

Divided by a common language

*Bridging the gap between the ideal world of geoinformatics
and the messy realities of geodesy.*

Thomas Knudsen, SDFE, Copenhagen, Denmark

*England and America are two countries
divided by a common language*

(attributed to)

GEORGE BERNARD SHAW

*Geodesy and Geoinformatics are two sciences
divided by a common language*

(attributed to)

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Disclaimer 😊

Exaggeration promotes understanding, so I'll leave out the details to make room for the exaggeration.

So consider the following a sketchy caricature, intended to introduce a potentially illustrative case of “mismatched shared concepts”.

The reason for the mismatch is historical, but the consequences will be tangible in a not-so-distant future.

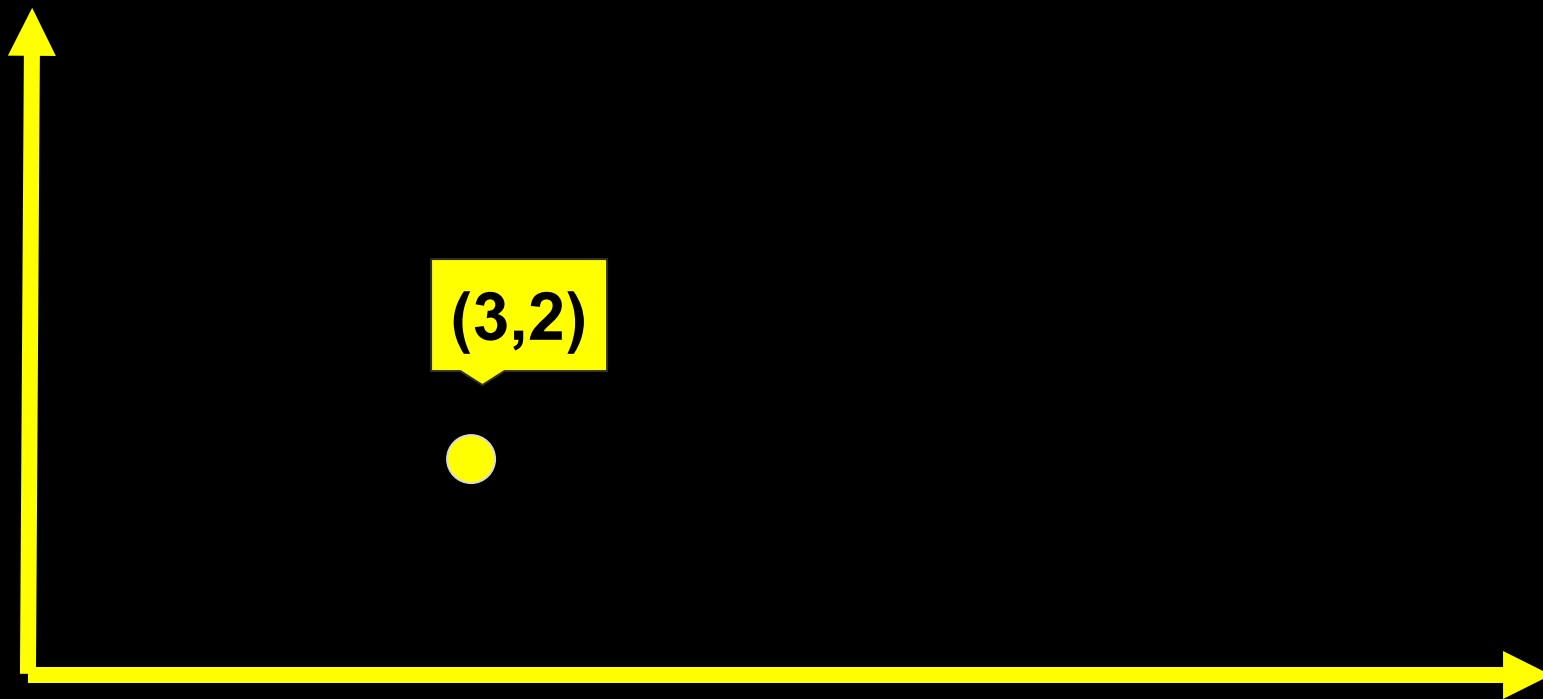
A picture of the ideal, eternal universe

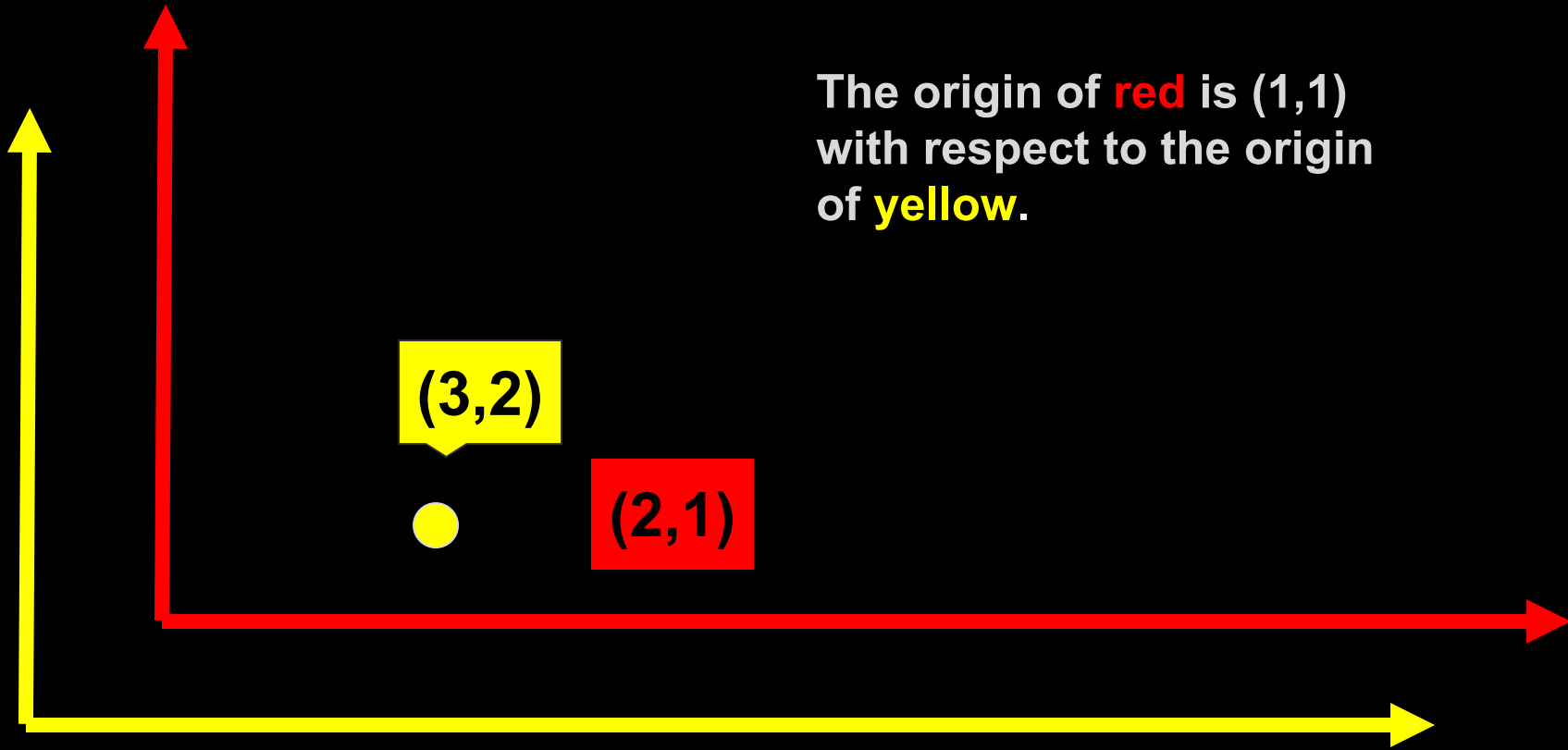
A picture of the ideal, eternal universe

(2,2)



A picture of the ideal, eternal universe

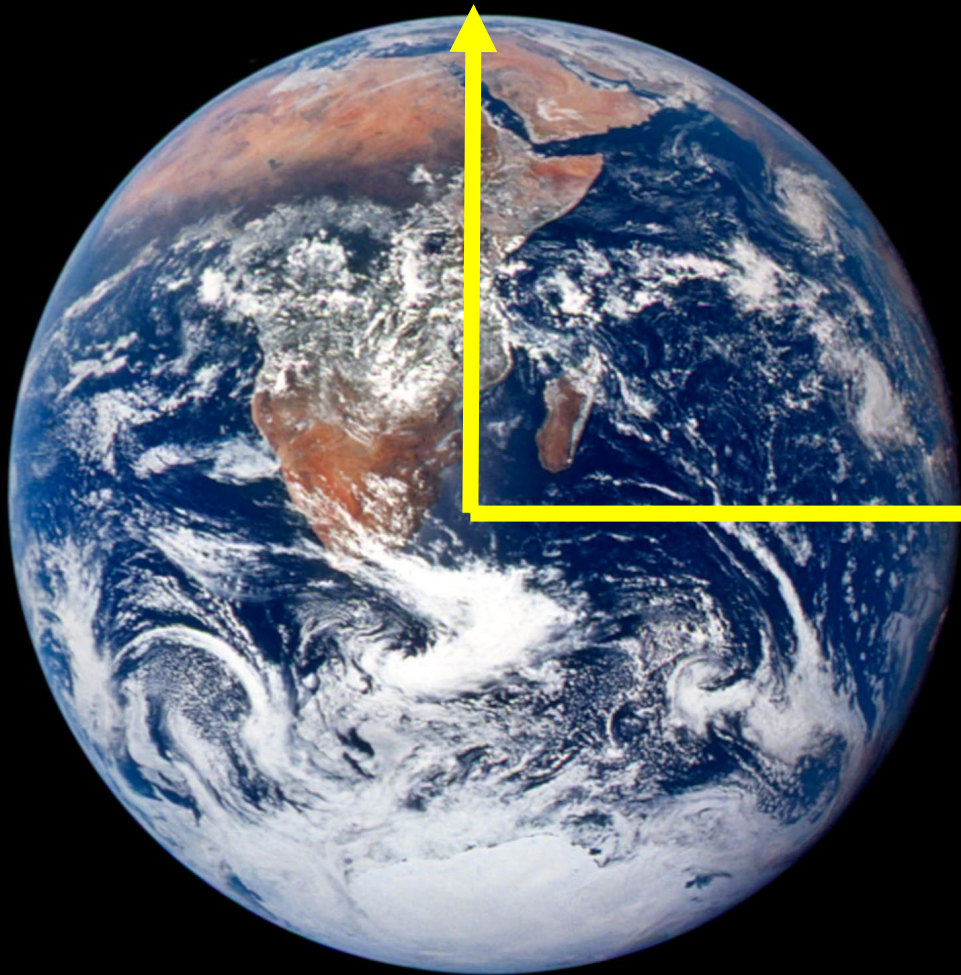




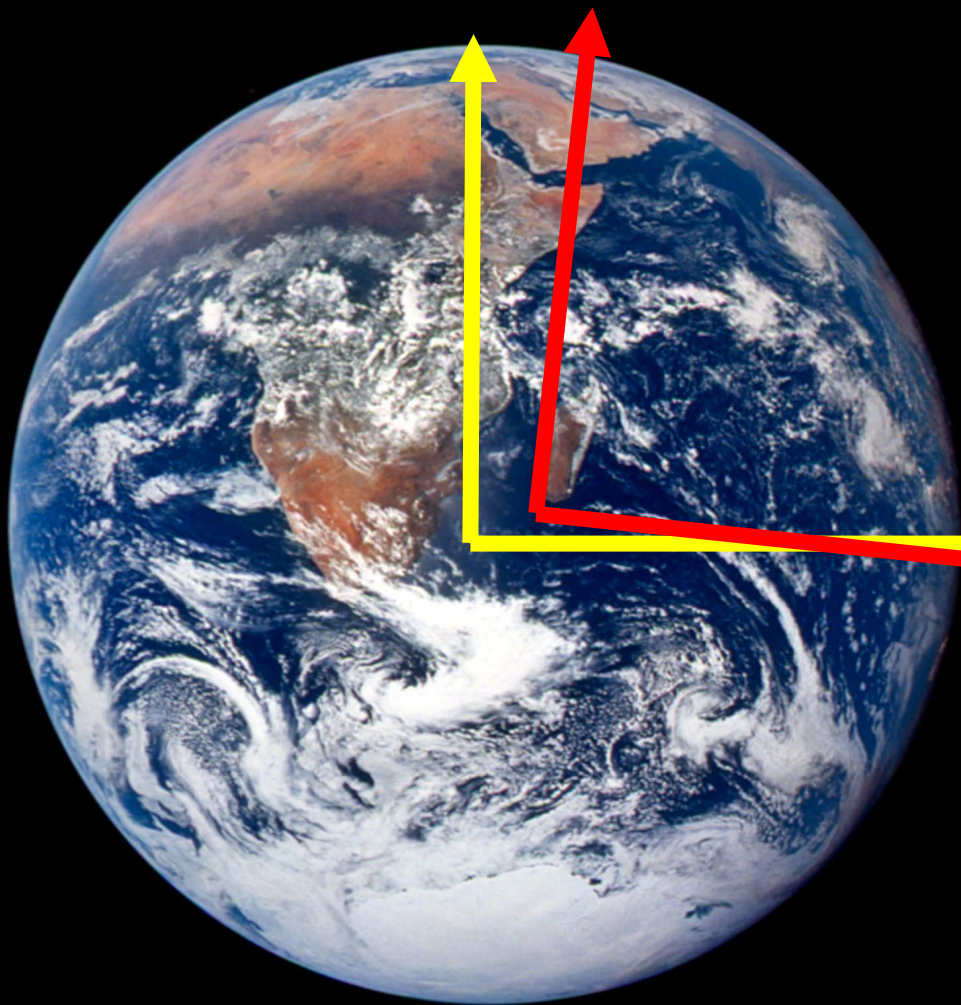
The origin of **red** is (1,1) with respect to the origin of **yellow**.



Origin at the center-of-mass

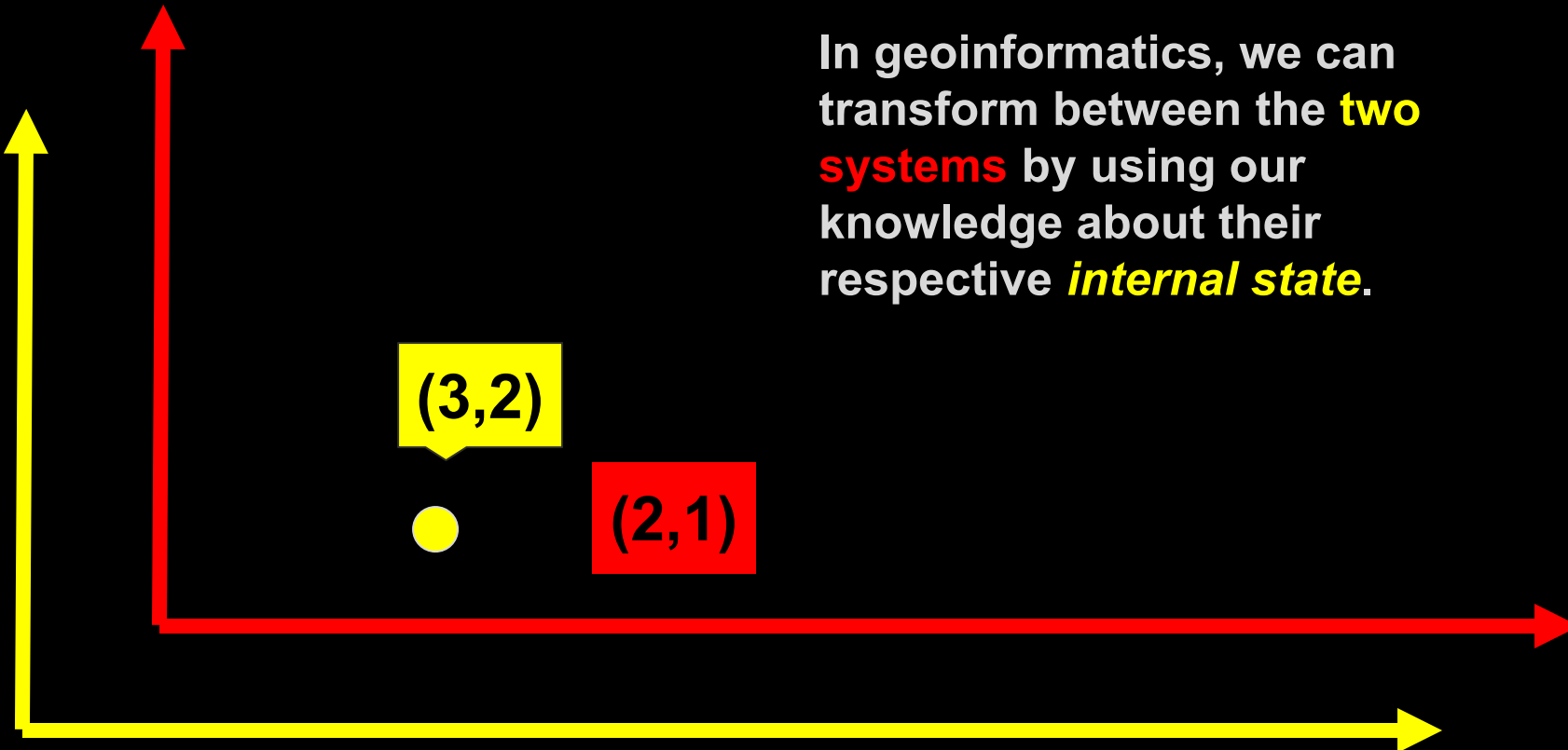


Origin at the center-of-mass

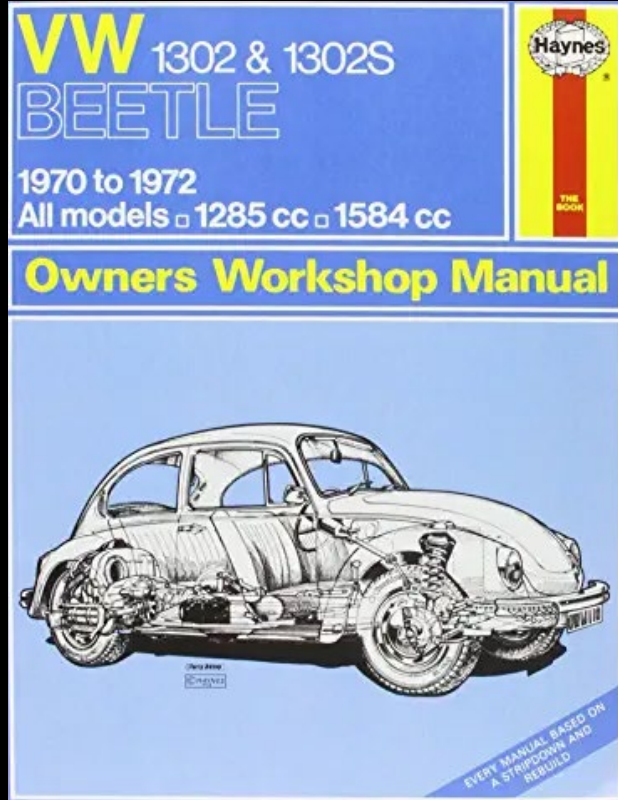


Origin at the center-of-mass

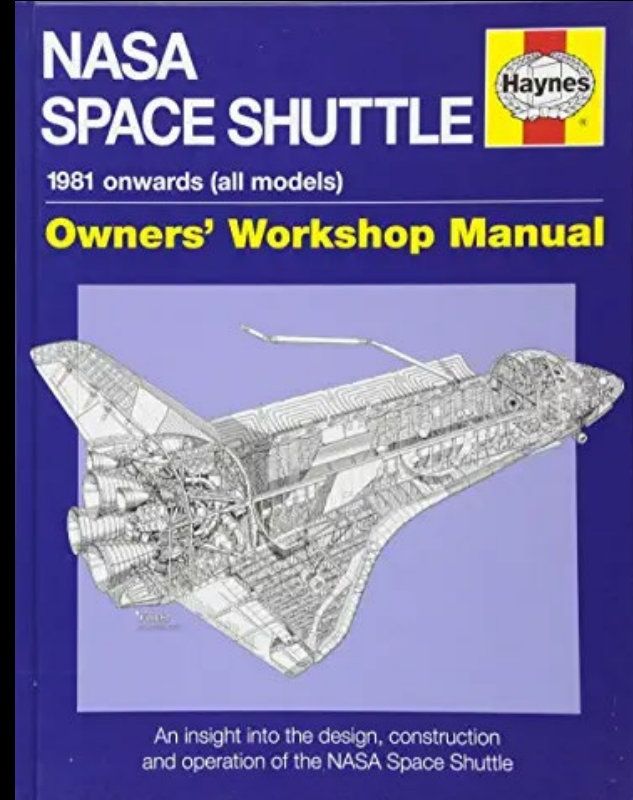
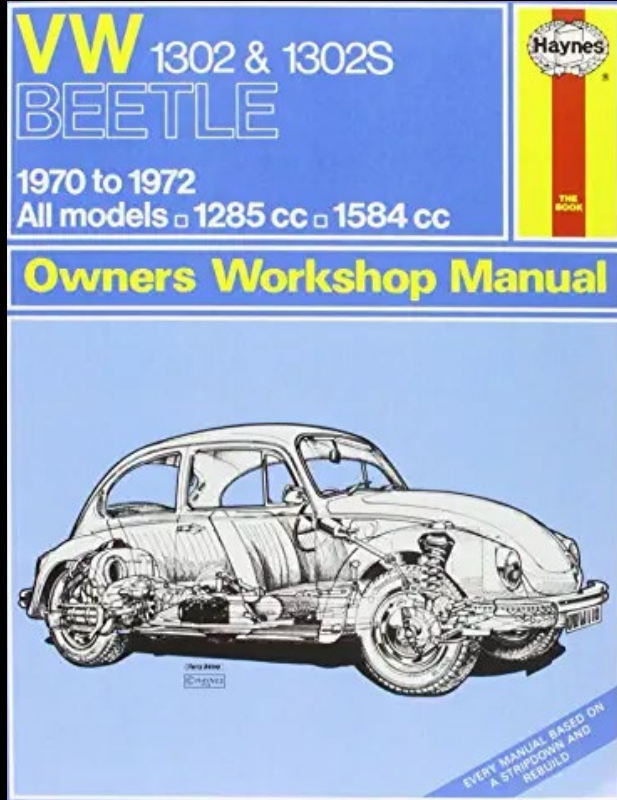
In geoinformatics, we can transform between the **two systems** by using our knowledge about their respective *internal state*.



“Knowledge of internal state...”



“Knowledge of internal state...”



INTERNATIONAL
STANDARD

ISO
19111

Third edition
2019-01-31

**Geographic information —
Referencing by coordinates**

Information géographique — Système de références par coordonnées

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ISO 19111:

- A coordinate reference system (CRS) is a real, tangible object with internal state, reflecting its definition.
- For a set of 2 CRS, we can infer a transformation between them, from their “definitions”

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Geodesy:

- A CRS is a label.
- There is no axiomatic foundation on which to build “definitions” of CRS
- Transformations are the “real objects”, but they are fundamentally of empirical nature.

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- Well defined concepts built on the illusion of an axiomatic foundation

Geodesy:

- Sloppy linguistic concepts, but built on empirical observations, not requiring axiomatic foundations.

Mission: Marry geodesy and geoinformatics

- A simplified ISO 19111, (better) reflecting the real world
- Improved conceptual rigor in geodesy

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Mission: Marry geodesy and geoinformatics

- A simplified ISO 19111, (better) reflecting the real world
- Improved conceptual rigor in geodesy
- The changes needed are probably surprisingly small
- ... but that's the subject of another talk

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Unused slides

C.5.7 Implementation considerations

This explanation of coordinate operations is not complete without giving some thought to their implementations. Coordinate transformation services should be able to automatically derive coordinate operations that are not stored explicitly in any permanent data store, in other words determine their own concatenated or inverse operations. The reason is that it is practically impossible to store all possible pairs of coordinate reference systems in explicitly defined coordinate operations. The key to a successful software implementation is the ability to apply meaningful constraints and validations to this process. For example, it may be mathematically possible to derive a concatenated coordinate operation that will transform North American Datum of 1927 coordinates to Australian Geodetic Datum of 1966 coordinates but, in a practical sense, that operation would be meaningless. The key validation that would flag such a coordinate operation as invalid would be a comparison of the two domains of validity and the conclusion that there is no overlap between them.

... but experience shows that this assertion is likely wrong!