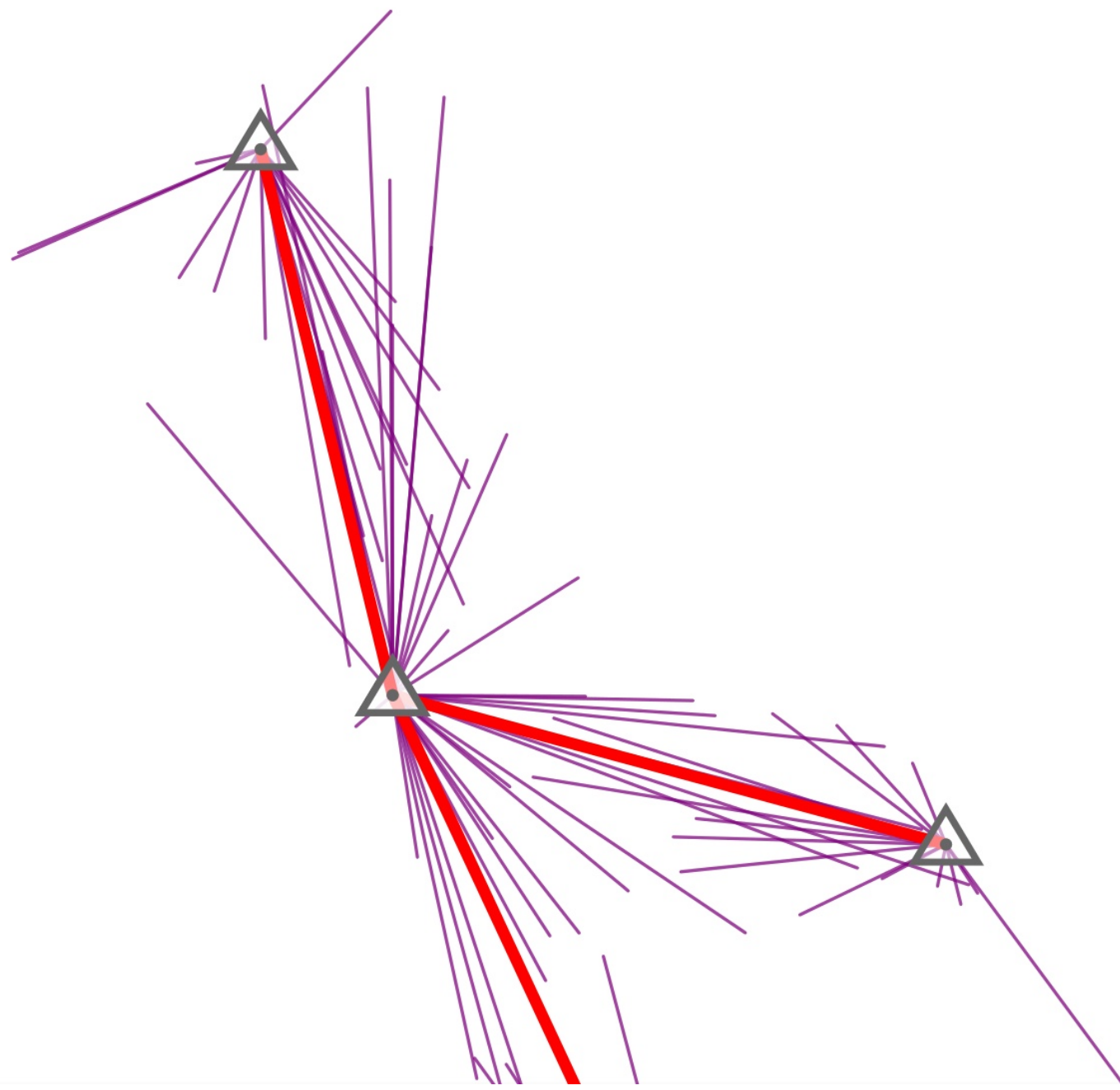


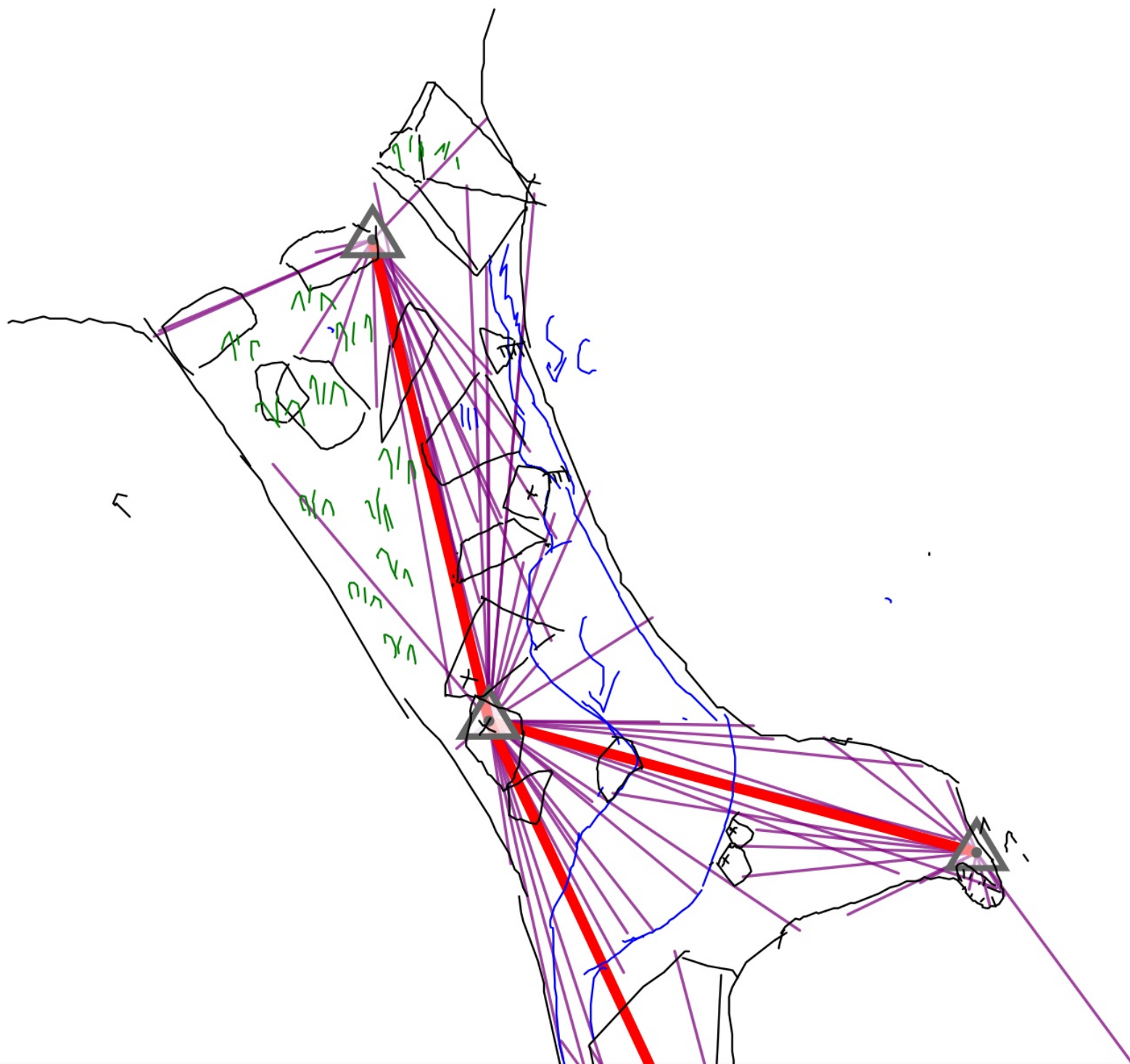


"Noodle"  
cave

Skeleton Gallery

Improvement: **Splay** measurements!  
brought by wireless communications





# The paperless workbench







# 1) The DistoX instrument



Leica



DISTO™ X310

+

ON  
DIST

-

FUNC



UNITS

You can't just buy it!



# Why so?

- No alternatives on the commercial market
- Problems with sourcing a suitable laser distance sensor

# Making measurements

- Touch the wall
- Point the laser
- Wait 2 seconds
- Press the button



# How to get it right?

- IT **NEEDS** TWO SECONDS!
- Be careful with extra targets
- Beware of iron and electricity
- It has to be calibrated! Really!

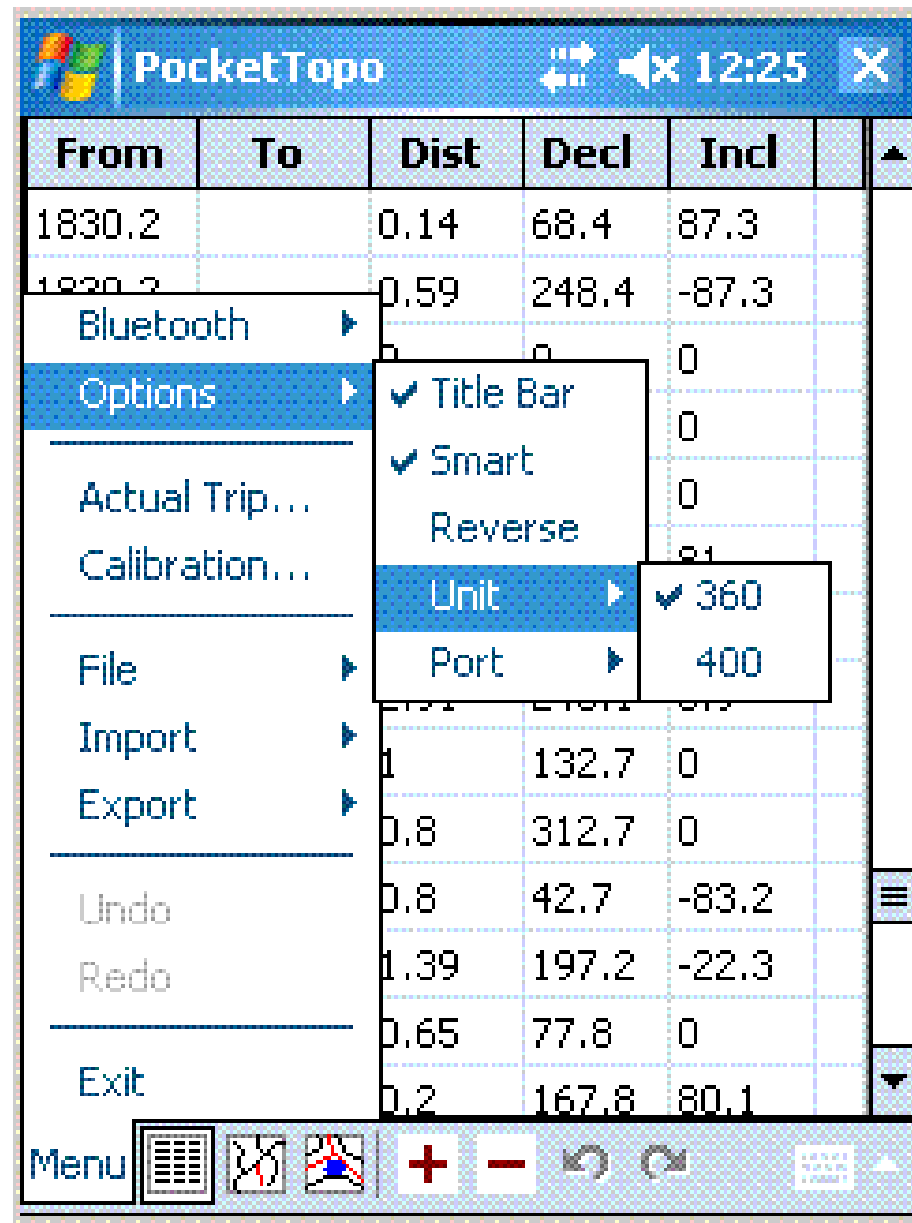




## 2) The software

- Windows Mobile platform
- Android platform

# Windows Mobile software



# Windows Mobile software

- The easiest program
- Obsolete!

Windows Mobile (2000 - 2010) is not Windows Phone (2010 - present)

- Resistive screens = more precision

# Android platform

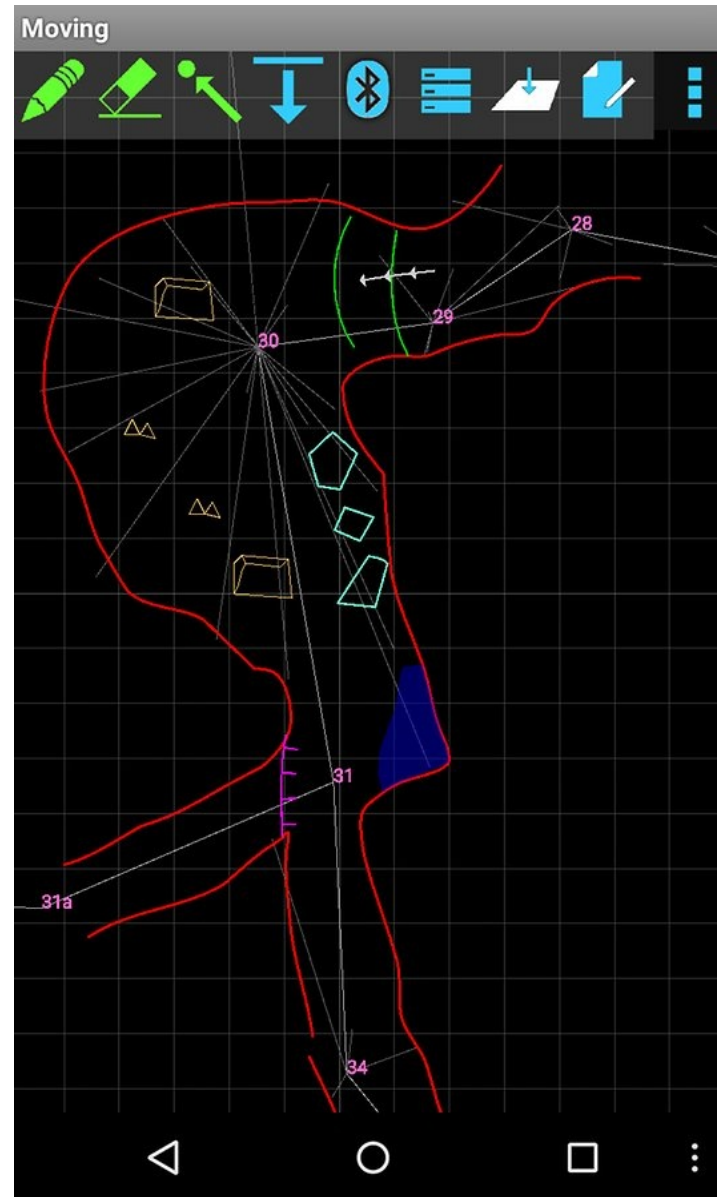
- Topodroid
- Abris
- Qave

... and a few more

but all are bad

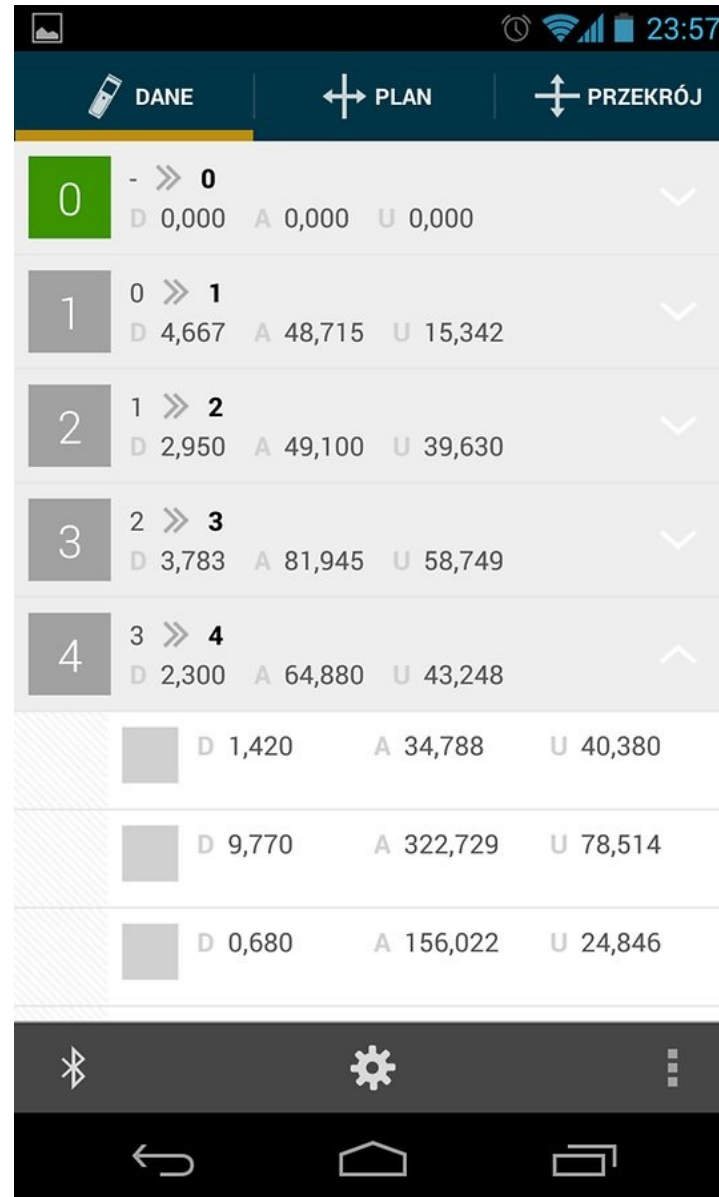


# Topodroid - powerful but not friendly





# Qave - easy but limited



The screenshot displays the Qave mobile application interface. At the top, there is a status bar with icons for signal, Wi-Fi, and battery, along with the time 23:57. Below this is a navigation bar with three tabs: 'DANE' (selected), 'PLAN', and 'PRZEKRÓJ'. The main content area shows a list of items, each with a number in a colored box, a sequence of arrows, and three numerical values (D, A, U). The items are numbered 0 through 4, followed by three items with grey boxes. The bottom of the screen features a dark grey bar with icons for Bluetooth, settings, and a menu, and a black bar with standard Android navigation icons (back, home, recent apps).

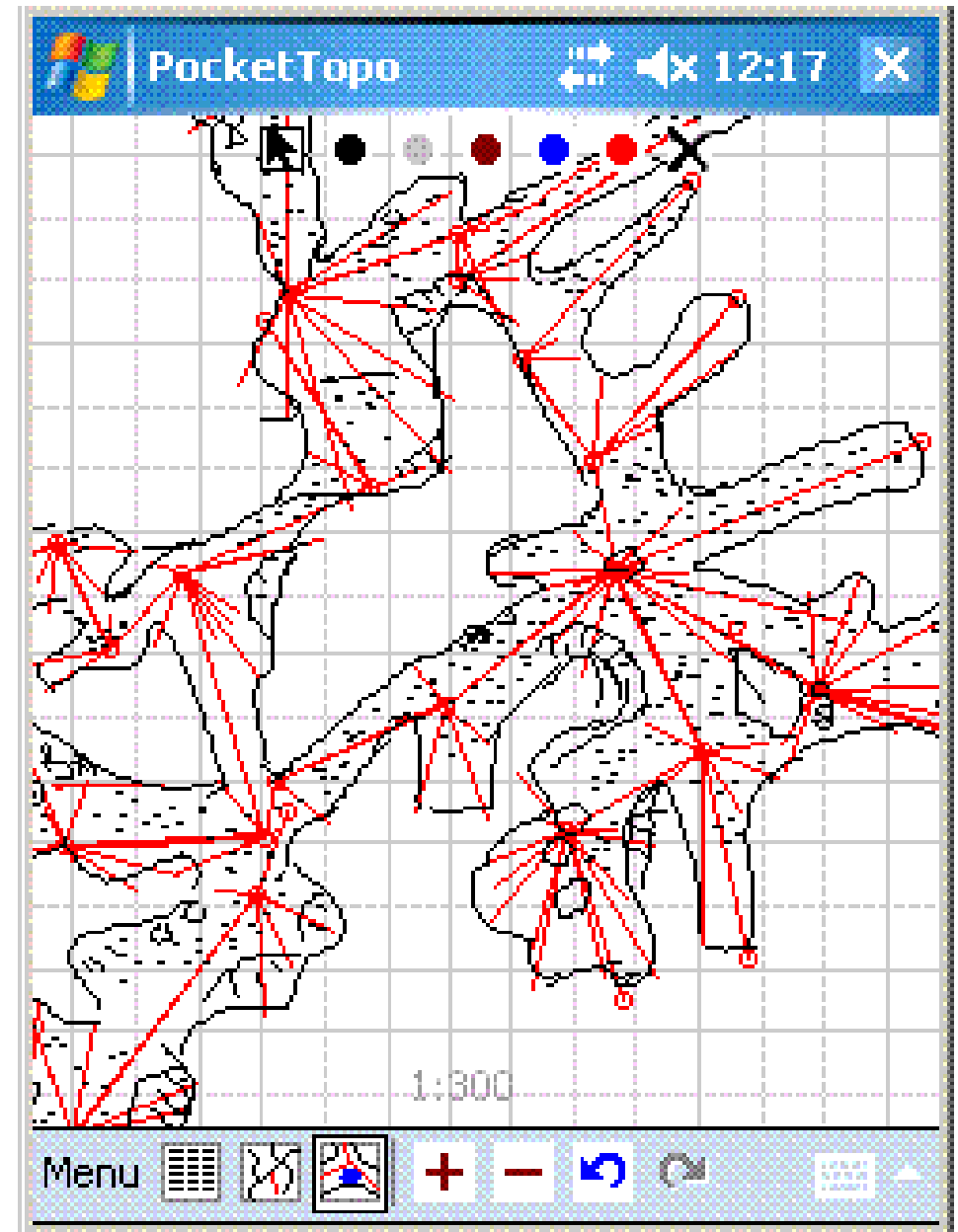
Item	Sequence	D	A	U
0	- >> 0	0,000	0,000	0,000
1	0 >> 1	4,667	48,715	15,342
2	1 >> 2	2,950	49,100	39,630
3	2 >> 3	3,783	81,945	58,749
4	3 >> 4	2,300	64,880	43,248
		1,420	34,788	40,380
		9,770	322,729	78,514
		0,680	156,022	24,846

# Using paperless software

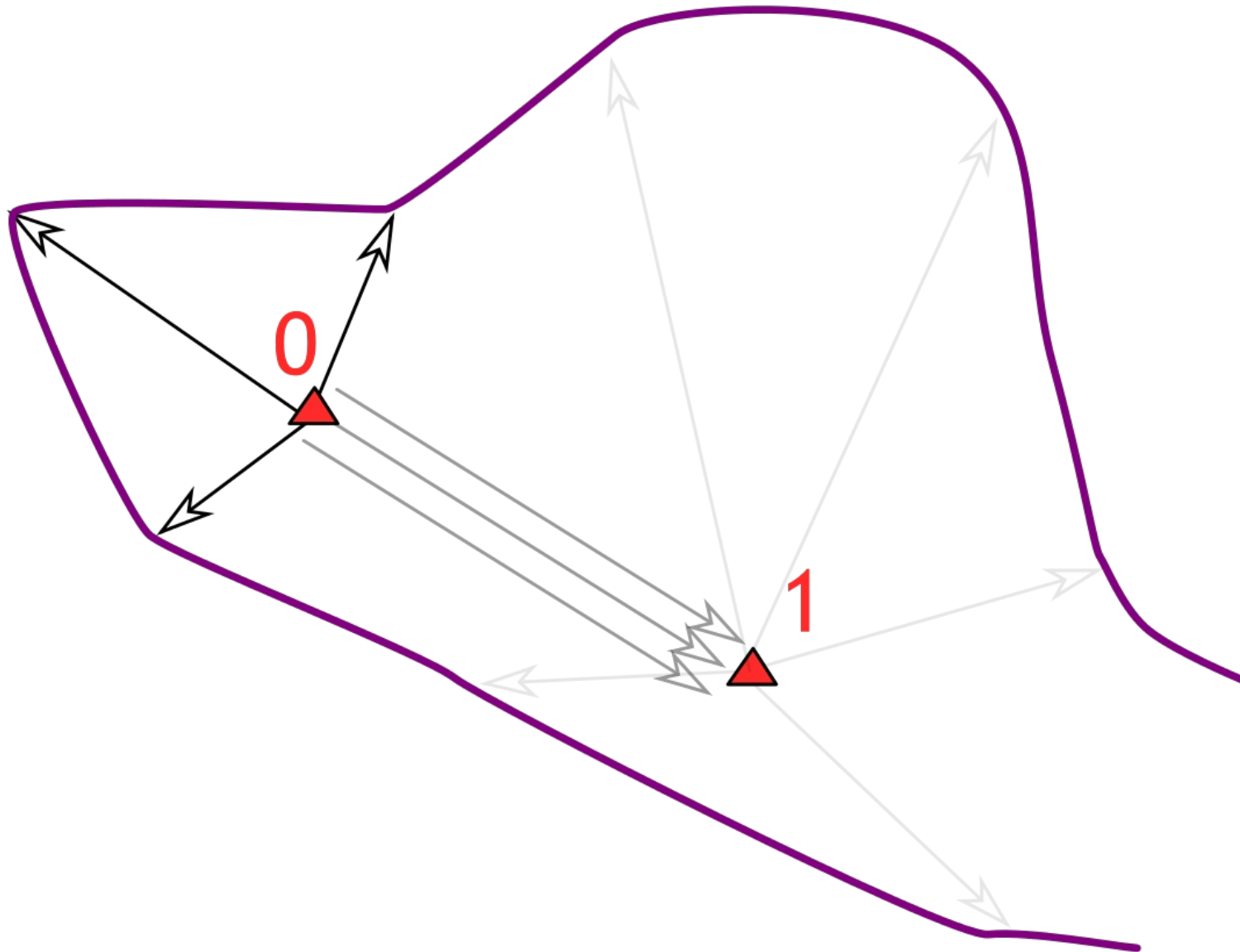
PocketTopo 12:16

From	To	Dist	Decl	Incl
1830.2		0.14	68.4	87.3
1830.2		0.59	248.4	-87.3
1503.50	1831.0	0	0	0
1831.0		1	158.4	0
1831.0		0.8	338.4	0
1831.0		0.29	68.4	81
1831.0		0.4	248.4	-81
1831.0	1831.1	2.91	248.1	8.9
1831.1		1	132.7	0
1831.1		0.8	312.7	0
1831.1		0.8	42.7	-83.2
1831.1	1831.2	1.39	197.2	-22.3
1831.2		0.65	77.8	0
1831.2		0.2	167.8	80.1

Menu [Icons]



# Smart mode

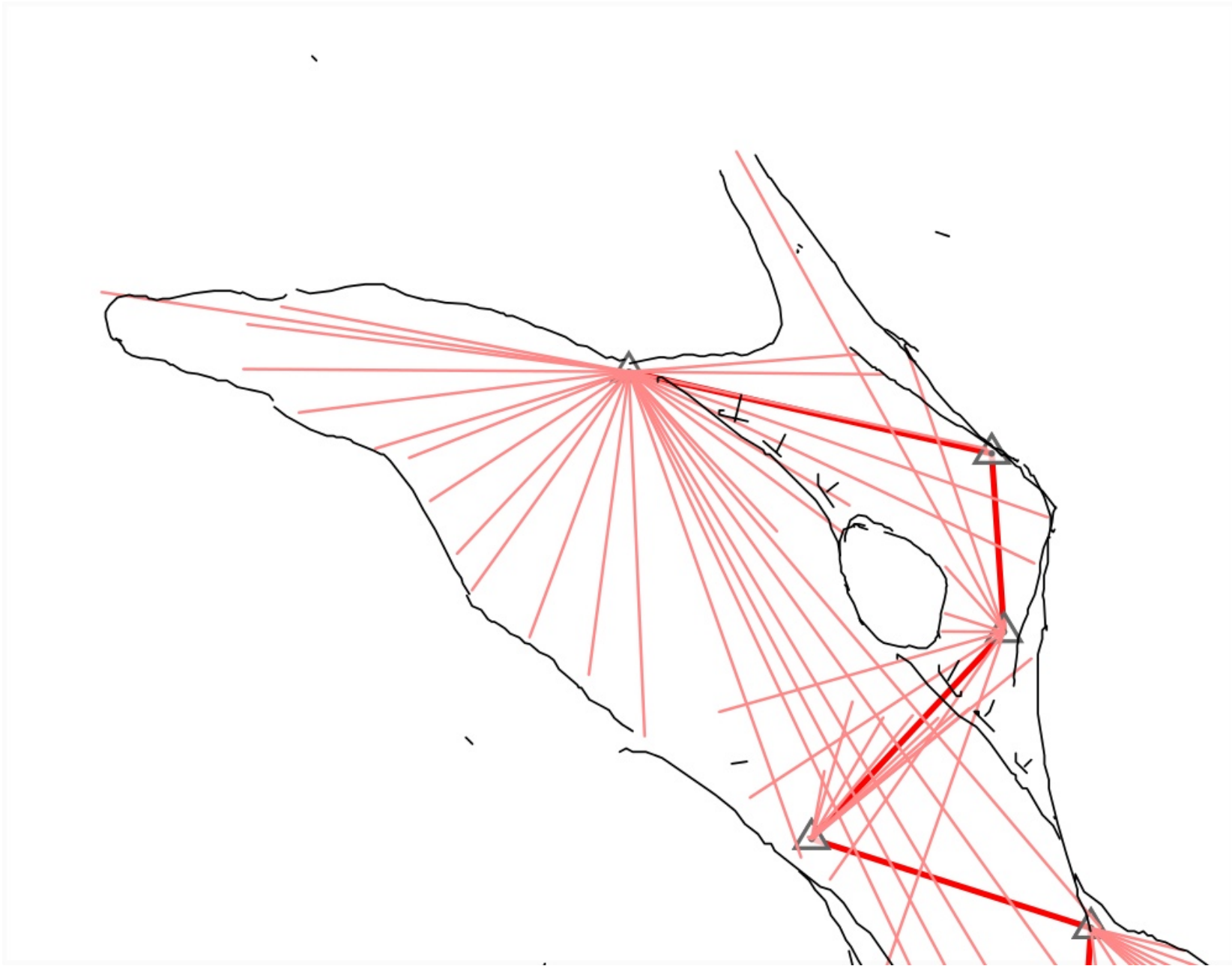


# How to get it right?

- Smart is smart, but check your data screen
- Good at distances? Use the grid!
- The sketcher is the leader.

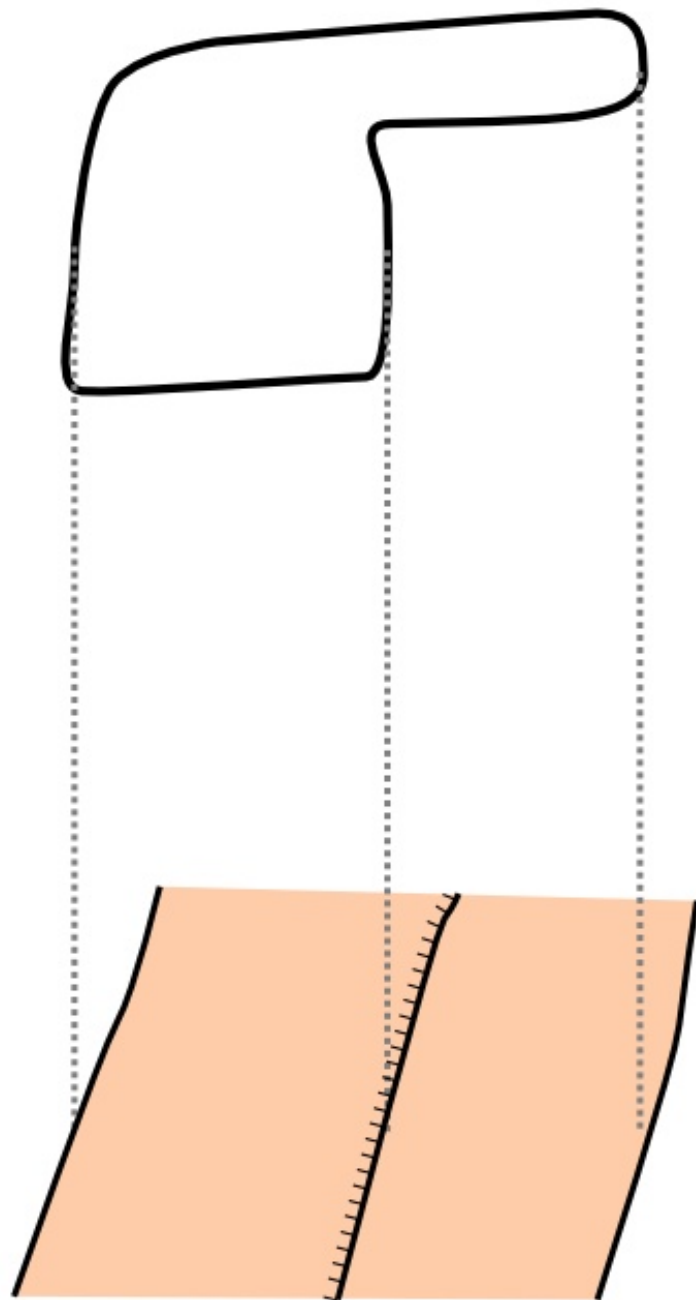
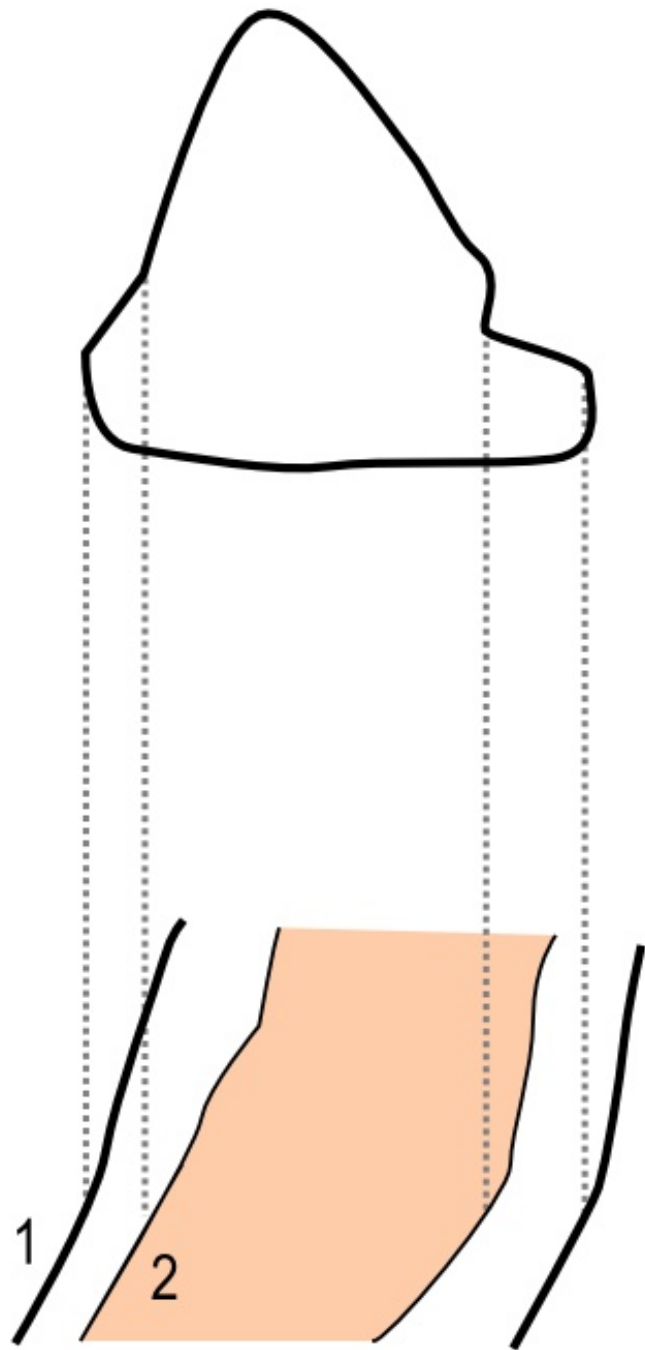
# Pitfalls of the method

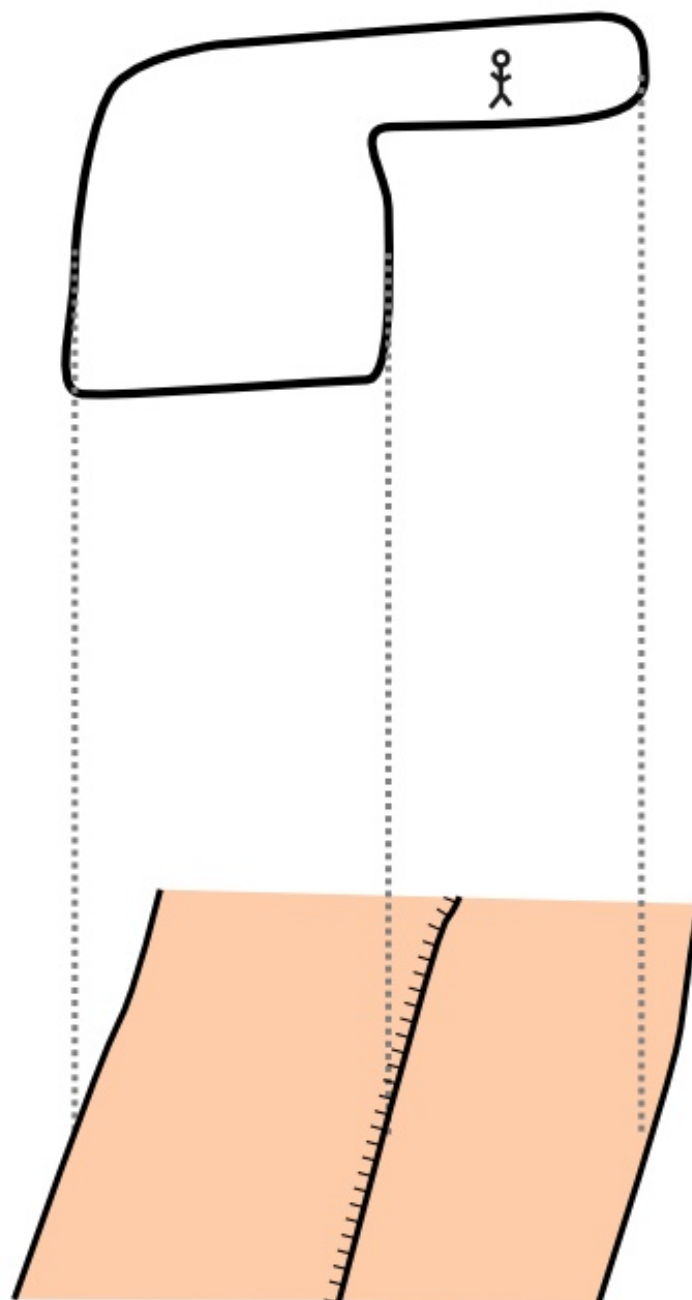
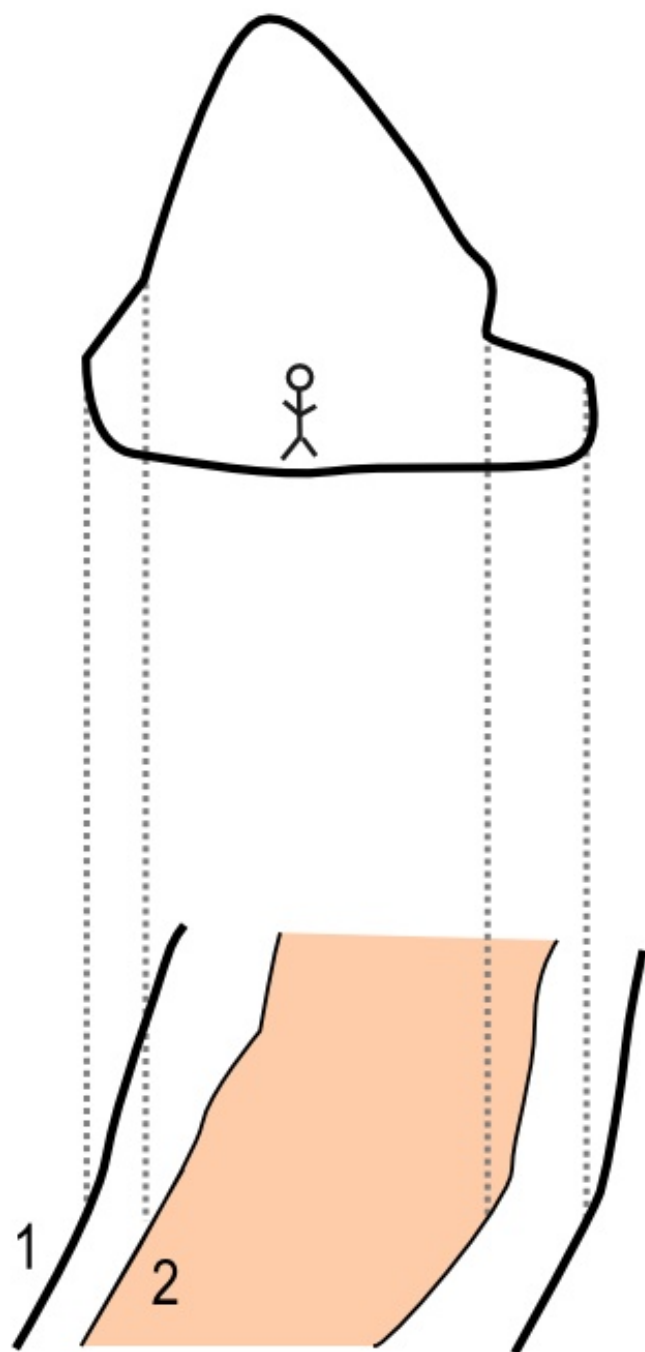
# Mistake 1: Laser scanning

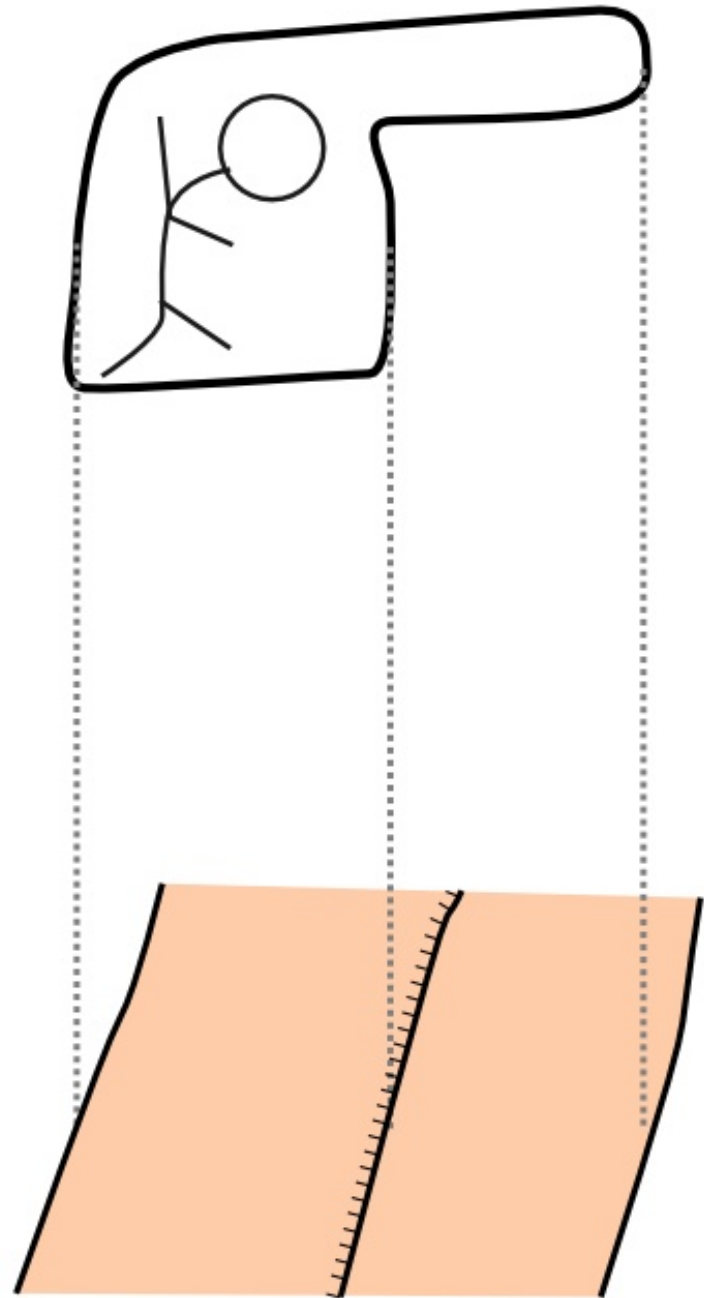
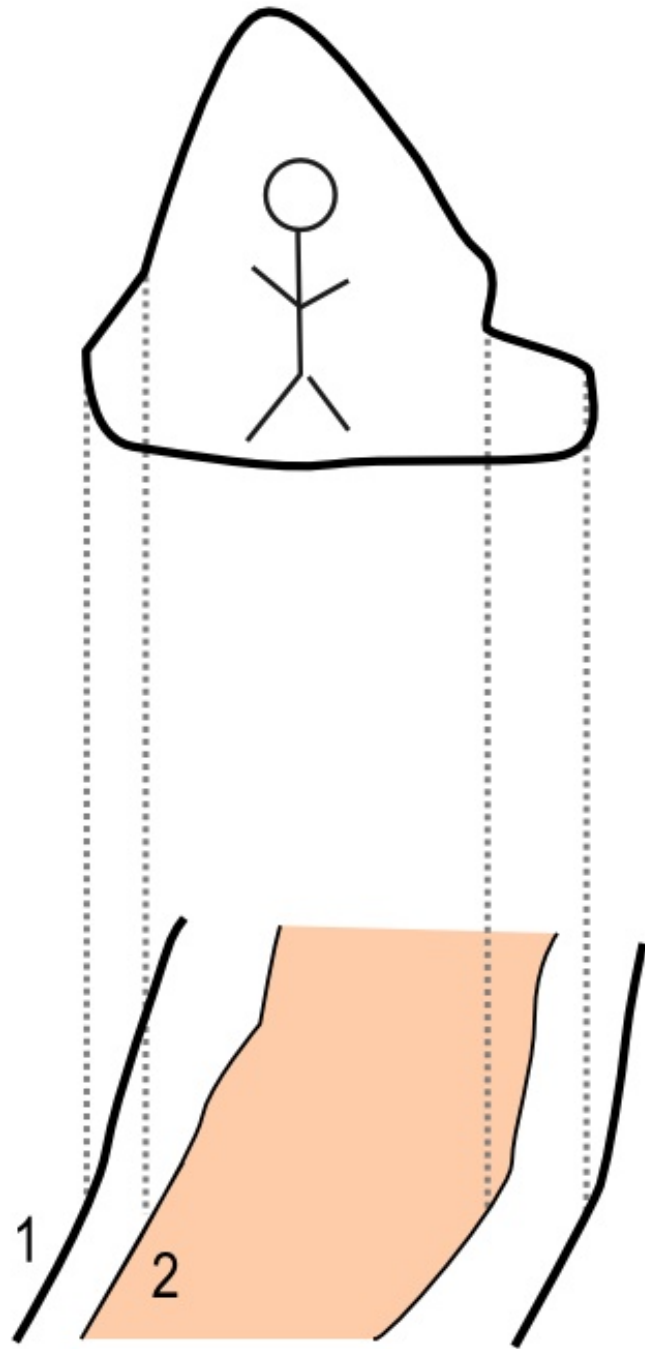




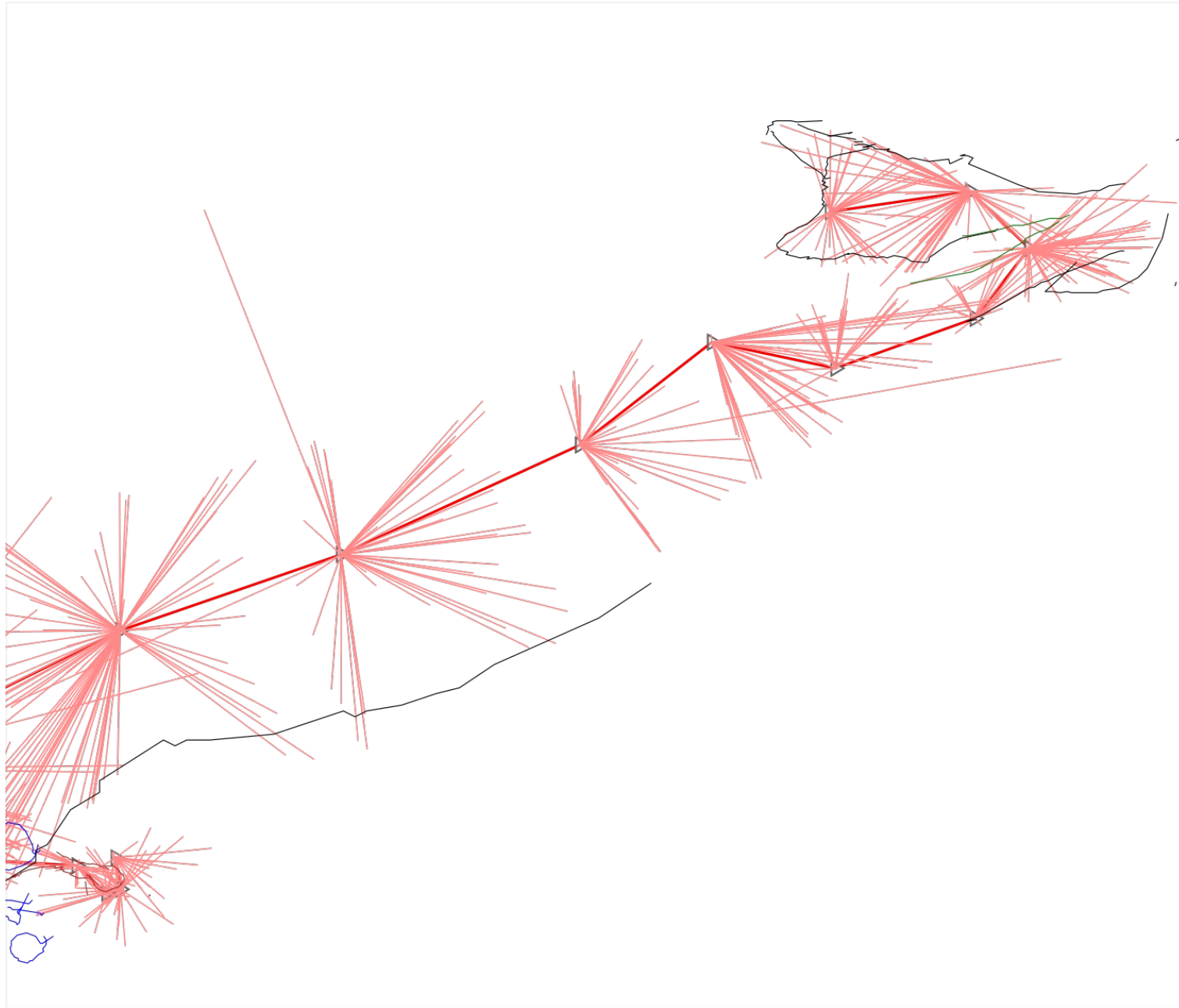
when measuring,  
**think about the map**







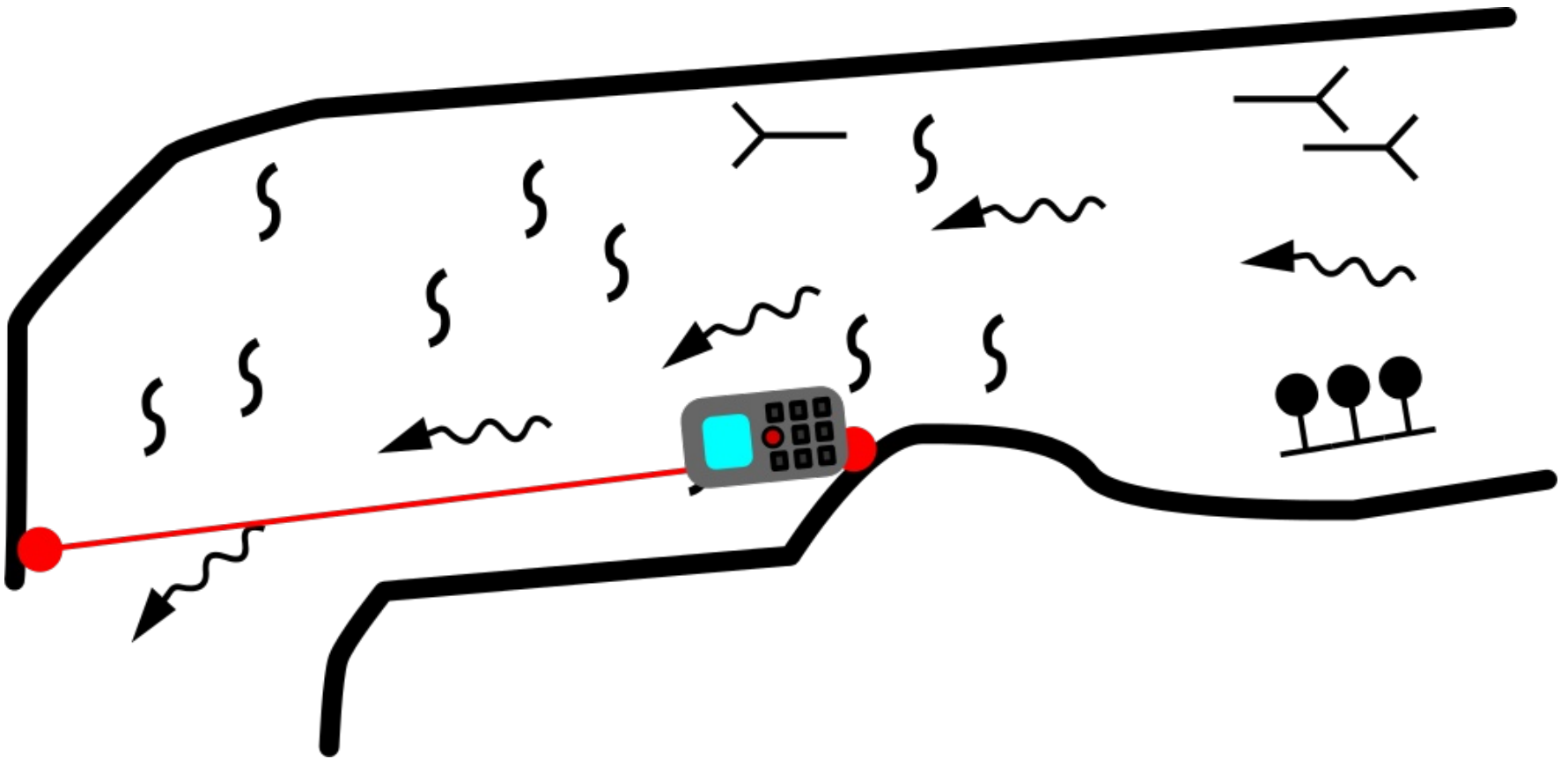
# Mistake 2: Sketching not needed





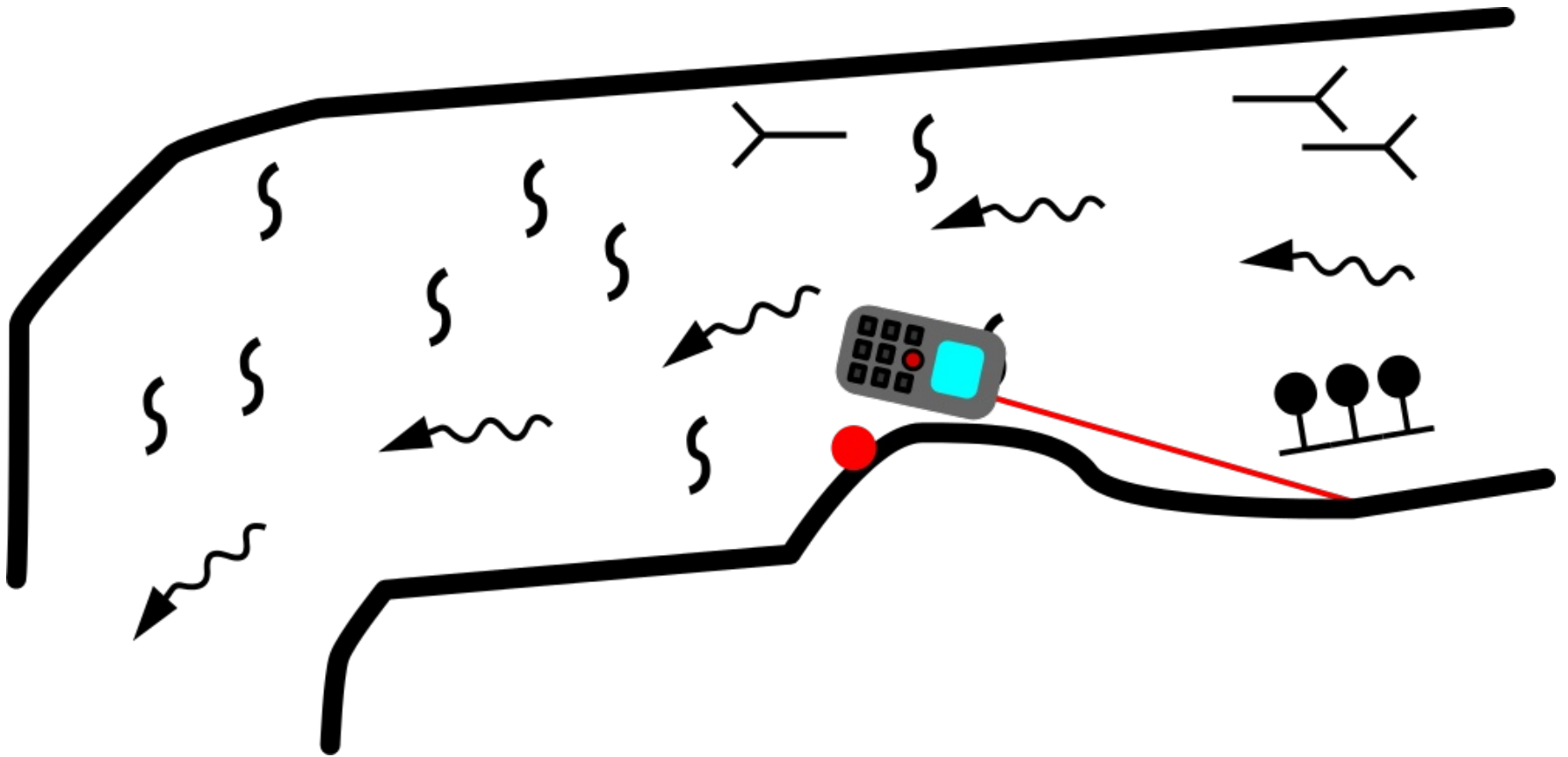
# Mistake 3: Poor measurement

- you will remember the workshop!  
... but many of your teammates are not here today
- note the two precision regimes!



Centerline: **NO COMPROMISES**

align instrument, aim perfectly



Splays: be reasonable

10 cm = 0,1 mm (in 1:1000)

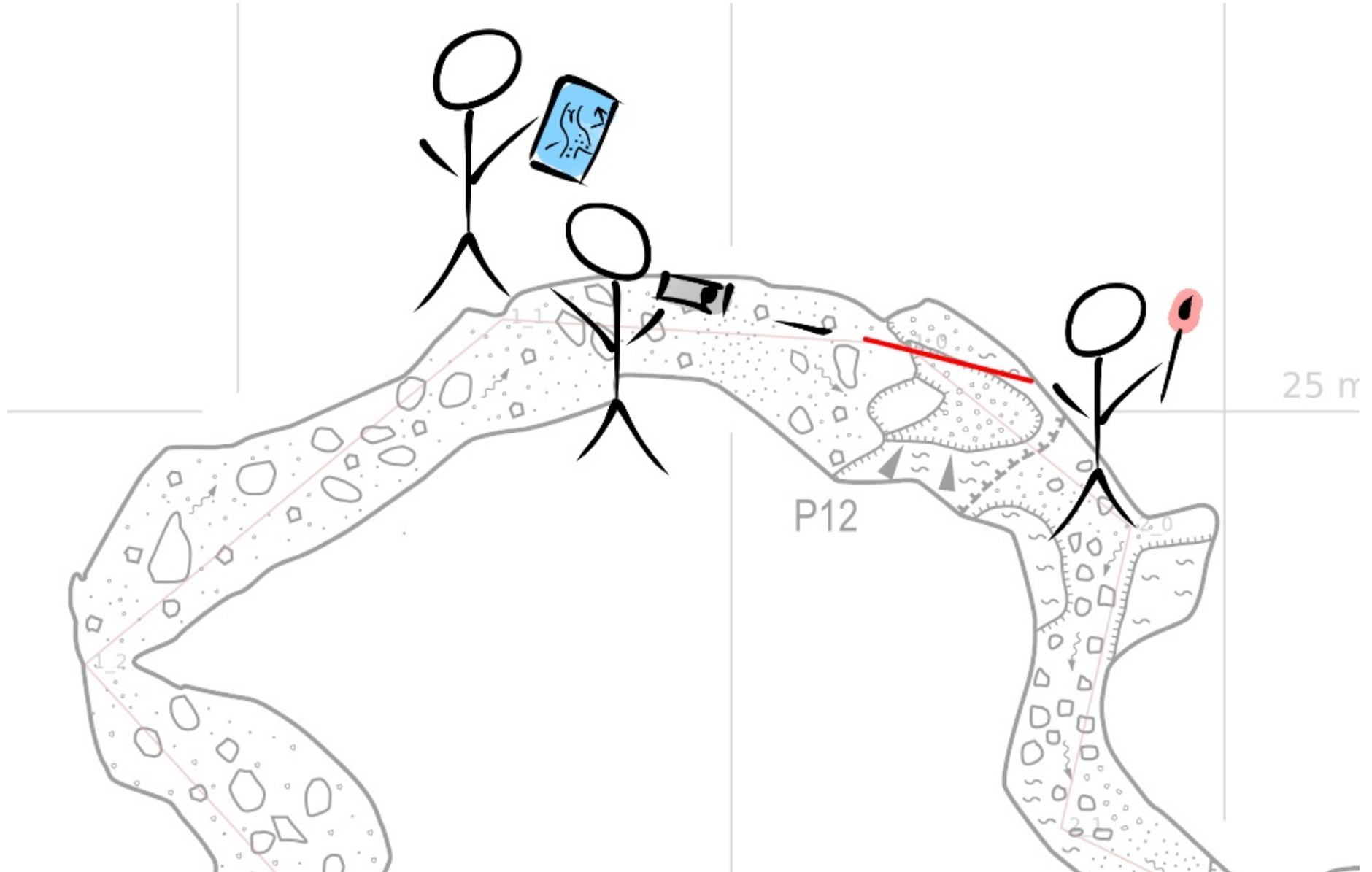
Our field trip

- Teams of three people
- Focus on workflow
- Please bring an Android smartphone
- **Please install Qave**

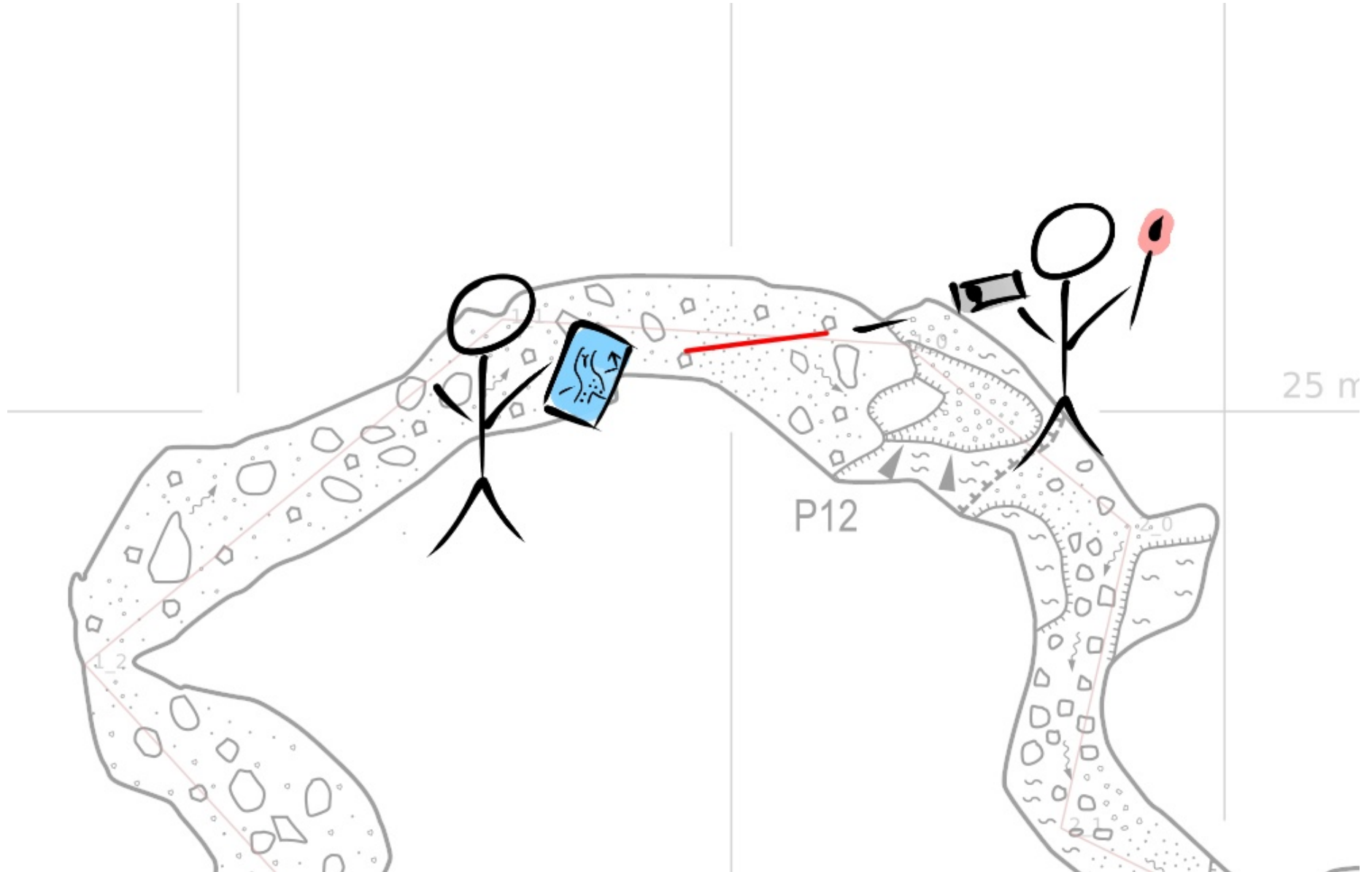
# Workflows



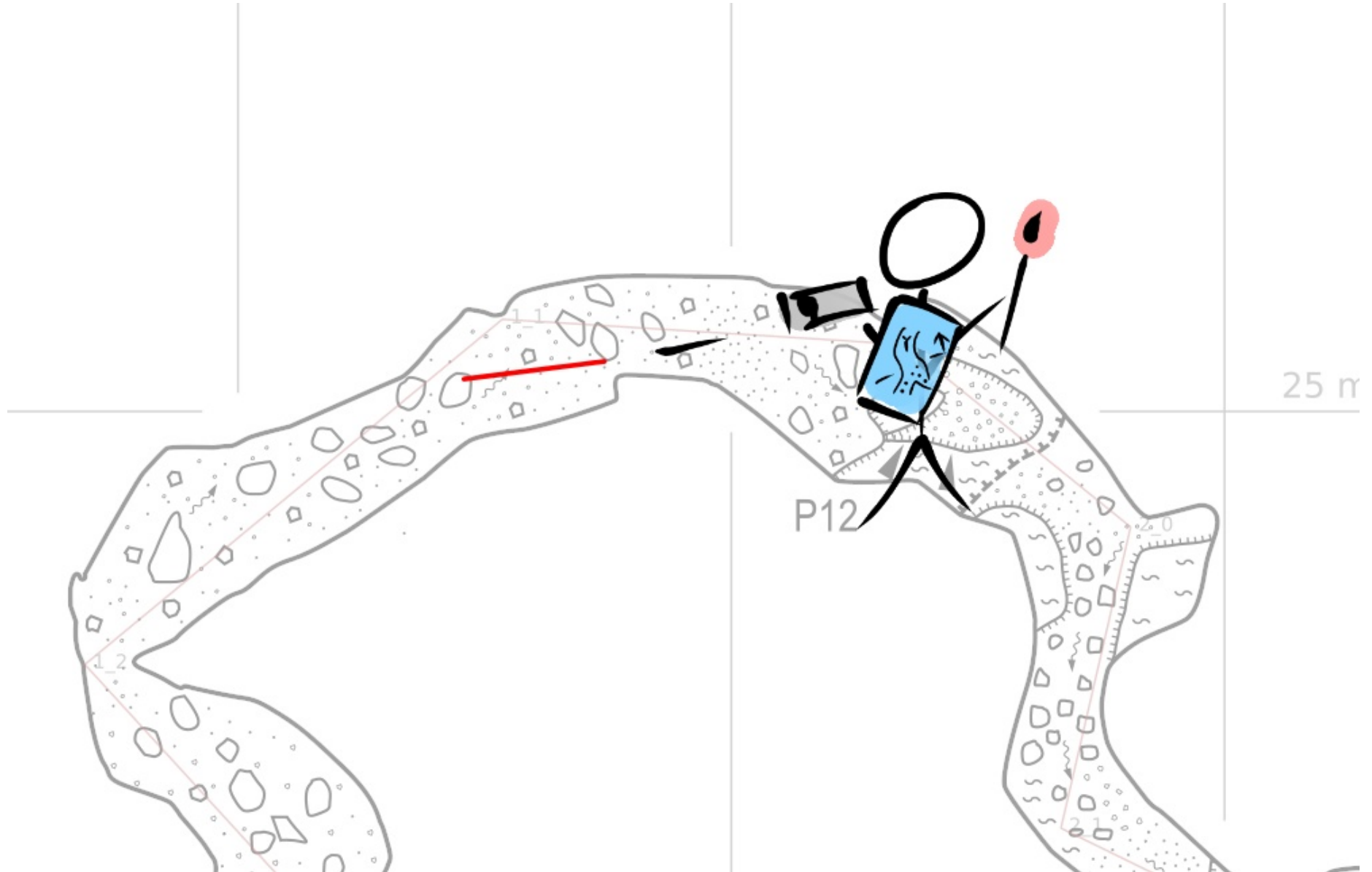
# Three person team



# Two person team - reverse!



# One person team - reverse!



# Vertical surveying

- Just like one-person team
- Teammate just shows stations

Processing paperless data

# What is new?

- Three measurements

1.2	1.1	22.480	311.08	-10.01
1.2	1.1	22.480	311.29	-9.83
1.2	1.1	22.480	311.28	-9.93

- Thousands of loops
- **DANGER**: Average of: 358, 0, 2 = 120




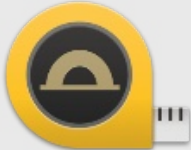
# What is new?

- Splay measurements

4_0	4_1	7.540	341.3	18.8
4_1	.	1.310	248.5	-45.8
4_1	.	1.350	59.7	28.5
4_1	.	1.010	292.1	-87.7
4_1	.	1.400	52.0	-46.4
4_1	.	2.250	64.3	2.5
4_1	.	3.230	62.9	-6.2

- Maybe throw them away?

# Importing measurements

	<div>Survex</div> <div></div>	<div>Therion</div> <div></div>	<div>Inkscape</div> <div></div>
<div>PocketTopo</div> <div></div>	<div>Export Therion Rename Use PoToCo</div>	<div>Export Therion</div>	<div>Export Therion Rename</div>
<div>Qave</div> <div></div>	<div>Export SVX</div>	<div>Export SVG</div>	<div>Export SVG</div>

# Importing sketches

- Therion
- Inkscape

Questions?

# References:

<http://paperless.bheeb.ch>

<http://jaskinie.jaszczur.org>

# Thank you

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Credits:

DistoX/DistoX2 photos; PocketTopo screenshots

(c) Beat Heeb ([paperless.bheeb.ch](http://paperless.bheeb.ch))