P - 2839

CHANNEL ALLOCATION WITH CHANNEL BORROWING IN MOBILE COMPUTING USING IMPROVED GENETIC ALGORITHM

A PROJECT REPORT

Submitted by

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BONAFIDE CERTIFICATE

Certified that this project report **"CHANNEL ALLOCATION WITH CHANNEL BORROWING IN MOBILE COMPUTING USING IMPROVED GENETIC ALGORITHM"** is the bonafide work of **"NITHYA.P AND NIVETHIDHA.R"** who carried out the project work under my supervision.

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ABSTRACT

Over the years, the applications running on the mobile devices are getting more data driven. Due to increasing load, the number of mobile hosts that could not connect the destination is increased. Hence Channel allocation becomes difficult with limited radio frequency spectrum with increased number of hosts. This leads to the increase in the number of blocked host to a cell leading the network to chaos. In a network of mobile host, the average number of blocked host is to be reduced by borrowing channel from neighboring cell. To solve the problem of allocation and borrowing of channels in mobile computing, the Genetic Algorithm (GA) is used. This has effective resource management of radio resources in dynamic channel allocation with channel borrowing. The GA uses a new operator called Pluck which makes the crucial decision of borrowings with the future consideration. The operator tries to borrow channels from neighboring cell at its best time and improves the performance and reduces the average blocked host and meets the traffic demands of the networks better than other methods.

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1. INTRODUCTION

A given radio spectrum (or bandwidth) can be divided into a set of disjoint or non-interfering radio channels. All such channels can be used simultaneously while maintaining an acceptable received radio signal. The widening availability of mobile systems is driven by the increasing demand to have information available for users anywhere and anytime. The mobile system uses the radio frequency spectrum for communication. The load on radio frequency resources increases with increase in mobile devices and users. This reduces the performance of the network. Since radio frequency spectrum is limited, need arises for the effective management of these resources. The radio resources are managed by limiting the channel spectrum. Channel allocation problem involves how to allocate, borrowable channels in such a way that it maximizes the long term and/or short-term performance of the network. Channel Reuse is the solution for the Channel allocation problem where channel are borrowed from the neighboring. In Channel reuse if a channel is outside the interference range of the other, the same frequency can be reused and thus, utilize the scarce resource. The efficient reusability of the channels improves the performance of the network so that the best performance is achievable.

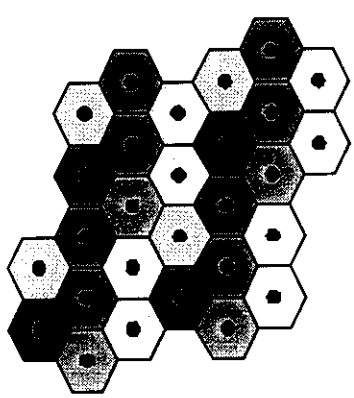
1.1. PROBLEM DEFINITION

In mobile computing network, the main issues are mobility, communication, portability. Due to increase in load, the number of hosts could not connect to the destination is increased. It is obvious that more blocked host degrade the performance of the network. The allocation of borrowable channel will utilize the current infrastructure and the

performance is achievable. The majority of the optimization methods such as greedy, heuristic algorithm which move from a single point in the decision space to the next, uses transaction rule to determine the next point. This method is harmful as it can allocate a false peak in multi modal search space. To make borrowing best with an appropriate choice of channel to borrow, the algorithm which climbs many peaks in parallel to find the best peak from a database of points simultaneously is required.This system solves the cellular resource allocation problem and minimizes the number of blocked hosts by making use of Improved Genetic Algorithm thus improving the performance of the network.

1.2 EXISTING SYSTEM

Existing system uses the Fixed Channel Allocation (FCA) for channel allocation. In FCA, the assignment of frequencies to a cell is fixed. This is inefficient if the traffic load on a channel varies from time to time. Disadvantages of the existing system are Increase in the amount of blocked host, Channel utilization is less, Degradation in the performance of the network



1.2.1 Related Models

Cell Splitting

Cell splitting is used in cellular networks, works by breaking down cells into smaller cells. This is accomplished by having several different levels of cell coverage. These different levels are called macro and micro cells. A macro cell is essentially an umbrella over a set of micro cells. There are obvious drawbacks to this scheme as it prevents being implemented throughout the network because of cost involved. A secondary concern is the extra traffic introduced by the additional cells.

Least Interference

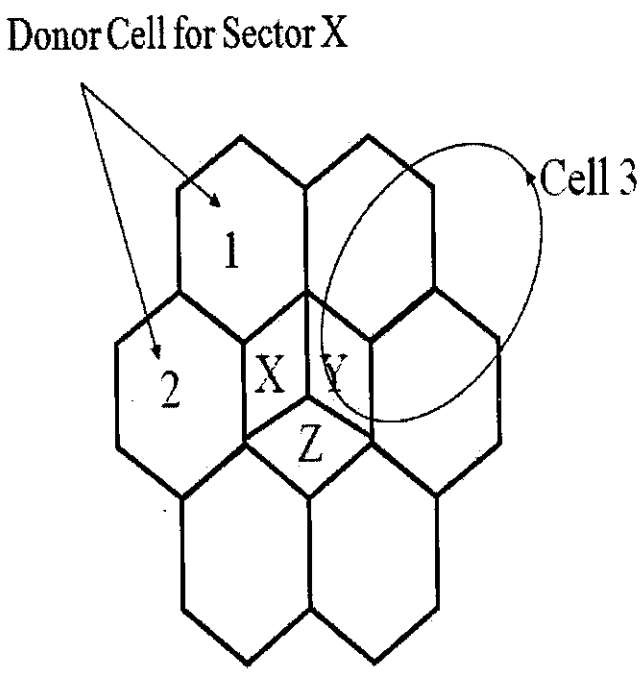
In the least interference method, the Access Point (cell) scans all available channels and selects the channel with the lowest interference power. If more than one channel shares the same lowest interference power, the channel used previously will be selected and, if none were used previously, the channel with the lowest number is selected.

Channel Segregation

In the channel segregation method, an ordered list is given to each Access Point (AP) and this list is updated according to interference conditions. The AP will scan the interference power for the highest priority channel in the ordered list. If the scanned interference power is below a threshold, this channel will be selected and the scanning process ends. The priority of each channel in the list is updated by a given function. The initial priority list can be arbitrary and is set to follow the channel number.

1.3 PROPOSED SYSTEM

In a channel borrowing scheme, an acceptor cell that has used all its nominal channels can borrow free channels from its neighbouring cells (donors) to accommodate new calls. A channel can be borrowed by a cell, if the borrowed channel does not interfere with existing calls. When a channel is borrowed, several other cells are prohibited from using it. This is called channel locking. The number of such cells depends on the cell layout and the type of the initial allocation of



channels to cells. For example, for a hexagonal planar layout with reuse distance of one cell, a borrowed channel is locked in three additional neighbouring cells while for a one-dimensional layout or a hexagonal planar grid layout with two cell reuse distance it is locked in two additional neighbouring cells. In contrast to Static Borrowing, channel borrowing strategies deal with short term allocation of borrowed channels to cells, and once a call is completed the borrowed channel is

returned to its nominal cell. The proposed Channel Borrowing schemes differ in the way a free channel is selected from a donor cell to be borrowed by an acceptor cell. The channel borrowing schemes can be divided into simple and hybrid. In the Simple Channel Borrowing schemes any nominal channel in a cell can be borrowed by a neighbouring cell for temporary use. In the Hybrid Channel Borrowing strategies, the set of channels assigned to each cell is divided into two subsets A (standard or local channels) and B (non-standard or borrowable channels). The subset A is for use only in the nominally assigned cell, while the subset B is allowed to be lent to neighbouring cells.

In the proposed system we are using Channel Borrowing for Channel Allocation. This is a Dynamic Channel Allocation method. Features of the proposed system are Blocked host is reduced, Channel utilization is high and Performance of the network can be increased.

2. OVERVIEW

Existing system uses the Fixed Channel Allocation (FCA) for channel allocation. In FCA, the assignment of frequencies to a cell is fixed. Disadvantages of the existing system are

- Increase in the amount of blocked host
- Channel utilization is less
- Degradation in the performance of the network

In the proposed system we are using Channel Borrowing for Channel Allocation. This is a Dynamic Channel Allocation method. A better method, in case of heavy load in one cell and light load in neighboring cell, is to borrow frequencies from neighbor cells. Cells with more traffic are

dynamically allotted more frequencies. This scheme is known as Borrowing Channel Allocation (BCA) and is used in GSM systems; however, it requires careful traffic analysis. The channel allocation problem involves how to allocate borrowable channels in such a way that it maximizes the long term and/or short-term performance of the network. The performance metric in the present work, to evaluate the proposed IGA for channel allocation, is the number of blocked hosts. A host is blocked if it enters into a cell but cannot get a channel. It is obvious that more blocked hosts result in performance degradation of the network. Thus, reduction in blocked hosts is sought in the present work.The number of borrowings should also be as few as possible because more borrowings incur more network traffic. The other metric that can be used to evaluate the performance is the number of "hot cells," a cell without any free channel. A cell is considered "hot" when all the channels in a cell are allocated to hosts. Hot cells are undesirable because mobile hosts will be denied a service upon entering the cell. Advantages of the proposed system are

- Blocked host is reduced
- Channel utilization is high
- Performance of the network can be increased

3. LITERATURE SURVEY

3.1 NEED FOR CHANNEL BORROWING

The amount of mobile phone users are keep on increasing. It leads to the increase in the blocked hosts. A host which is present inside the coverage area (Cell) and not able to communicate with the destination is called blocked host. So we planned to reduce the amount of blocked host.

We identified two ways to reduce the amount of blocked hosts. One way is increasing the amount of channels whenever there is an increase in mobile host. Second way is utilizing the channels properly.

The first way is a cost consuming process. So in our project we can allocate the channels using channel borrowing and we can minimize the amount of blocked host. In our project we are using Improved Genetic Algorithm (IGA). This is differed from the Genetic Algorithm, because IGA having an operator called Pluck.

Over the years, not only have the number of mobile devices increased, but the applications running on the mobile devices are also getting more data driven. Due to increasing load, the number of mobile hosts that could not connect to the destination is increased. There are two ways to solve this problem. One is to increase the number of channels (radio frequency) with the corresponding increase in cost. The other is to utilize the current infrastructure efficiently so that the best performance is achievable. Obviously, the second option is better and preferable.

In a mobile network, the number of wireless channels is usually limited and is reused. Channel reuse is defined as: If one channel is outside the interference range of other, it can reuse the same frequency and, thus, utilize the scarce resource. The efficient reusability of the channels improves the performance of the network. Other methods to deal with excess load in mobile networks in addition to channel borrowing are channel sharing and cell splitting. Particularly, cell splitting is very common in many real cellular networks.

Technological advances and rapid development of hand held wireless terminals have facilitated the rapid growth of wireless communications and

mobile computing. Taking ergonomics and economics factors into account, and considering the new trends in the telecommunications industry to provide ubiquitous information access, the population of mobile users will continue to grow at a tremendous rate. Another important developing phenomenon is the shift of many applications to multimedia platforms in order to present information more effectively.

The tremendous growth of the wireless/mobile users population coupled with the bandwidth requirements of multimedia applications requires efficient reuse of the scarce radio spectrum allocated to wireless/mobile communications. Efficient use of radio spectrum is also important from a cost-of-service point of view, where the number of base stations required to service a given geographical area is an important factor. A reduction in the number of base stations and hence a reduction in the cost-of-service can be achieved by more efficient reuse of the radio spectrum. The basic prohibiting factor in radio spectrum reuse is interference caused by the environment or other mobiles. Interference can be reduced by deploying efficient radio subsystems and by making use of channel assignment techniques.

The widening availability of mobile systems is driven by the increasing demand to have information available for users anywhere and anytime. The mobile system uses the radio frequency spectrum for communication. The load on radio frequency resources increases with increase in mobile devices and users. This reduces the performance of the network. Since radio frequency spectrum is limited, need arises for the effective management of these resources. The radio resources are managed by limiting the channel spectrum.

Channel allocation problem involves how to allocate, borrow able channels in such a way that it maximizes the long term and/or short-term performance of the network. Channel Reuse is the solution for the Channel allocation problem where channel are borrowed from the neighboring. In Channel reuse if a channel is outside the interference range of the other, the same frequency can be reused and thus, utilize the scarce resource. The efficient reusability of the channels improves the performance of the network so that the best performance is achievable.

Wireless networking greatly enhances the utility of portable computing devices. The technical challenges that mobile computing must surmount to achieve this potential are hardly trivial. The main issues stem from three essential properties of mobile computing, i.e., communication, mobility, and portability.

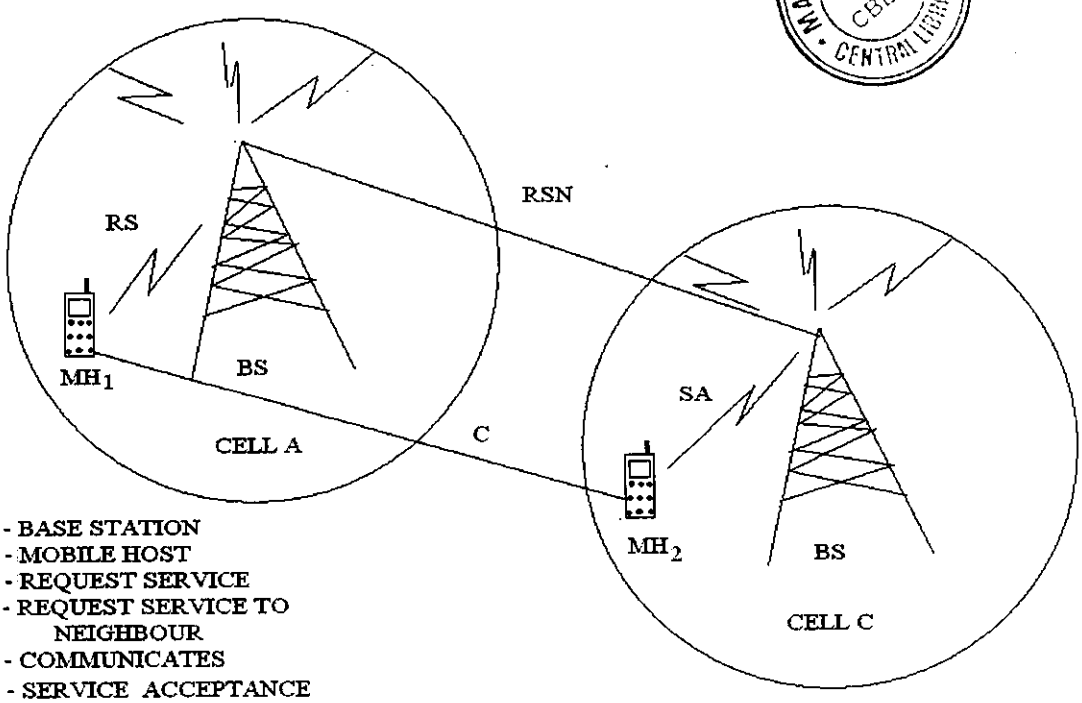
Wireless networks communicate by modulating radio waves or pulsing infrared light. Wireless networks are linked to the wired network infrastructure by stationary transceivers. The area covered by an individual transceiver's signal is known as cell. Cell radii vary from tens of meters in buildings to hundreds of meters in cities or tens of kilometers in the countryside. Cellular systems use small cells due to frequency reuse, less transmission power, and thin interference.

The ability to change locations yet connected to the network increases the possibility of the volatility of some information. Certain data considered static for stationary computing becomes dynamic for mobile computing. Moving mobile hosts will use different network access point or "addresses" and, so needs more location, sensitive information than stationary devices. The hand over is a common problem that arises due to mobility.

In mobile computing network, the main issues are mobility, communication, portability. Due to increase in load, the number of hosts could not connect to the destination is increased. It is obvious that more blocked host degrade the performance of the network. The allocation of borrowable channel will utilize the current infrastructure and the performance is achievable. The majority of the optimization methods such as greedy, heuristic algorithm which move from a single point in the decision space to the next, uses transaction rule to determine the next point. This method is harmful as it can allocate a false peak in multi modal search space. To make borrowing best with an appropriate choice of channel to borrow, the algorithm which climbs many peaks in parallel to find the best peak from a database of points simultaneously is required.

4. SYSTEM DEFINITION AND ANALYSIS

Mobile Host Communications in Mobile Network



BS - BASE STATION
MH - MOBILE HOST
RS - REQUEST SERVICE
RSN - REQUEST SERVICE TO NEIGHBOUR
C - COMMUNICATES
SA - SERVICE ACCEPTANCE

In the above figure, a Mobile Host1 (MH 1) request service from the Base Station (BS) in CELL A to a Mobile Host2 (MH2) in CELL C. The BS in CELL A request the neighbor CELL C for service, the CELL C checks the MH2 for service acceptance. If MH2 is busy the acceptance will not be provided, but since it's free service is accepted and a communication link is established between MH1 and MH2. With the communication link MH1 is capable to transfer information. When the transfer is over the link is disabled and a new establishment is favored. The link is said to be a channel and each channel has a capacity to support the communication. Each Cell has a fixed number of channel when one link is disabled then the channel is used for the next communication.

5. SYSTEM CONFIGURATION

5.1 Hardware Specifications

Processor	:	Intel Pentium III
RAM	:	256 MB
Hard Disk	:	20 GB
Monitor	:	800*600 minimum resolution at 256 colours minimum
I/O Devices	:	Mouse and standard Key board

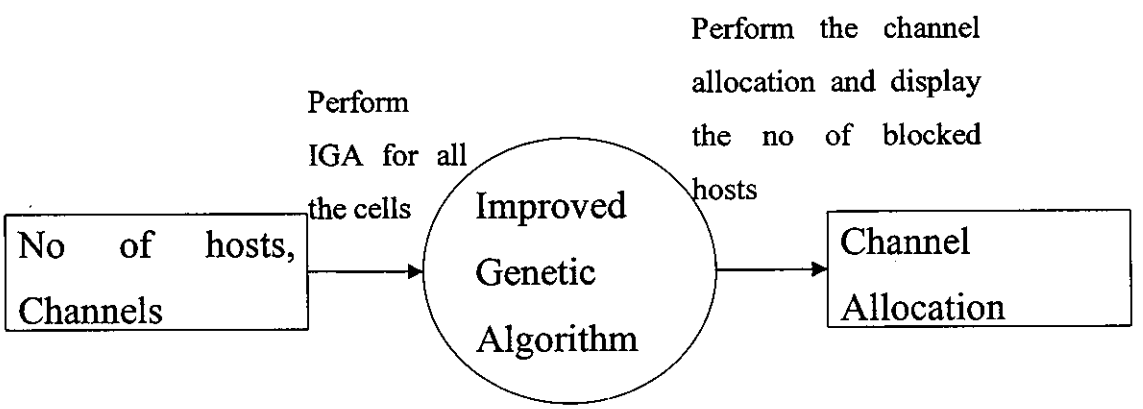
5.2 Software Specifications

Operating System	:	Windows
Front End	:	Java1.6

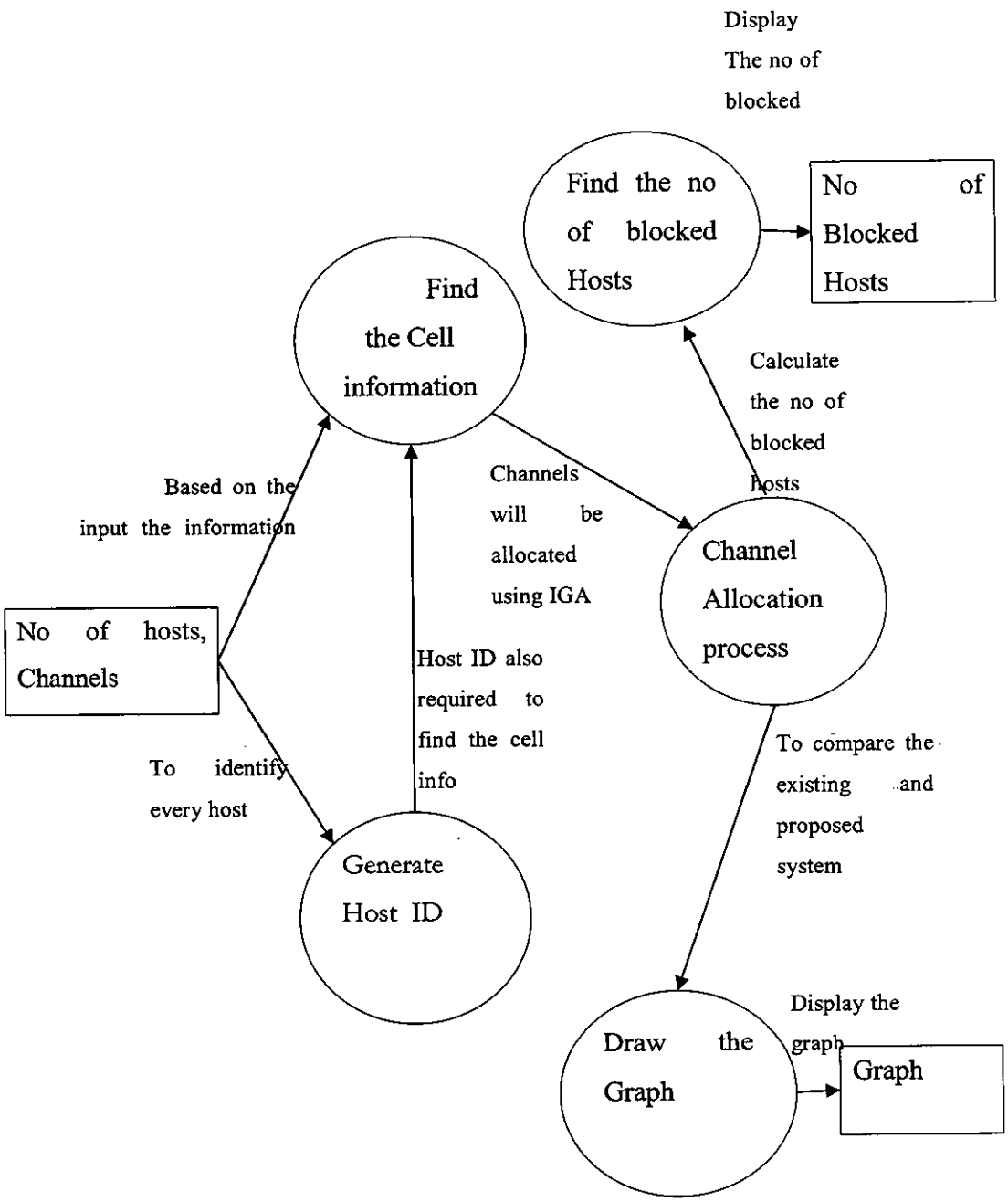
6. SYSTEM DESIGN

6.1 Data Flow Diagram

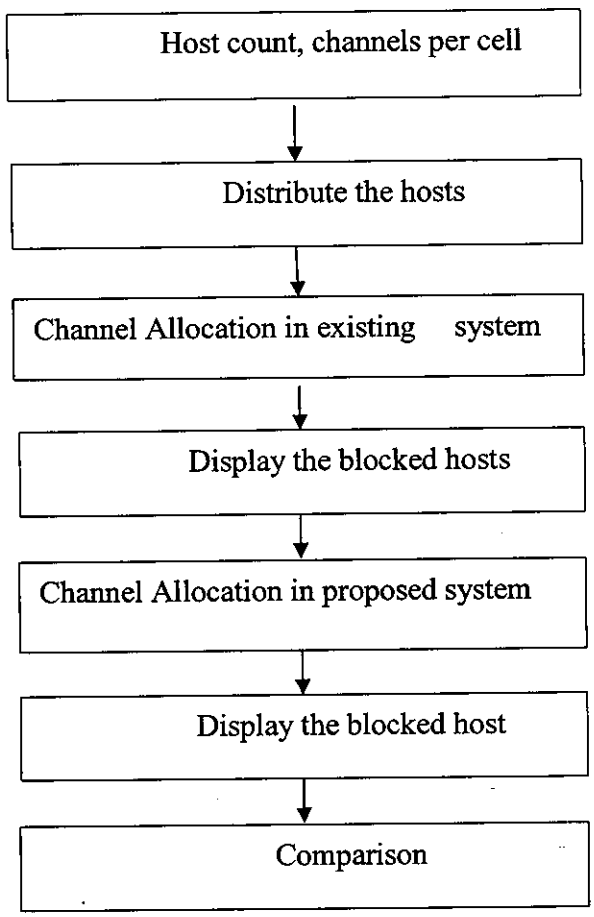
6.1.1 Level 0 Data Flow Diagram



6.1.2 Level 1 Data Flow Diagram



6.2 System Flow Diagram



7. PROPOSED SYSTEM

PROJECT CLASSIFICATION

This project consists of five modules. They are

- Find the information of all the cells
- Ranking the cells
- Borrow and Allocate the channels
- Find the number of blocked hosts
- Comparison between Existing and Proposed System

FIND THE INFORMATION OF ALL THE CELLS

A cell is a service area represented by a hexagon. In this project, we have seven cells namely cell0, cell1, cell2, cell3, cell4, cell5, cell6. After getting the number of hosts in the network and channels per cell, hosts will be distributed randomly to all the cells. So each cell will be having a Base Station(BS), Channels(The number of channels will be specified in input), Hosts(This will be distributed randomly). In this module we will be displaying the number of hosts, blocked hosts and channels present in each cell. Also the adjacent cells information will be displayed. All the information will be displayed at the channel information column.

One of the most important aspects that control GA's performance is the encoding method chosen. The encoding refers to the method by which the problem parameters are mapped into a chromosome.

There are number of ways to encode the chromosome: Here, a gene is created for each cell. Each gene contains the information about the number of hosts and the number of free channels in the cell. It also contains the information where to borrow, how much to borrow, and to whom to give and how much. The environment considers each cell with six neighbors and,

for each of them, we have the information at borrow-side and lending-side. After encoding the gene for each cell, genes are combined into a super cut gene, which contains information of the whole network.

A gene is an array of length 14. At the in first location of the array, we keep the number of blocked hosts and the second one has the number of free channels. The next six locations contain the information about lending in, to six neighbors. The last six locations have the information about borrowing from six neighbors. A super gene is formed with the gene of a cell and the gene of its six neighboring cells. Hence, the super gene is a matrix of 7 x 14 and all GA operations are performed on this super gene, i.e., matrix.

RANKING THE CELLS

When there is no idle channel in the present cell the channel which is present in the adjacent cell can be borrowed. Before perform the borrow operation the cells should be ranked. Fitness function is used to rank the cells.

The parameters for the fitness functions are,

- Number of channels
- Number of hosts
- Number of blocked hosts
- Number of idle channels

The fitness function returns the value called fitness value. Based on the fitness value the cells will be ranked. Channels will be borrowed from the cell, which has the highest preference based on the fitness value. The fitness function is used to rank the quality of a chromosome.

BORROW AND ALLOCATE THE CHANNEL

In channel borrowing, channels are assigned to cells just as in fixed allocation schemes. If a cell needs a channel in excess of the channels previously assigned to it, that cell may borrow a channel from one of its neighboring cells given that a channel is available and use of this channel won't violate frequency reuse requirements. Since every channel has a predetermined relationship with a specific cell, channel borrowing is often categorized as a subclass of fixed allocation schemes.

The channel allocation problem involves how to allocate, borrowable channels in such a way that it maximizes the long term and/or short-term performance of the network. The performance metric in the present work, to evaluate the proposed IGA for channel allocation, is the number of blocked hosts. A host is blocked if it enters into a cell but cannot get a channel. It is obvious that more blocked hosts result in performance degradation of the network. Thus, reduction in blocked hosts is sought in the present work. The number of borrowings should also be as few as possible because more borrowings incur more network traffic. The other metric that can be used to evaluate the performance is the number of "***hot cells***," a cell without any free channel. A cell is considered "hot" when all the channels in a cell are allocated to hosts. Hot cells are undesirable because mobile hosts will be denied a service upon entering the cell.

After ranking, the channels should be borrowed and to be allocated. When a host tries to communicate with another host, first it will check whether a channel is present inside the current cell or not. If a channel is present inside the current cell means, the host will use that channel for

making communication with the other host. This is represented by the pink lines between the host and channel.

If there is no channel in the current cell, then channel will be borrowed from the neighbor cell. The neighbor cell will be selected based on the fitness value. When there is no channel in the current cell, the host will send the channel request to the Base Station (BS). This is represented by the green lines. After getting the request from the host, the BS will send the request to the channels of the neighbor cell. This is represented by blue lines. Finally the channel will be allocated from the any one of the neighbor channel, if it have any free channel.When one cell tries to borrow some channels from a neighbor cell, it checks whether it is the best time to borrow. If the cell finds that it may give better results for the next, considering the environment, then the cell does not borrow the channel from this neighbor. If it finds that it may lead to a bad situation if it is borrowed later, then the cell tries to borrow it at the appropriate time. This future information (i.e., the information about free and blocked hosts) is extracted from the cell itself. Thus, pluck, together with the encoding method, produces the population for other GA operations.

FIND THE NUMBER OF BLOCKED HOSTS

A host which is present inside a cell and not able to get the channel for communicating with another host is called blocked host. The amount of blocked host will be high in the existing system. Because, the existing system uses Fixed Channel Allocation (FCA) for channel allocation. Consider a network with ten hosts and two channels in each cell. In this situation, for each cell, two hosts will get channels. So, for each cell, eight

hosts will become a blocked host. Totally 56 blocked host will be there in the network.

This huge amount of blocked host can be reduced in the proposed system. Because, here we are borrowing the channels from the neighbor's cells. The amount of blocked host for each existing and proposed system will be displayed in the result window.

COMPARISON BETWEEN EXISTING AND PROPOSED SYSTEMS

The amount of blocked host in both the existing and proposed system will be compared using graph. X axis represents the clock pulse and Y axis represents the number of blocked hosts. The pink line in the graph represents the existing system and green line represents the proposed system.

From the graph we can know that the amount of blocked host will be less in the proposed system.

8. IMPLEMENTATION AND TESTING

8.1 IMPLEMENTATION

8.1.1 PHASES OF GENETIC ALGORITHM

Selection

During each successive generation, a proportion of the existing population is selected to breed a new generation through a fitness-based process, as measured by a fitness function. Certain selection methods rate the fitness of each solution and preferentially select the best solutions.

Crossover

Crossover is a genetic operator that combines (mates) two chromosomes (parents) to produce a new chromosome (offspring). The idea behind crossover is that the new chromosome may be better than both

of the parents if it takes the best characteristics from each of the parents. Crossover occurs during evolution according to a user-definable crossover probability.

A crossover operator that randomly selects a crossover point within a chromosome then interchanges the two parent chromosomes at this point to produce two new off springs.

Consider the following 2 parents which have been selected for crossover. The "|" symbol indicates the randomly chosen crossover point.

1st matrix:	2nd matrix:
?cut point	?cut point
1 2 3 4 5 6 7	4 5 6 5 7 4 6
2 3 4 3 4 8 7	4 3 5 8 7 9 4
5 6 7 5 6 4 3	1 2 2 6 6 3 4

The offspring generated from two parental matrices are:

Offspring 1	offspring 2
4 5 6 5 7 4 6	1 2 3 4 5 6 7
4 3 5 3 8 7 4	2 3 4 4 8 9 7
1 2 2 6 6 3 4	5 6 7 6 6 4 3

Mutation

Mutation is a genetic operator that alters one or more gene values in a chromosome from its initial state. This can result in entirely new gene values being added to the gene pool. With these new gene values, the genetic algorithm may be able to arrive at better solution than was previously

possible. Mutation is an important part of the genetic search as help helps to prevent the population from stagnating at any local optima. Mutation occurs during evolution according to a user-definable mutation probability. This probability should usually be set fairly low (0.01 is a good first choice). If it is set to high, the search will turn into a primitive random search.

Termination

The generational process is repeated until a termination condition has been reached. Common terminating conditions are

- A solution is found that satisfies minimum criteria
- Fixed number of generations reached
- The highest ranking solution's fitness is reaching or has reached a plateau such that successive iterations no longer produce better results
- Manual inspection
- Combinations of the above.

CLASSES USED:

The different classes used in this project are described below

Globals

This class uses the function

Wait()

This class uses the wait function to declare the delay time. The MSS width, height; cell width, height and start X and start Y of cell are specified in this class.

Cell

This class uses the functions

Cell()

setid()

getid()

getNodeCount()

getChannelCount()

addNode()

addChannel()

linkNodeToChannel()

clearAllocations()

isNodeAllocated()

findNodeOfChannel()

findBlockedNodeCount()

The class uses the functions cell() to initialize counter, setid() and getid() to initialize and get the id of cells. The function getNodeCount(), getChannelCount(), are used to obtain input from the users. The addNode() and addChannel() functions are used to add the user specified channel to the simulated network. The linkNodeToChannel(), clearAllocations(), isNodeAllocated() and findBlockedNodeCount() are used to obtain the channel for allocation and also the blocked hosts in the network.

Node

This class has function as

Node()

This class uses the Node() function to initialize X and Y position and to specify each node id to all the nodes present in the project network.

Map

This class has functions such as

Map()

getCellInfo()

findTotalNodesCount()

findTotalChannelsCount()

findCellIDOfNode()

findNodeIndexInCell()

findCellIDOfChannel()

findChannelIndexInCell()

drawNodesLabel()

The function Map() is used to define the mapping status of the cell in the simulation. getCellInfo() is used get the cell in which a node is present. findTotalNodesCount() and findTotalChannelsCount() are used to obtain nodes and channels in each cell. findNodeIndexInCell(), findCellIDOfChannel(), and findChannelIndexInCell() are used to obtain index and cell id of channels and nodes. drawNodesLabel() are used to draw the nodes label in the adjacency list.

Channel

This class uses functions like

Channel()

getstatus()

setstatus()

The channel class uses the channel() function to set the channel id and the getstatus() and setstatus() function to obtain status of the channel from the user and to set the status for the appropriate channel.

ChannelAllocationGA

The functions in this class are

ChannelAllocationGA()

existing()

proposed()

addNewChannelToCell()

addRandomChannels()

pluck()

isAlreadyAllocated()

findNodeDistance()

SendRequestMessage()

CheckChannelsOfCell()

swapChannelStatus()

ChangeChannelStatus()

drawStatistics()

In the class the function ChannelAllocationGA() is used to initialize user interface (ui) parameter and (x,y) positions of frames and labels in the ui. The existing() function is used to evaluate the blocked host based on the existing algorithm and the proposed() is used to evaluate the blocked host based on the proposed algorithm with the genetic operation results.

The addNewChannelToCell() and addRandomChannels() are used to add new channel to the cell and the channels are added randomly. The pluck() function is were the genetic algorithm is implemented with all its opereator.

The class uses functions drawChannelLinks(), DrawCellRequestArrow(), HighlightAllocatedChannel() and drawStatistics()

to draw paths between channel and nodes, request arrow to BSs, to draw highlight for the allocated channel and to draw the statistics of the comparisons between the existing and proposed systems respectively.

8.2 TESTING

8.2.1 Unit Testing

Unit testing helps to eliminate uncertainty in the units themselves and can be used in a bottom-up testing style approach. By testing the parts of a program first and then testing the sum of its parts, integration testing becomes much easier.

A heavily debated matter exists in assessing the need to perform manual integration testing. While an elaborate hierarchy of unit tests may seem to have achieved integration testing, this presents a false sense of confidence since integration testing evaluates many other objectives that can only be proven through the human factor. Some argue that given a sufficient variety of test automation systems, integration testing by a human test group is unnecessary. Realistically, the actual need will ultimately depend upon the characteristics of the product being developed and its intended uses. Additionally, the human or manual testing will greatly depend on the availability of resources in the organization.

8.2.2 Integration Testing

Integration testing (sometimes called Integration and Testing, abbreviated I&T) is the phase of software testing in which individual software modules are combined and tested as a group. It follows unit testing and precedes system testing.

Integration testing takes as its input modules that have been unit tested, groups them in larger aggregates, applies tests defined in an integration test plan to those aggregates, and delivers as its output the integrated system ready for system testing.

8.2.3 Regression Testing

Regression testing is any type of software testing which seeks to uncover regression bugs. Regression bugs occur whenever software functionality that previously worked as desired, stops working or no longer works in the same way that was previously planned. Typically regression bugs occur as an unintended consequence of program changes.

8.2.4 Validation Testing

The goal for the regulators is to ensure that quality is built into the system at every step, and not just tested for at the end, as such validation activities will commonly include training on production material and operating procedures, training of people involved and monitoring of the system whilst in production. In general, an entire process is validated; a particular object within that process is verified. The regulations also set out an expectation that the different parts of the production process are well defined and controlled, such that the results of that production will not substantially change over time. This also extends to include the development and implementation as well as the use and maintenance of computer systems. The software validation guideline states: "The software development process should be sufficiently well planned, controlled, and documented to detect and correct unexpected results from software changes.

8.2.5 Output Testing

Software testing is an empirical technical investigation conducted to provide stakeholders with information about the quality of the product or service under test , with respect to the context in which it is intended to operate. This includes, but is not limited to, the process of executing a program or application with the intent of finding errors. Quality is not an absolute; it is value to some person. With that in mind, testing can never completely establish the correctness of arbitrary computer software; testing furnishes a criticism or comparison that compares the state and behavior of the product against a specification. An important point is that software testing should be distinguished from the separate discipline of Software Quality Assurance (S.Q.A.), which encompasses all business process areas, not just testing.

9. CONCLUSION

This project aims at exploring the Genetic Algorithm (GA) and improving it to solve the cellular resource allocation problem. It presents a different approach of handling the resource allocation problem by incorporating problem specific knowledge. When a host enters into a new cell, a hand-off is made for a channel. If there are channels available, it can get a free channel immediately, otherwise, a Channel Borrowing (CB) operation is endeavored.

The GA operator Pluck attempts to improve the Channel Borrowing (CB) by making decisions that minimize the number of blocked hosts and maximize the long term performance of the network.

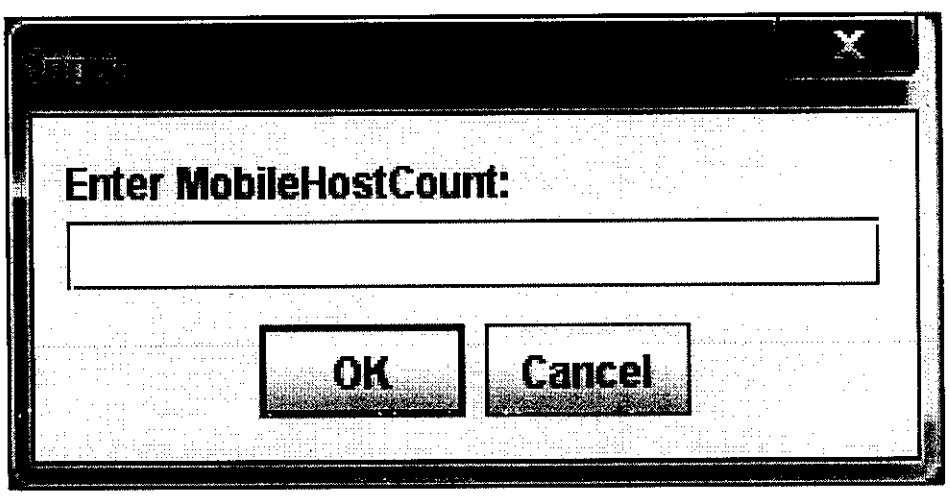
The comparison of the result with the existing model reveals that the proposed model has an edge for improving the channel utilization. Thus, the

project suggests that the proposed allocation model will outperform the earlier channel allocation models in terms of reduction in blocked hosts. The consequence is better channel utilization.

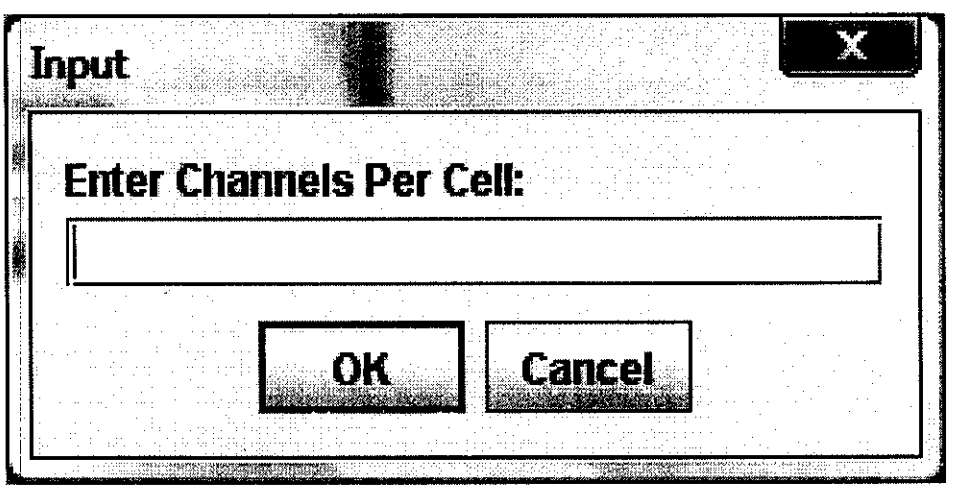
10.FUTURE ENHANCEMENT

The project can be further enhanced by implementing channel allocation using GA operators for dynamic channel allocation with heavy load and can be used over a vast area of network. It can be also enhanced such that it acts even with less number of mobile hosts.

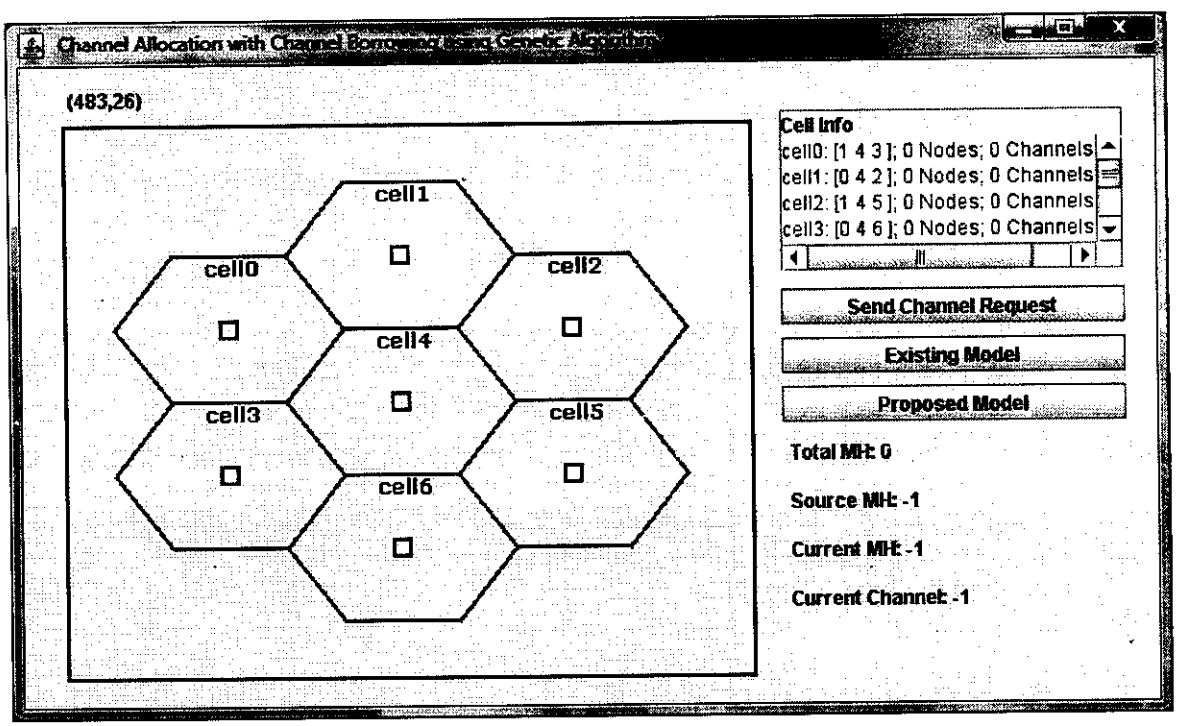
11. SCREEN SHOTS



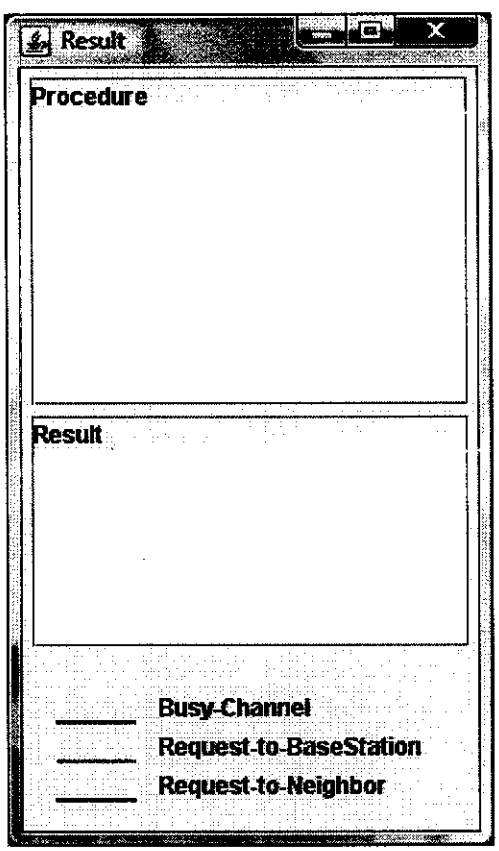
Input for Mobile Host Count



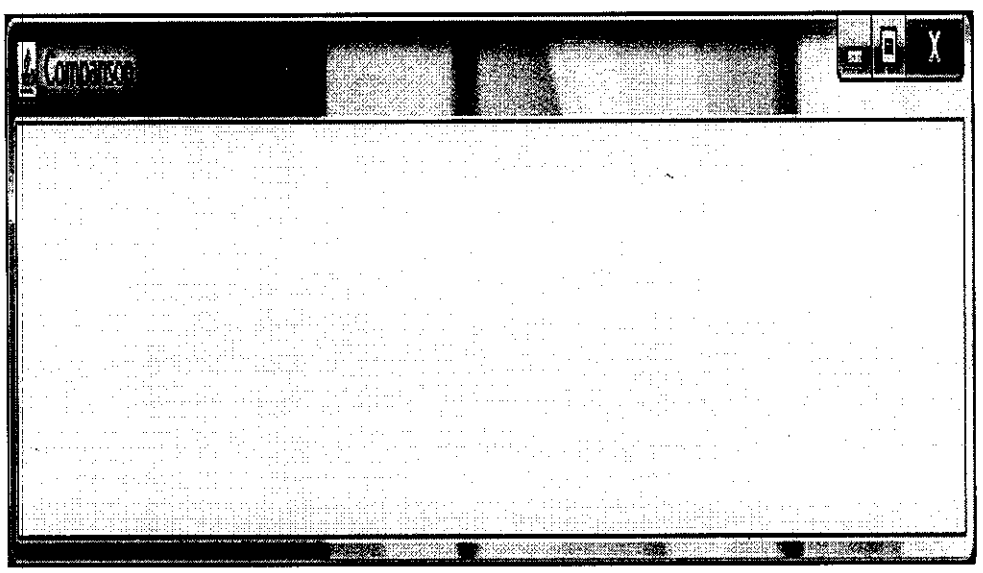
Input for Channels Per Cell



Cell representation

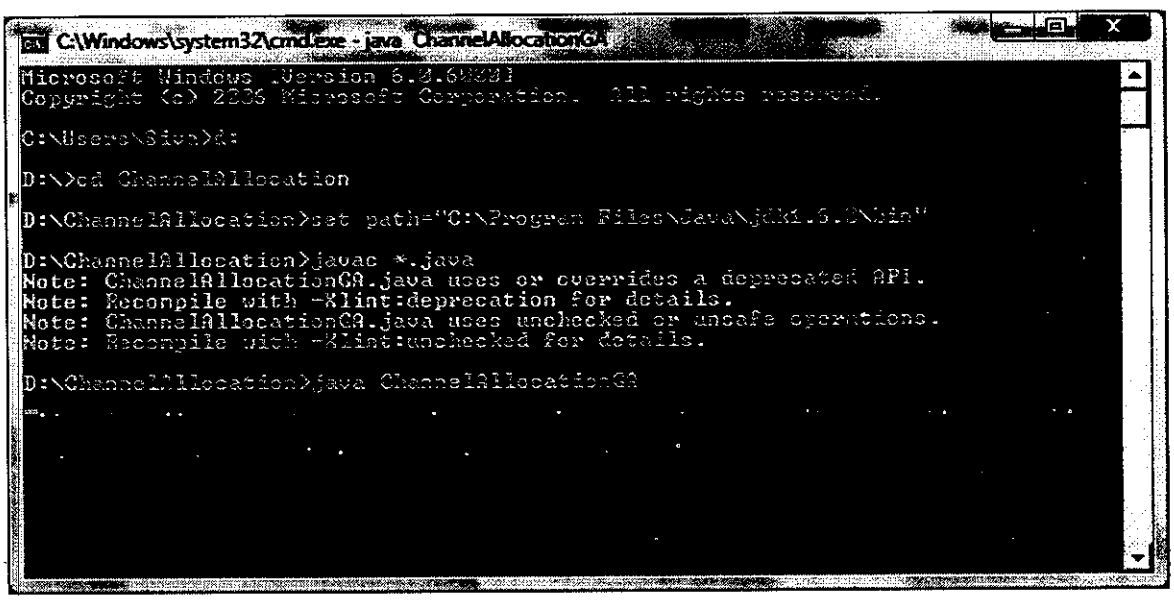


Result window

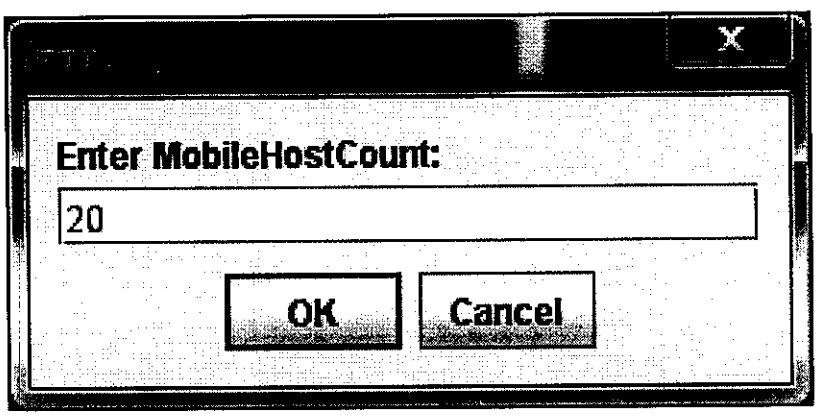


Graph

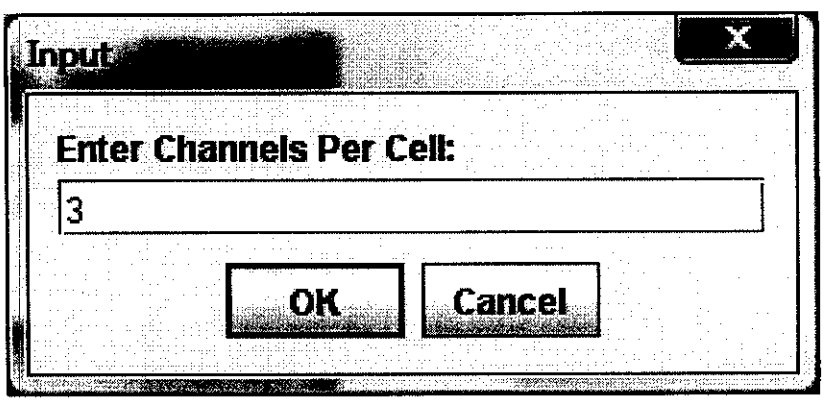
SAMPLE OUTPUT



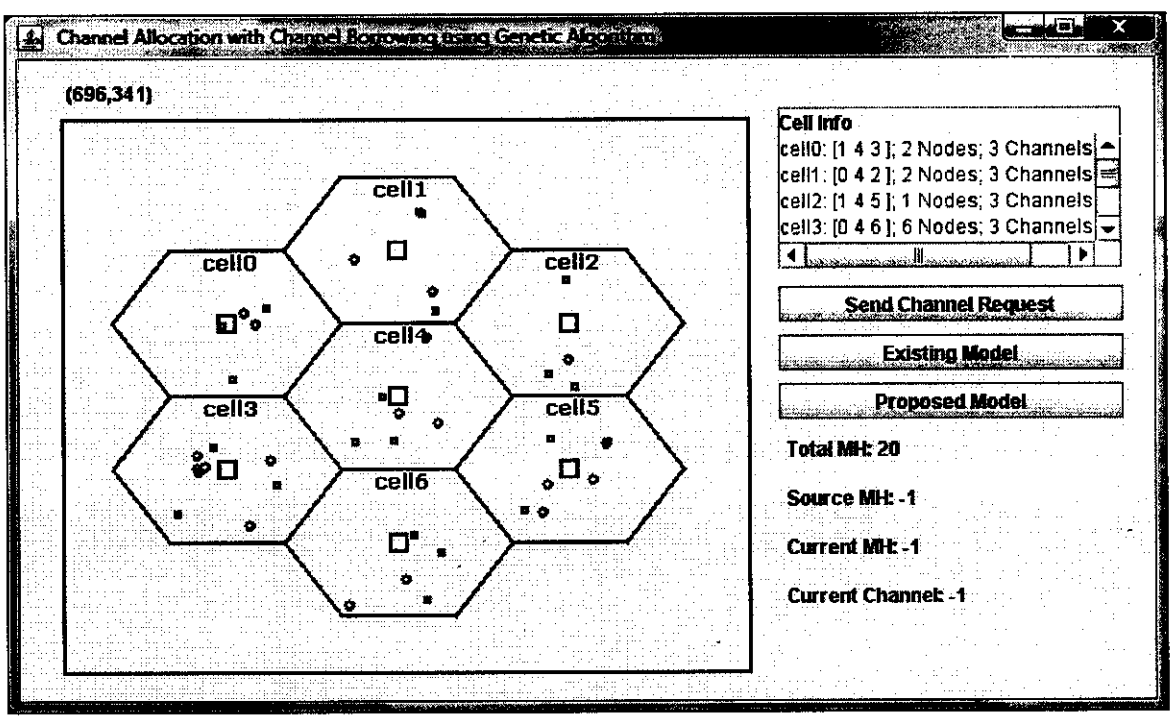
Execution



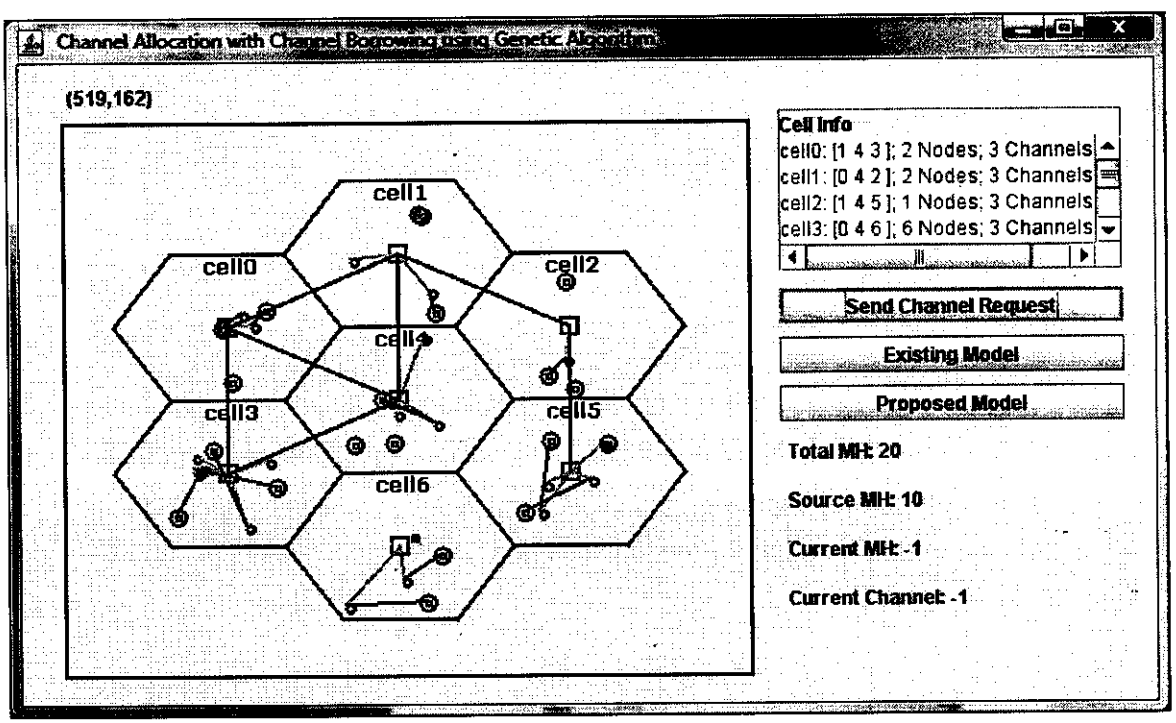
Input for Mobile Host Count



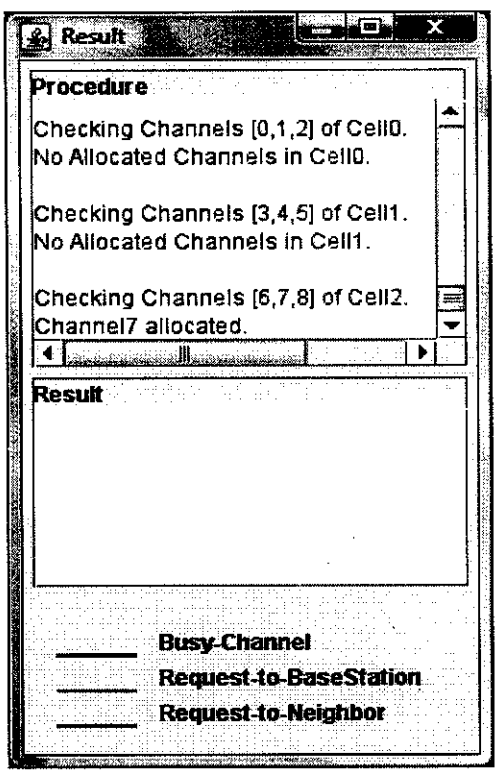
Input for Channels Per Cell



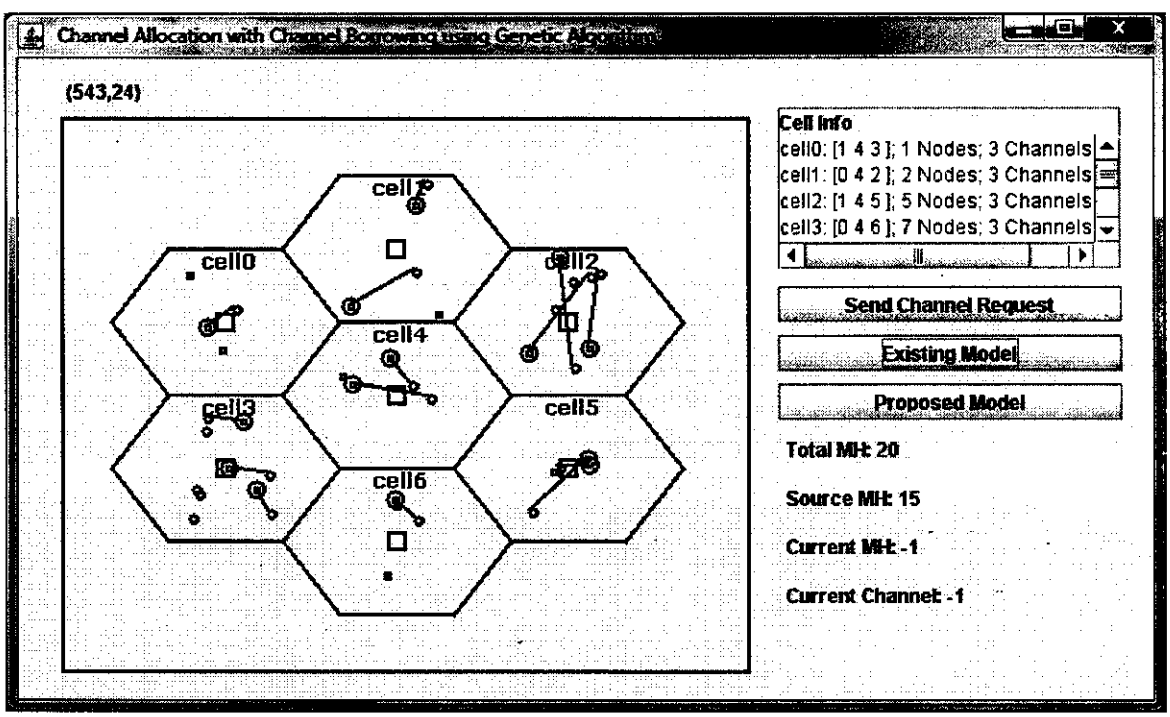
At the initial stage of Channel Allocation Scheme



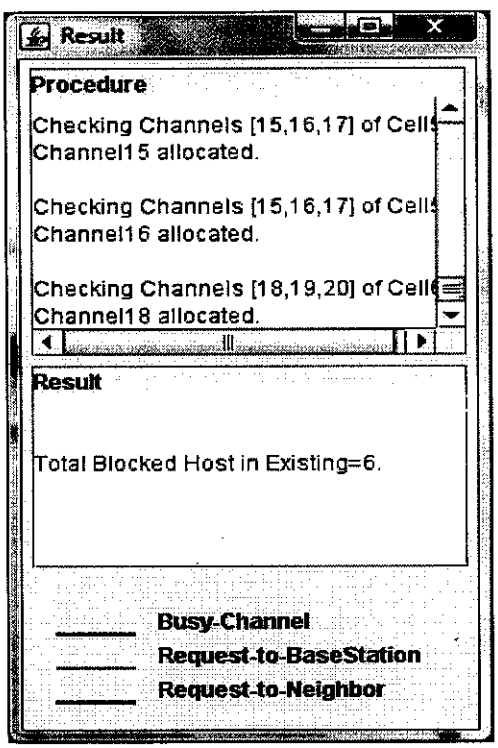
Usage of Send Channel Request Button



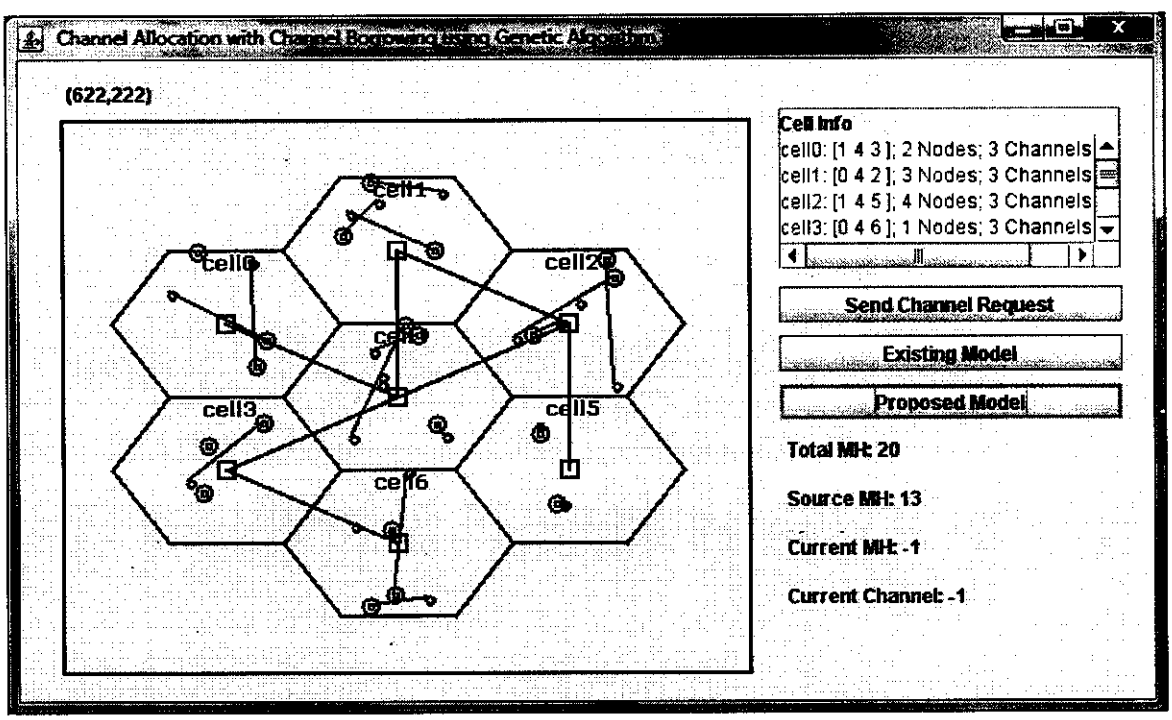
Procedure Window



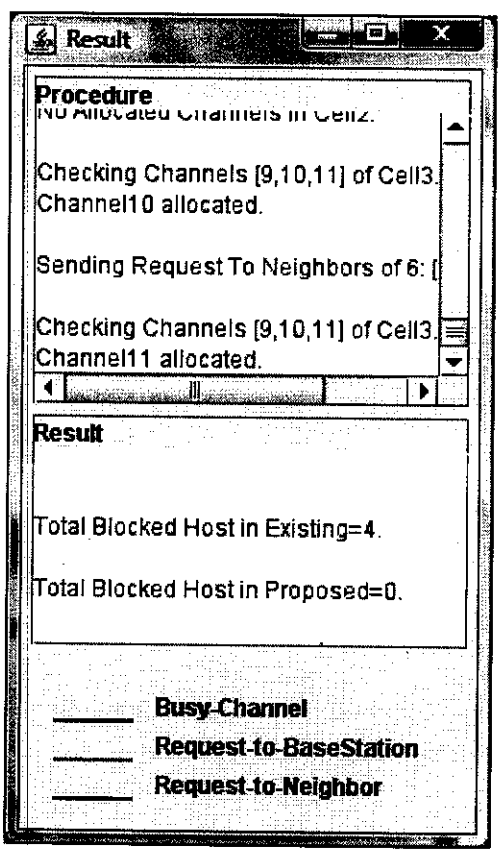
Channel Allocation in Existing Model



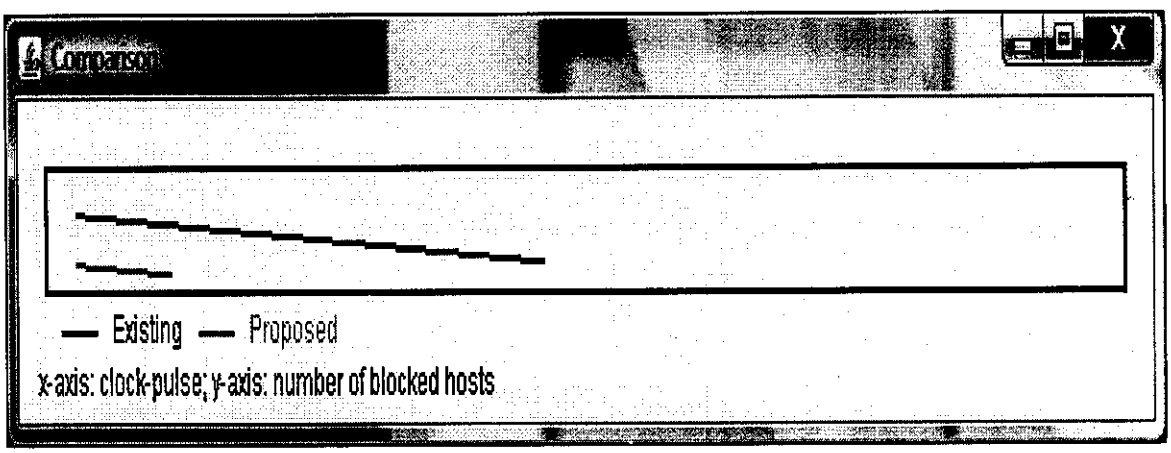
Blocked host in Existing Ssytem



Channel Allocation in Proposed System



Blocked host in Existing, Proposed System



Comparison between the Existing and Proposed syatem

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