

XMatch metadata requirements

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□ Minimum requirements

- Basic cross-matches
 - positional columns
 - reference frame
 - epoch (to possibly warn the user if \neq)
- Taking into account positional errors
 - error columns (1, 2 or 3 columns)
 - (+ systematics?)
- Astrometrical cross-match
 - proper motions + parallax + radial velocity
 - epoch
 - minimal covariance matrix (errors)
 - epoch of the minimal covariance matrix

□ Positions

- Get columns + coordinate system?
 - Column names:
 - GLON/GLAT, l/b (galactic)
 - RAJ2000/DEJ2000 (ICRS or Barycentric FK5 J2000)
 - RAdeg/DEdeg, ra/dec (ICRS assumed?)
 - UCDs:
 - *pos.eq.(ra/dec)*: Equatorial (FK4/5, ICRS?)
 - *pos.galactic.(lon/lat)*: Galactic
 - *pos.supergalactic.(lon/lat)*: Supergalactic
 - ... ;*meta.main*
 - COOSYS (+ *ref* if several positions)

□ Epoch

How to know the epoch?

- Column or *PARAM* name: Epoch, JD, MJD, ...
- Column or *PARAM* UCD: *time.epoch*
- *COOSYS* for a global epoch
- How to link epoch with positional columns?
 - ...; *meta.main*
 - *ref* to *COOSYS*
 - *GROUP* (what is the status?)
 - Data Model (DM)?

□ Positional errors 1/2

How to find positional errors?

- At least 5 ways (see also § Uncertainties in [STC2 Astronomical Measurements Model](#) by AR and MCD):
 - circular error:
 - *stat.error;pos.eq*
 - non-oriented ellipse:
 - *stat.error;pos.eq.ra*
 - *stat.error;pos.eq.dec*
 - oriented ellipse:
 - non-oriented + *stat.correlation;pos.eq.ra;pos.eq.dec*
 - non-oriented + *stat.covariance;pos.eq.ra;pos.eq.dec*
 - *phys.angSize.sm(aj|in)Axis;pos.errorEllipse* + *pos.posAng;pos.errorEllipse* ?
- Solve possible ambiguities:
 - *...;meta.main*
 - or *GROUP*, DM?

□ Positional errors 2/2

- How is defined the positional error?
 - 90% confidence interval
 - 68% confidence interval (1σ in 1D)
 - 39% confidence interval (1σ errors in 2D, coming from $2 \times 1\sigma$ in 1D)
 - ...
- What is included in the error?
 - Internal (PSF fit) + External (calibration) errors?
 - Often hard to find the info, even in papers!
- Is it the role of the VO to provide such information?
- Can't we simply ask the user? (easier life vs responsibility)

□ First Conclusion

- We can already do a lot with UCDs + COOSYS
 - Ambiguities: use *meta.main*, else *GROUP*?
 - Problem:
 - long UCDs: *phys.angSize.smajAxis;pos.errorEllipse;meta.main*
 - in practice: no *meta.main* or just *stat.error*
- But: error definition? Systematics?
- Efficient cross-matches: same system + same epoch (Gaia in the future?)
- Positions (and magnitudes) are the basis of astronomical catalogues
 - both VO not yet compatible with clean catalogue merging

□ My needs

What I would like to ask to a black box:

- Does my table contain ICRS positions?
 - if not, does it contains FK5 J2000? ...
- Get the position entity (+ ID referencing it)
 - get the column names/indices of the RA and DEC columns attached to the position entity
- Is an epoch attached to the position entity?
 - is it global?
 - get the value
 - is it provided in a column?
 - get the column name attached to the epoch entity
- Are errors attached to the position entity?
 - get the error type (circle, oriented ellipse, ...)?
- ...

□ Best way to fulfill them

What is the best tool to replace the black box?

- Heuristic based convention: names + units + UCDs + column positions
 - Pro: simple, limited modifications of existing datasets
 - Con: rely on column relative positions, not flexible, hard to extend
- RDF (+ ontology) / DM / ...
 - Pro: powerfull and flexible
 - Con:
 - complexity, additional tools and concepts
 - who will update the metadata of the 15.000 Vizier tables?
- *COOSYS* + *GROUP* somewhere between both previous solutions
- Solution having an **incremental complexity**?
 - do not pay the high price for simple needs