ECO and RESOLVE MOCK CATALOGUES

Repository for the mock catalogues - Normal Version

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This README file describes the mock galaxy catalouges for the different survey geometries, i.e. for *ECO*, *Resolve A*, and *Resolve B*. The table and text were produced using markdown language.

This is a summary of teh values used to create these mock catalogues: These catalogues are taking into account the extra buffer along the *cz* direction in redshift space.

Survey	**RA (Deg)**	**RA Range**	**DEC (Deg)**	**DEC Range**	***zmin***	***zmax***	**Vmin (km/s)**	**Vmax (km/s)**	**Dist (Mpc)**
A	(131.25, 236.25)	105.0	(0 ,+5)	5	0.00844	0.0249	2532	7470.	(25.32,70.02)
B	(330.0 , 45.0)	75.0	(-1.25,+1.25)	2.5	0.01416	0.024166	4250	7250.	(42.5 , 72.5)
ECO	(130.05, 237.45)	107.4	(-1, +49.85)	50.85	0.00844	0.0249	2532	7470.	(25.32,70.02)

The next table provides the number of mock catalogues per cubic box of L=180 Mpc/h.

Survey	**N Mocks**
Resolve A	59
Resolve B	104
ECO	8

Mock Catalogues

The mock catalogues have the same geometries as those of the real surveys. The mock catalogues consist of a total of **26**

columns, each column providing information about the individual galaxy and its host DM halo, and properties from real galaxy catalogues. Aside from the values obtained from the simulation (Columns 1-12), we matched properties from real catalogues (i.e. ECO and RESOLVE A/B) to the mock catalogues by finding the r-band absolute magnitude in real data that resembles that of the mock galaxy catalogues. For r-band absolute magnitudes between -17.33 < Mr <= -17.00, we matched the mock galaxy's Mr to a galaxy in RESOLVE B (resolvecatalog*str.fits | Updated on 2015-07-16) For r-band absolute magnitudes brighter than Mr = -17.33, we matched the mock galaxy's Mr to a galaxy in ECO (eco*wresa_050815.dat | Updated on 2015-05-08). For each matched galaxy, we attached the galaxy's properties to the matched mock galaxy catalogue.

We also ran the Berlind2006 Friends-of-Friends algorithm on each mock catalogue, and assigned an estimated mass to the galaxy group through *Halo Abundance Matching*.

For observables in the real data, the joint probability distributions are the same as those in the real data.

For all the values, we use the following cosmology:

```
Omega_M_0     : 0.302
Omega_lambda_0: 0.698
Omega_k_0     : 0.0
h             : 0.698
```

For the Group finding, we used the following parameters and linking lengths:

```
Linking Parallel: 1.1
Linking Perpend.: 0.07
Nmin            : 1
```

Columns

Theory Columns : Columns 1 - 12

Observables Columns: Columns 13 - 20

Group Columns : Columns 21 - 25

1. **Right Ascension** : RA of the individual galaxy, given in *degrees*
2. **Declination** : Declination of the ind. galaxy, given in *degrees*
3. **CZ_Obs** : Velocity of the galaxy (*with* redshift distortions), given in *km/s*
4. **Mr** : Galaxy's magn. in the r-band. Calculated using a CLF approach, but using real photometry from survey.
5. **Halo ID** : DM Halo identification number, as taken from the simulation
6. **log(MHalo)** : Logarithmic value of the DM Halo's Mass, as **log(MHalo / (Msun/h))** with h=0.698.
7. **NGals_h** : Total number of galaxies in DM halo. Number of galaxies in the mock may differ from this value.
8. **Type** : Type of Galaxy, i.e. Central or Satellite. **Halo Central** = 1, **Halo Satellite** = 0.
9. **CZ_Real** : Velocity of the galaxy (*without* redshift distortions), given in *km/s*.
10. **Dist_central** : *Real* Distance between Halo's center and the galaxy, in *Mpc*. Here, **Central galaxy = Halo's center**.

11. **Vp_total** : Total value for peculiar velocity, given in *km/s*.
12. **Vp_tang** : Tangential component of the peculiar velocity, given in *km/s*.
13. **Morphology** : Galaxy morphology. 'LT': *Late Type* ; 'ET': *Early Type*. Used either 'goodmorph' (ECO) or 'MORPH' (RESOLVE) keys. '-9999' if no matched galaxy.
14. **log Mstar** : Log value of Galaxy stellar mass in log *Msun*. Used either 'rpgoodmstarsnew' (ECO) or 'MSTARS' (RESOLVE) keys in the files.
15. **r-band mag** : Galaxy's r-band *apparent* magnitude. Used either 'rpsmoothrestrmagnew' (ECO) or 'SMOOTHRESTRMAG' (RESOLVE) keys in the files.
16. **u-band mag** : Galaxy's u-band *apparent* magnitude. Used either 'rpsmoothrestumagnew' (ECO) or 'SMOOTHRESTUMAG' (RESOLVE) keys in the files.
17. **FSMGR** : Stellar mass produced over last Gyr divided by pre-extisting Stellar mass from new model set. In *(1/Gyr)*. Used 'rpmeanssfr' (ECO) or 'MODELFSMGR' (RESOLVE) keys.
18. **Match_Flag** : Survey, from which the properties of the real matched galaxy were extracted. 'ECOgal' = Galaxy from ECO file. 'RESgal' = Galaxy from RESOLVE file.
19. **u-r color** : Color of the matched galaxy, i.e. umag - rmag (Col 15 - Col 16).
20. **MHI mass** : HI mass in *Msun*. Used the *predicted HI* masses (matched to the ECO file, i.e. eco*wresa*050815.dat) and the key 'MHI' for RESOLVE galaxies. To compute MHI masses using **ECO values**, we used the formula: **10^(MHI + logMstar)**. Units in *Msun*.
21. **Group ID** : Group ID, to which the galaxy belongs after running the Berlind2006 FoF group finder.
22. **Group NGals** : Number of galaxies in a group of galaxies.
23. **RG projected** : Projected radius of the group of galaxies. Units in *Mpc*.
24. **CZ Disp. Group** : Dispersion in velocities of galaxies in the group. Units in *km/s*.
25. **Abund. log MHalo** : Abundance matched mass of the group of galaxy. This was calculated by assuming a monotonic relation between dark matter halo mass (MHalo) and the group *total* luminosity. For RESOLVE B, we used a modified version of the ECO group luminosity function. Units in *Msun*.
26. **Group Gal. Type** : Type of group galaxy. **Group central** = 1, **Group Satellite** = 0.

The relationship between velocities (CZ's) is the following:

```
( CZ_Obs - CZ_Real)^2 + (Vp_tang)^2 = (Vp_total)^2
```

Halos Filaments

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Columns

1. **Halo ID** : This corresponds to the Halo ID number for the given DM Halo in the simulation box.
2. **log(MHalo)** : Logarithmic value of the DM Halo's Mass, as **log(MHalo / (Msun/h))** with *h* = 1.0

3. **ID / Type** : This is a flag that shows what the environment of the DM halo is. There are four options for this, i.e. a. ID = 0 ..... Not in a filament b. ID = 1 ..... A filament node c. ID = 2 ..... Part of a filament skeleton d. ID = 3 ..... within a close radius of a filament
4. **Fil.** : The ID of the filament the halo belongs to (-1 if it is not in a filament).
5. **Fil. Quality**: The quality of the filament (i.e. probability that the filament is real).

Project Organization

```
├── LICENSE
├── Makefile           <- Makefile with commands like `make data` or `make train`
├── README.md          <- The top-level README for developers using this project.
├── data
|   ├── external       <- Data from third party sources.
|   ├── interim        <- Intermediate data that has been transformed.
|   ├── processed      <- The final, canonical data sets for modeling.
|   └── raw            <- The original, immutable data dump.
|
├── docs               <- A default Sphinx project; see sphinx-doc.org for details
|
├── models             <- Trained and serialized models, model predictions, or model summaries
|
├── notebooks          <- Jupyter notebooks. Naming convention is a number (for ordering),
|                         the creator's initials, and a short `-` delimited description, e.g.
|                         `1.0-jqp-initial-data-exploration`.
|
├── references         <- Data dictionaries, manuals, and all other explanatory materials.
|
├── reports            <- Generated analysis as HTML, PDF, LaTeX, etc.
|   └── figures        <- Generated graphics and figures to be used in reporting
|
├── requirements.txt   <- The requirements file for reproducing the analysis environment, e.g.
|                         generated with `pip freeze > requirements.txt`
|
├── src                <- Source code for use in this project.
|   ├── __init__.py    <- Makes src a Python module
|   |
|   ├── data           <- Scripts to download or generate data
|   |   └── make_dataset.py
|   |
|   ├── features       <- Scripts to turn raw data into features for modeling
|   |   └── build_features.py
|   |
|   ├── models         <- Scripts to train models and then use trained models to make
|   |   |                 predictions
|   |   ├── predict_model.py
|   |   └── train_model.py
|   |
|   └── visualization  <- Scripts to create exploratory and results oriented visualizations
|       └── visualize.py
|
└── tox.ini            <- tox file with settings for running tox; see tox.testrun.org
```

Project based on the [cookiecutter data science project template](). #cookiecutterdatascience