

Advanced Gurobi Datatypes

Tuplelist

- ▶ subclass of python list
- ▶ list of tuples of same size
- ▶ easy notation to find specific subsets
- ▶ same is doable with list comprehension *but* tuplelist is faster

Tuplelist

Creation

```
l = tuplelist([(1, 2), (1, 3), (2, 3), (2, 4)])
```

Tuplelist

Creation

```
l = tuplelist([(1, 2), (1, 3), (2, 3), (2, 4)])
```

Queries ('*' is wildcard character)

```
l.select(1, '*')  
l.select('*', [2, 4])  
l.select('*', '*')
```

Tupledict

- ▶ subclass of python dictionary
- ▶ dictionary with tuplelist as keys
- ▶ usually used for variables of complex systems
- ▶ easy access via *select*
- ▶ easy constraint generation via *sum* and *prod*

Tupledict

Creation

```
l = tuplelist([(1, 2), (1, 3), (2, 3), (2, 4)])  
d=model.addVars(l)
```

Tupledict

Creation

```
l = tuplelist([(1, 2), (1, 3), (2, 3), (2, 4)])  
d=model.addVars(l)
```

Queries and creation of expressions

```
d.select(1, '*' )  
d.sum(1, '*' )  
coeff=[2,5]  
d.prod(coeff, 1, '*' )
```

Demo 4

Tuplelist and tupledict

Visualization

Visualization of Graphs

- ▶ natural connection between many LPs and graphs
- ▶ visualizing graphs improves understanding
- ▶ matplotlib

Visualizing graphs

```
import networkx as nx
import math
G = nx.Graph()
G.add_nodes_from([(i, {'x': coord[0], 'y': coord[1]})
                  for i, coord in enumerate(position)])
G.add_edges_from([(e[0], e[1]) for e in edges])
nx.draw_networkx_nodes(G, position, node_color=)
nx.draw_networkx_labels(G, position)
nx.draw_networkx_edges(G, position, edge_color=)
```
