KMeans-Clustering

In [ ]:

```
import numpy as np
import pandas as pd
```

In [46]:

```
data = pd.read_csv("order.csv")
t = data.iloc[:,-8:] # 选择所有行，取出倒数第8列及以后
# t
```

In [47]:

```
class KMeans:
    """使用python语言实现聚类算法"""
    def __init__(self, k, times):
        """初始化方法
        Parameters
        ------
        k: int
           聚类的个数
        times: int
           聚类迭代的次数
        """
        self.k = k
        self.times = times
    def fit(self, X):
        """根据提供的训练数据，对模型进行训练
        Parameters
        ------
        X: 类数组类型，形状为：[样本数量，特征数量]
           待训练的样本特征属性
        """
        X = np.asarray(X)
        # 设置随机种子，以便于可以产生相同的随机序列
        np.random.seed(0)
        # 从数组中随机选择 k个点作为初始聚类中心
        self.cluster_centers_ = X[np.random.randint(0, len(X),self.k)]
        self.labels_ = np.zeros(len(X))
        for t in range(self.times):
            for index, x in enumerate(X):
                # 计算每个样本与聚类中心的距离
                dis = np.sqrt(np.sum((x - self.cluster_centers_) ** 2, axis = 1)
                # 将最小距离的索引赋值给标签数组，索引的值就是当前点所属的簇，范
                self.labels_[index] = dis.argmin()
            # 循环遍历每一个簇
            for i in range(self.k):
                # 计算每个簇内所有点的均值，更新聚类中心
                self.cluster_centers_[i] = np.mean(X[self.labels_ == i], axis =
    def predict(self, X):
        """根据参数传递的样本，对样本数据进行预测（预测样本属于哪一个簇中）
        Parameters
        ------
        X:类数组类型，形状为：[样本数量，特征数量]
          待预测的特征属性
        Returns
        ------
        result:数组类型
               预测的结果,每一个X所属的簇
        """
        X = np.asarray(X)
        result = np.zeros(len(X))
        for index, x in enumerate(X):
            # 计算样本到每个聚类中心的距离
            dis = np.sqrt(np.sum((x - self.cluster_centers_) ** 2, axis = 1))
            # 找到距离最近的菌类中心，划分类别
            result[index] = dis.argmin()
        return result
```

In [49]:
```
kmeans = KMeans(3, 50)
kmeans.fit(t) # 数据较大则需稍等
```

In [50]:
```
kmeans.cluster_centers_
```

Out[50]:
```
array([[46.33977936,  8.93380516, 23.19047005, 13.11741633,  4.8107557 ,
         1.17283735,  1.35704647,  0.95392773],
       [19.5308009 , 50.42856608, 14.70652695,  7.89437019,  3.69829234,
         0.91000428,  1.92515077,  0.82113238],
       [ 7.93541008,  4.56182052, 30.65583437, 18.57726789,  8.61597195,
         1.28482514, 26.81950293,  1.30158264]])
```

In [51]:
```
# 查看某个簇内的所有样本数据
# 例，查看簇为 0 内的所有样本数据
t[kmeans.labels_ == 0]
```

Out[51]:

	Food%	Fresh%	Drinks%	Home%	Beauty%	Health%	Baby%	Pets%
15	48.23	20.37	15.38	8.29	7.73	0.0	0.0	0.0
23	24.10	22.29	38.69	14.92	0.00	0.0	0.0	0.0
24	36.51	31.93	27.18	4.38	0.00	0.0	0.0	0.0
40	22.76	0.00	0.00	77.24	0.00	0.0	0.0	0.0
43	65.64	12.36	21.99	0.00	0.00	0.0	0.0	0.0
...	...	...	...	...	...	...	...	...
29974	33.93	0.00	17.46	41.46	7.15	0.0	0.0	0.0
29977	45.10	0.00	26.68	28.22	0.00	0.0	0.0	0.0
29988	28.21	0.00	48.34	23.44	0.00	0.0	0.0	0.0
29989	61.32	0.00	23.34	15.34	0.00	0.0	0.0	0.0
29990	29.74	28.72	19.52	22.02	0.00	0.0	0.0	0.0

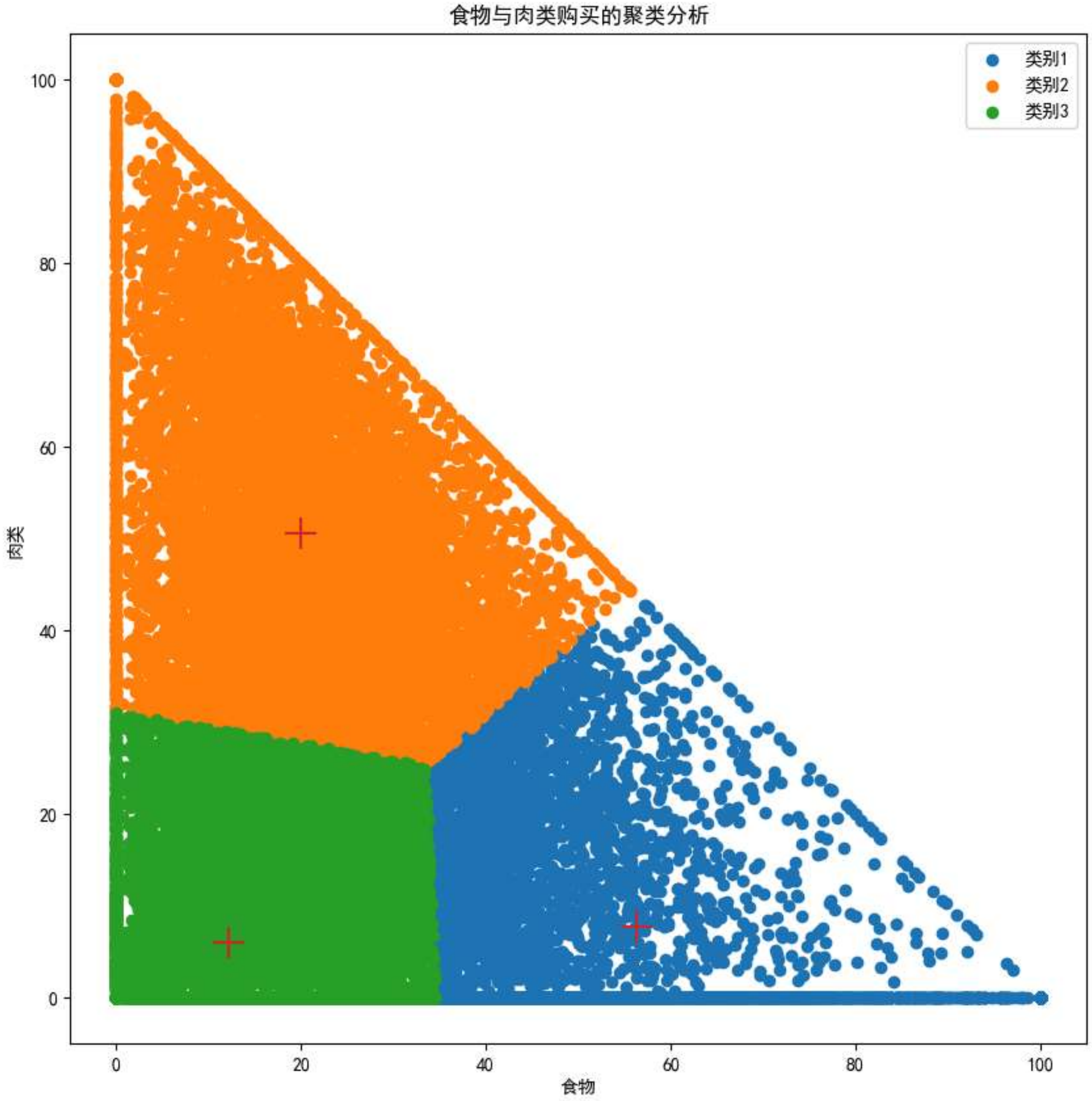
9382 rows × 8 columns

In [52]:
```
t2 = data.loc[:,"Food%":"Fresh%"]
kmeans = KMeans(3, 50)
kmeans.fit(t2)
```

In [53]:
```
import matplotlib as mpl
import matplotlib.pyplot as plt
mpl.rcParams["font.family"] = "SimHei"
mpl.rcParams["axes.unicode_minus"] = False
```

In [56]:
```
plt.figure(figsize=(10,10))
# 绘制每个类别的散点图
```

```
plt.scatter(t2[kmeans.labels_ == 0].iloc[:,0], t2[kmeans.labels_ == 0].iloc[:,1]
plt.scatter(t2[kmeans.labels_ == 1].iloc[:,0], t2[kmeans.labels_ == 1].iloc[:,1]
plt.scatter(t2[kmeans.labels_ == 2].iloc[:,0], t2[kmeans.labels_ == 2].iloc[:,1]
# 绘制聚类中心
plt.scatter(kmeans.cluster_centers_[:,0],kmeans.cluster_centers_[:,1],marker="+"
plt.title("食物与肉类购买的聚类分析")
plt.xlabel("食物")
plt.ylabel("肉类")
plt.legend()
plt.show()
```



In [ ]: