Ivan Surya H - 0860812

HW2– MATLAB code for Interference Management in Drone Small Cells

1. Compute the Similarity and Responsibility Matrix:

```
% Construct similarity matrix
if N>3000
    fprintf('\n*** Warning: Large memory request. Consider activating\n');
    fprintf('     the sparse version of APCLUSTER.\n\n');
end;
if size(s,2)==3
    S=-Inf*ones(N,N);
    for j=1:size(s,1) S(s(j,1),s(j,2))=s(j,3); end;
else S=s;
end;
```

```
% Compute responsibilities
Rold=R;
AS=A+S; [Y,I]=max(AS,[],2); for k=1:N AS(k,I(k))=-realmax; end;
[Y2,I2]=max(AS,[],2);
R=S-repmat(Y,[1,N]);
for k=1:N R(k,I(k))=S(k,I(k))-Y2(k); end;
R=(1-lam)*R+lam*Rold; % Damping
```

2. Compute the Availability and Criterion Matrix:

```
% Compute availabilities
Aold=A;
Rp=max(R,0);
for k=1:N Rp(k,k)=R(k,k); end;
A=repmat(sum(Rp,1),[N,1])-Rp;
dA=diag(A); A=min(A,0); for k=1:N A(k,k)=dA(k); end;
A=(1-lam)*A+lam*Aold; % Damping
```

```
% Check for convergence
E=((diag(A)+diag(R))>0); e(:,mod(i-1,convits)+1)=E; K=sum(E);
if i>=convits || i>=maxits
    se=sum(e,2);
    unconverged=(sum((se==convits)+(se==0))~=N);
    if (~unconverged&&(K>0))||(i==maxits) dn=1; end;
end;
```

3. Decide which DSC needs to be turned off from the exemplars that has highest interference:

```
I=find(diag(A+R)>0); K=length(I); % Identify exemplars
```
Identify the exemplars

```
% Find indices of non-zero minimum criterion
[a,position]=min(criterion(criterion > 0));
```

Identify which DSC with lowest criterion that does not need to be turn off

4. Result and Improvement after turn off DSC using Affinity Propagation:

```
List of exemplars of DSC:
    1
    2
    8
    9

DSC with the lowest interference and does not need to be turn off:
    9

DSC need to be turn off:

cluster_center =

    1
    2
    8

Baseline system throughput in average: 266.226267
APC system throughput in average: 294.410967
Improvement is: 10.586746 >>
```

After turn off DSC with highest interference based on Affinity Propagation algorithm, we got improvement of 10.5% from the average baseline throughput.

Based on APC, DSC with highest interference and need to be turned off are:

DSC 1, 2, and 8

DSC that still be turned on are:

DSC 3, 4, 5, 6, 7, 9, 10, 11, 12 and which users handled will determined by n_APC

5. Prediction of New Cluster after using APC: