UrbanSIM Review

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1 Household location choice model

1.1 Household table

1.2 First step:household relocation model and transition model

1.2.1 Household relocation model

- code location models.py (urbansim_defaults), settings.yaml
- model explanation simple rate-based model reallocating 5% of households annually
- output they lose their building id and are reassigned by the hlcm (?)

1.2.2 Household transition model

- code location models.py (urbansim_defaults), settings.yaml
- model explanation generates new households based on control totals (?) does does it take care of aging, household formation, etc as well?
- output

1.3 Household location choice model

1.3.1 Model Explanation

1.3.2 Input and output

From the code above, we can see that, households orca.table and residential_units orca.table, as well as the unit_aggregations orca.injective are the inputs.

1.3.3 LCM_estimate function from urbansim.utils

- 1. Here we need to make this clearer by comparision
 - function

Signature: utils.lcm_estimate(cfg, choosers, chosen_fname, buildings, join_tbls) where cfg refers to the yaml file; chooser refers to either households or developers orca.table; chosen_fanme refers to the name of the column (present in choosers) which contains the ids that identify the chosen alternatives;

buildings refers to either the residential_units or commercial_units;

Table 1: My caption

var	orca.table
np.log1p(residential_price)	buildings
$np.log1p(sqft_per_unit)$	buildings
ave_lot_size_per_unit	nodes
ave_income	nodes
persons	households
ave_hhsize	nodes
white/black/hisp/asian	households
pct_white/pct_black/pct_hisp/pct_asian	nodes
jobs	nodes
autoPeakTotal	logsums
transitPeakTotal	logsums
autoOffPeakRetail	logsums

join_tbls refers to orca.injective (A list of land use dataframes to give neighborhood info around the buildings will be joined to the buildings using existing broadcasts)

- calling the function cfg:"hlcm_owner.yaml" chooser orca.table:households chosen_fname:"unit_id" buildings:residential_units join_tbls:unit_aggregations=buildings,nodes,logsums
- 2. Then how will the input be processed to get the output?

1.3.4 How model is built?

The below table shows where each variables comes from. And the idea is that:now units are replacing units in updated version.But currently based on what the

1.3.5 How is filter built and how is segmented discrete choice model built?

hownrent is a column that indicate the household is the owner of the unit of the household is a renter of the unit.

```
choosers_fit_filters:
hownrent == 1

choosers_predict_filters:
hownrent == 1
```

1.3.6 Urbansim_defaults

Here many basic models are defined And they call below puthon packages from urbansim:

```
from urbansim.models import RegressionModel, SegmentedRegressionModel, MNLDiscreteChoiceModel, SegmentedMNLDiscreteChoiceModel, GrowthRateTransition, transition
from urbansim.models.supplydemand import supply_and_demand
from urbansim.developer import sqftproforma, developer
from urbansim.utils import misc
```

2 Cost Function Procedure for Discrete Choice Model

2.1 Current Model

2.2 Setps

This task consists of three steps:

- construct a new dataframe accommodating needed variables from households table, residential_units table, and the units_aggregations orca injective, consisting of three dataframes
- regression residential_price on other explanatory variables, and get residual as a pandas series, and add it as a column of the building orca.table(strange, why price is the at building level instead of units_level?)
- create a new yaml file and a new orca step for the new hlcm model with residual variables.

20cm

3 Data Source

3.1 H5 file

```
<sup>1</sup> #Putting tables in the HDF5 file
 store = pd. HDFStore(h5_path)
  store ['parcels'] = parcels # http://urbansim.org/Documentation/Parcel/
     ParcelTable
  store ['buildings'] = buildings # http://urbansim.org/Documentation/Parcel/
     BuildingsTable
  store ['households'] = hh # http://urbansim.org/Documentation/Parcel/
     HouseholdsTable
  store ['jobs'] = jobs # http://urbansim.org/Documentation/Parcel/JobsTable
  store ['zones'] = zones # http://urbansim.org/Documentation/Parcel/ZonesTable
  store.close()
  @orca.table('jobs', cache=True)
  def jobs (store):
      # nets = store['nets']
3
      ###go from establishments to jobs
      # df = nets.loc[np.repeat(nets.index.values, nets.emp11.values)]
          # .reset_index()
```

```
# df.index.name = 'job_id'

df = store['jobs']

return df
```

4 Data Source

Where can I get the data? From "2015_06_01_bayarea_v3.h5", we can get "parcels", "buildings", "households", "jobs" and "zones". Other tables are loaded in datasources.py file from local csv files from local data folder.

datasources.py is used to load local data into orca table. Then varibales.py is used to generate new columns of existent orca tables.

5 Setting, neighbrhood_vars, price_vars

6 Hedonic Regression Model

6.1 Model Basics

Note simple linear regression cannot be done within urbansim modules. We need statmodels to conduct regression.

• Background in urbansim_utils

• rrh.yaml

```
name: rrh
model_type: regression

fit_filters:
    price_sqft > 0.5
    price_sqft < 7

predict_filters: null
model_expression: np.log(price_sqft) ~ np.log1p(sqft_per_unit) + ave_lot_size_per_unit</pre>
```

```
+ ave_income + pct_black + pct_hisp + pct_asian + pct_renters +
population +
autoPeakTotal + transitPeakTotal + autoOffPeakRetail + jobs

ytransform: np.exp

fitted: true
```

• First step:create rrh_simulate as an orca "step" in models.py file from urbansim_defaults import utils, and here call the utils.hedonic_estimate function in urbansim_utils package

hedonic_estimate is a function in urbansim_utils, that

```
# creating a residential rental hedonic
@orca.step('rrh_estimate')
def rh_cl_estimate(craigslist, aggregations):
    return utils.hedonic_estimate("rrh.yaml", craigslist, aggregations)
```

• Second step:call rrh_simulate step in estimation.py file and simulation.py file,since if you want to have simulation result, the first step is estimation of parameters, both for hedonic regression and MNL Discrete Choice Models

```
import time
  import models
  import pandas as pd
  import orca
  orca.run([
      "neighborhood_vars",
                                     # accessibility variables
                                     # residential sales hedonic
       "rsh_estimate"
      "rrh_estimate"
                                     # residential rental hedonic
9
      #"rsh_simulate"
10
      #"hlcm_estimate"
                                       # household lcm
11
  1)
12
```

6.2 Change models

To save variations, create a new yaml file and run this to register it (create orca step for this specific hedonic regression)

The coefficient can be stored or can be printed out, as below:

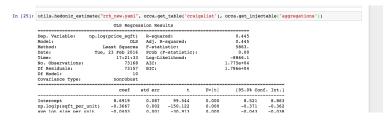
6.2.1 We package the estimation step as an orca step, so that we can call them sequentially in orca run

```
In [9]:

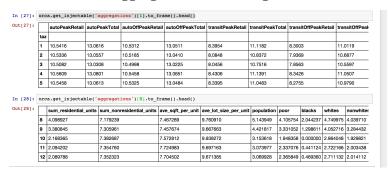
# Co seew variations, create a new yam! file and run this to register it from urbanisminulis import accounts from urbanismin import accounts from urbanismin developer import active from urbanismin developer import active from urbanisming defaults import utulis

| **Social State** | **Soci
```

6.2.2 But we can decompose it to get the estimation function that directly gives us the regression result



6.2.3 What is aggregations? how to get them?



There must be some code like this for aggregation injectable.

```
# setting up a separate aggregations list for unit-based models
@orca.injectable("unit_aggregations")
def unit_aggregations(settings):
    if "unit_aggregation_tables" not in settings or \
        settings["unit_aggregation_tables"] is None:
        return []
    return [orca.get_table(tbl) for tbl in settings["unit_aggregation_tables"]
```

It can be concluded that:

- orca.injectable is a list of orca.table
- orca.table
- orca.column

And from urbansim.utils import misc, since the orca.column step will have to use this function

```
Signature: misc.reindex(series1, series2)
  Source:
  def reindex(series1, series2):
4
       This reindexes the first series by the second series. This is an
5
          extremely
      common operation that does not appear to be in Pandas at this time.
6
       If anyone knows of an easier way to do this in Pandas, please inform
       UrbanSim developers.
      The canonical example would be a parcel series which has an index
       parcelids and a value which you want to fetch, let's say it's
          land_area.
       Another dataset, let's say of buildings has a series which indicate
12
          the
       parcel_ids that the buildings are located on, but which does not have
       land_area. If you pass parcels.land_area as the first series and
14
       buildings.parcel_id as the second series, this function returns a
15
          series
       which is indexed by buildings and has land_area as values and can be
16
       added to the buildings dataset.
17
18
       In short, this is a join on to a different table using a foreign key
       stored in the current table, but with only one attribute rather than
20
       for a full dataset.
21
22
       This is very similar to the pandas "loc" function or "reindex"
23
          function,
       but neither of those functions return the series indexed on the
       table. In both of those cases, the series would be indexed on the
          foreign
       table and would require a second step to change the index.
26
27
28
      # turns out the merge is much faster than the .loc below
29
       df = pd.merge(pd.DataFrame({"left": series2}),
30
                     pd.DataFrame({"right": series1}),
31
                     left_on="left",
32
                     right_index=True,
33
                     how="left")
34
       return df.right
              /anaconda/lib/python2.7/site-packages/urbansim-3.1.dev0-py2.7.
      egg/urbansim/utils/misc.py
              function
  Type:
```

@orca.column('homesales', 'node_id', cache=True)

def node_id(homesales, parcels):
 return misc.reindex(parcels.node_id, homesales.parcel_id)

7 Hedonic Simulation Model

- 8 lcm-estimate
- 9 lcm-simulation

10 simple-relocation

10.1 Model basics

```
Signature: utils.simple_relocation(choosers, relocation_rate, fieldname)
   def simple_relocation(choosers, relocation_rate, fieldname):
       Run a simple rate based relocation model
5
       Parameters
       tbl: DataFrameWrapper or DataFrame
           Table of agents that might relocate
       rate: float
11
           Rate of relocation
       location_fname : str
13
           The field name in the resulting dataframe to set to -1 (to unplace
14
           new agents)
15
16
       Returns
17
18
       Nothing
19
20
       print "Total agents: %d" % len(choosers)
21
       _print_number_unplaced(choosers, fieldname)
22
       print "Assigning for relocation ..."
24
       chooser_ids = np.random.choice(choosers.index, size=int(relocation_rate *
                                        len (choosers)), replace=False)
26
       choosers.update_col_from_series(fieldname,
27
                                         pd. Series(-1, index=chooser_ids))
28
       _print_number_unplaced(choosers, fieldname)
30
              ~/Google_Drive/Berkeley/research/2015Fall/bayarea_urbansim/build/
      bdist.macosx-10.5-x86_64/egg/urbansim_defaults/utils.py
              function
  Type:
```

11 @orca.step("travel_model_output")

Dolor sit amet [Greenwade, 1993].

References

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