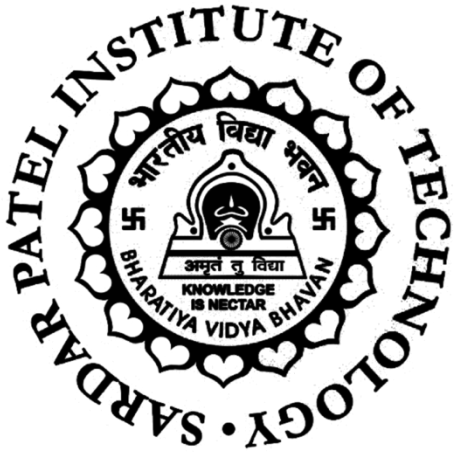

SARDAR PATEL INSTITUTE OF TECHNOLOGY

B. Tech.

Department of Electronics and Telecommunication

Semester VII

ETL71: Mobile and Wireless Technology

Faculty in Charge: Prof. Anand Mane

Experiment No. 02-A

To Implement Channel Assignment Methods - Fixed

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Aim: To implement Fixed and Dynamic Channel Allocation methods.

Theory:

1) Channel Allocation: Channel allocation deals with the allocation of channels to cells in a cellular network. Once the channels are allocated, cells may then allow users within the cell to communicate via the available channels. Channels in a wireless communication system typically consist of time slots, frequency bands and/or CDMA pseudo noise sequences, but in an abstract sense, they can represent any generic transmission resource. There are three major categories for assigning these channels to cells (or base-stations).

2) Types of Channel Allocation Method
   a) Fixed Channel Allocation,
   b) Dynamic Channel Allocation and
   c) Hybrid Channel Allocation which is a combination of the first two methods.

3) Fixed Channel Allocation
   Fixed Channel Allocation (FCA) systems allocate specific channels to specific cells. This allocation is static and cannot be changed. For efficient operation, FCA systems typically allocate channels in a manner that maximizes frequency reuse. Thus, in a FCA system, the distance between cells using the same channel is the minimum reuse distance for that system. The problem with FCA systems is quite simple and occurs whenever the offered traffic to a network of base stations is not uniform.

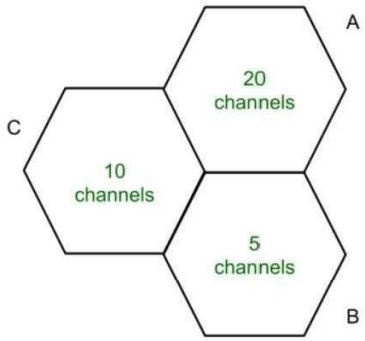

Figure 1: Fixed Channel Allocation

a) In cell A 20 Channels or Voice channels are allocated. If all channels are occupied and the user makes a call then the call is blocked.
b) Borrowing Channels handles this type of problem. In this cell borrow channels from other cells.

For N competing users, the bandwidth is divided into N channels using frequency division multiplexing (FDM), and each portion is assigned to one user. In this allocation scheme, there is no interference between the users since each user is assigned a fixed channel. However, it is not suitable in case of a large number of users with variable bandwidth requirements.

Problem Statement:

1) Assume Total Number of Channels (50-100).
2) Assume 15-20% of total Channels are reserved for Control channels.
3) Remaining are Voice/Data channels.
4) Distribute Control and Voice Channels in 7,9,13 size of Cluster.
5) Display results of Control and Voice channels separately in matrix format.

Algorithm:

6) Take input for total number of channels
7) Control Channels = 20% of total channels
8) Traffic channel=Total channels – control channels
9) Take input for cluster size and verify cluster size using i^2+j^2+i*j
10) If cluster size is valid, proceed for allocation else display error
11) Create two matrix – Traffic Control and Channel Control with all values as zero
12) For traffic allocation: Considering starting traffic allocation from channel 1
    a. Use two loops for matrix and check whether the channel number is less than traffic channels and append the channel number to corresponding matrix value
    b. If the condition is not fulfilled, append zero to the corresponding matrix value
13) Display Traffic Allocation Matrix
14) For Control Channel allocation: Considering starting control channel allocation from channel traffic channel +1
    a. Use two loops for matrix and check whether the channel number is less than total channels and append the channel number to corresponding matrix value
    b. If the condition is not fulfilled, check if the value is repeated more than thrice. If it has, append zero to the corresponding matrix value else append channel number to it.
15) Display Control Channel Allocation Matrix

Code:

Assuming traffic channel allocation is done first and control channel allocation is done afterwards

1) Input and Cluster Size Verification

```
clc
num_channel = input("Enter number of num_channels: ");% Total number of Channels
num_control= ceil(0.2*num_channel); % 20% of total allocated for control channel
fprintf("Number of control channels: %d \n",num_control);
num_traffic = num_channel - num_control;% Traffic is diff of total and control
cluster = input("Enter size of cluster: ");% Cluster size

%checking if cluster size is valid
flag=0;
for i=1:10
    for j=1:10
        if(cluster == i*i+j*j+i*j)
            flag=1;
            break
        end
    end
end
```

2) Traffic Allocation Matrix

```
if(flag==1)
    fprintf("Cluster Size is valid \n");
    trf = zeros(cluster,ceil(num_traffic/cluster));% Ceil round number to nearest integer,traffic ,matrix
    ctrl = zeros(cluster,ceil(num_control/cluster));% zeros return mxn matrix of zeros, control matrix
    x = 1;% First traffic channel
    for i=1:ceil(num_traffic/cluster)% for loop for columns of traffic matrix
        for j=1:cluster% for loop for rows of traffic matrix
            if x<=num_traffic% conditional check till last channel
                trf(j,i) = x;
                x = x + 1;
            else
                trf(j,i) = 0;% if not satisfied then element value is 0
            end
        end
    end

    disp("Traffic Allocation Matrix") % Show traffic matrix
    disp(trf)
```

3) Channel Control Allocation Matrix

```
        num=1+ceil(num_traffic);
        count=0;
        count2=0;
        for i=1:ceil(num_control/cluster)% for loop for columns of traffic matrix
            temp=num;
            for j=1:cluster % for loop for rows of traffic matrix
                if num<=num_channel
                    ctrl(j,i)=num;
                    num=num+1;
                else
                    count = count + 1;
                    if count<3 % Check if the channel is repeating more than 3 times
                        num = temp;
                        ctrl(j,i) = num;
                        num = num + 1;
                    else
                        ctrl(j,i)=0;% Put zero if not
                        count2=count2+1;
                    end
                end
            end
        end
```

4) Verifying Traffic Allocation Matrix with respect to Control Channel Allocation

```
        %verifying traffic channel according to control channel
        [m,n]=size(trf);
        [m1,n1]=size(ctrl);

        for i=1:n1
            for j=1:m1
                if(ctrl(j,i)==0)
                    trf(j,i)=0;
                end
            end
        end
```

5) Display Functions

```
    %display fucntions
    if count2>0
        disp("Traffic Allocation Matrix") % Show traffic matrix
        disp(trf(:,1:n1))
        disp("Control Allocation Matrix")% Show control matrix
        disp(ctrl(1:(m1-count2),:))
    else
        disp("Traffic Allocation Matrix") % Show traffic matrix
        disp(trf)
        disp("Control Allocation Matrix")% Show control matrix
        disp(ctrl)
    end
else
    fprintf("Cluster Size Invalid");
end
```

Results:

1) Inputs=60; Cluster Size=7

```
Enter number of num_channels: 60
Number of control channels: 12
Enter size of cluster: 7
Cluster Size is valid
Traffic Allocation Matrix
     1     8    15    22    29    36    43
     2     9    16    23    30    37    44
     3    10    17    24    31    38    45
     4    11    18    25    32    39    46
     5    12    19    26    33    40    47
     6    13    20    27    34    41    48
     7    14    21    28    35    42     0

Control Allocation Matrix
    49    56
    50    57
    51    58
    52    59
    53    60
    54    56
    55    57
```

2) Input =60; Cluster Size=8

```
Enter number of num_channels: 60
Number of control channels: 12
Enter size of cluster: 8
Cluster Size Invalid>>
```

3) Inputs=95; Cluster Size=13

```
Enter number of num_channels: 95
Number of control channels: 19
Enter size of cluster: 13
Cluster Size is valid
Traffic Allocation Matrix
     1    14    27    40    53    66
     2    15    28    41    54    67
     3    16    29    42    55    68
     4    17    30    43    56    69
     5    18    31    44    57    70
     6    19    32    45    58    71
     7    20    33    46    59    72
     8    21    34    47    60    73
     9    22    35    48    61    74
    10    23    36    49    62    75
    11    24    37    50    63    76
    12    25    38    51    64     0
    13    26    39    52    65     0

Control Allocation Matrix
    77    90
    78    91
    79    92
    80    93
    81    94
    82    95
    83    90
    84    91
    85    92
    86    93
    87    94
    88    95
    89    90
```

4) Inputs=95; Cluster Size=27

```
Enter number of num_channels: 95
Number of control channels: 19
Enter size of cluster: 27
Cluster Size is valid
Traffic Allocation Matrix
     1    28    55
     2    29    56
     3    30    57
     4    31    58
     5    32    59
     6    33    60
     7    34    61
     8    35    62
     9    36    63
    10    37    64
    11    38    65
    12    39    66
    13    40    67
    14    41    68
    15    42    69
    16    43    70
    17    44    71
    18    45    72
    19    46    73
    20    47    74
    21    48    75
    22    49    76
    23    50     0
    24    51     0
    25    52     0
    26    53     0
    27    54     0
```

```
Control Allocation Matrix
    77
    78
    79
    80
    81
    82
    83
    84
    85
    86
    87
    88
    89
    90
    91
    92
    93
    94
    95
    77
    78
    79
    80
    81
    82
    83
    84
```

5) Inputs= 30; Cluster Size=21

```
Enter number of num_channels: 30
Number of control channels: 6
Enter size of cluster: 21
Cluster Size is valid
Traffic Allocation Matrix
     1
     2
     3
     4
     5
     6
     7
     8
     9
    10
    11
    12
    13
    14
    15
    16
    17
    18
     0
     0
     0
```

```
Control Allocation Matrix
    25
    26
    27
    28
    29
    30
    25
    26
    27
    28
    29
    30
    25
    26
    27
    28
    29
    30
```

Conclusion:

1) Each cell is permanently allocated to a predetermined group of channels in fixed channel allocation. Any call attempt within a cell can only be served by unused channels in that particular cell.

2) The subscriber does not receive service if all channels are occupied and the call is blocked.

3) Frequency usage is very high being cell channels are separated using minimum reuse distance.

4) Once the call of the subscriber is complete, the channel remains with the cell. Mobile Station Center has less burden.

5) Borrowing technique where a cell is allowed to borrow channels from a neighbouring cell if all channels are already occupied is always used with this type of strategy. Mobile Base station (MSC) monitors the function of base station including borrowing ensuring that borrowing does not interfere with any call-in progress in the donor cell.