Effective handoff schemes with dynamic channel allocation

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ABSTRACT

Sufficient bandwidth that can support multimedia service has to be provided in the next generation wireless communication system. In this paper, the effective handoff scheme considering the position of mobile terminal is proposed. In addition, the dynamic channel allocation scheme is proposed. The shared channel in this algorithm can reduce more the blocking probability and the dropping probability. The proposed algorithms are simulated by SMPL library in C language. The simulation results show that the blocking probability and the dropping probability of the call can be reduced up to 60% and 10% using the proposed algorithms, respectively.

1. INTRODUCTION

Recently, for more efficiency using restrictive channel, a channel is allocated dynamically in wireless communication according to tremendous increase of broadband service demand, such as data, voice, image and video[1]. In addition, the service area has been reduced because of the undesirable the increment of handoff by reusing the resources. The various handoff algorithm is proposed to solve the above issue[2].

The handoff is an important function of wireless communication system to guarantee the continuity of call. If there is no available bandwidth in base station, the handoff call is dropped. Because the dropping of handoff call is less desirable than the blocking of new call that cause little delay to user until accepting the new call. Considering the quality of service(QoS) in wireless communication, it is desirable to reduce the dropping probability of handoff call[3][11].

In the existing algorithm, the channel of all the adjacent cells is reserved for handoff. But the position of mobile terminal is considered. In addition, the channel reservation is made differently in each cell. A shared channel is used to the channel of base station. If other mobile terminal demands a call admission, a channel of the mobile terminal was allocated to the shared channel. So, we propose two algorithms that reduce dropping probability of handoff call[4][5][6][7]. The paper is organized as follows. An existing algorithm is introduced and the proposed algorithm is explained in section 2, 3, 4, and 5. In the section 6, its simulation results are discussed.

2. ALGORITHM DESCRIPTION

In an existing algorithm, because of no considering mobility of traffic, channel of the handoff call and channel of the new call is set in fixable size. If the ratio of handoff call is row, connection establishment is rejected although there is available bandwidth for new call. That is, utilization of wireless channel is low. Considering traffic mobility, some researches are required in channel allocation area in order that channel is guaranteed for the handoff call and the blocking probability of new call is reduced[8][13].

In this paper, it is used a conventional hexagon cell model which considers the reuse pattern[9][10][13].

In this model, one cell is divided into six sectors. In Fig. 1, if a call is occurred in a cell, the six adjacent cells around the cell are classified into the most adjacent cell, the adjacent cell, and others.

For example, if a new call is occurred in the 1st sector of the 1st cell, the 7th cell is the most adjacent cell. In addition, the 2nd and the 6th cell are the adjacent cells.

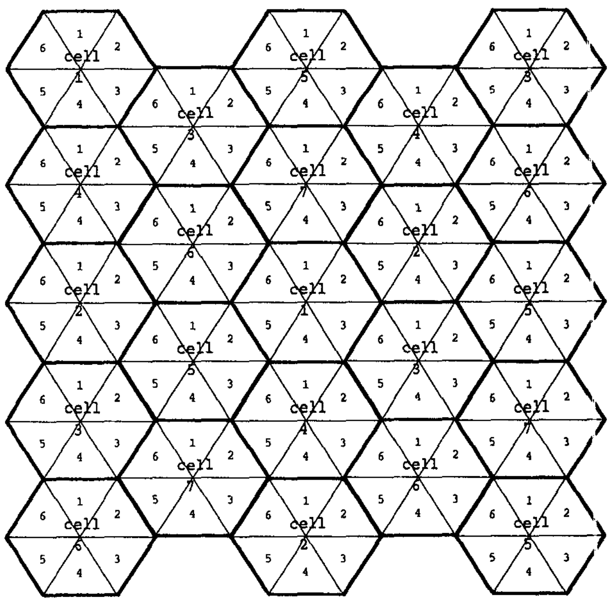

Fig. 1. Classification of the sectors and the cells

The channel of the above adjacent cells is reserved for the handoff. When the handoff call moves into the cells that are reserved, the channel is allocated. If the handoff call moves into others, there is no reserved channel in others. To solve this problem, the reserved channel for different cell is borrowed, since the reserved channel is not decided yet whether the handoff call is accepted or not.

3. CHANNEL ALLOCATION ALGORITHM

In Fig. 2, if new call is occurred, an available bandwidth for the new call checks to exist. If the available bandwidth for the new call exists, a position of the call is estimated.

In case that the available bandwidth of the new call doesn't exist, it is checked whether the available bandwidth of the shared channel exists or not. If the shared channel exists, a position of the call is estimated and otherwise, it executs blocking.

If the available bandwidth for the handoff in three adjacent cells to permit the new call is reserved, the new call is permitted after being estimated a position. If the reserved channel doesn't exist, the shared channel is checked whether it is available or not. In case that the available reserved channel exists, the channel is allocated. If there is no available bandwidth in shared channel, the call is blocked.

In Fig. 3, when the handoff call moves into the cells that are reserved, the channel is allocated. If the handoff call moves into others, there is no reserved channel in others. To solve this problem, the reserved channel for different cell is borrowed, since the reserved channel is not decided yet whether the handoff call is accepted or not. In case that the reserved channel doesn't exist, the call is dropped.

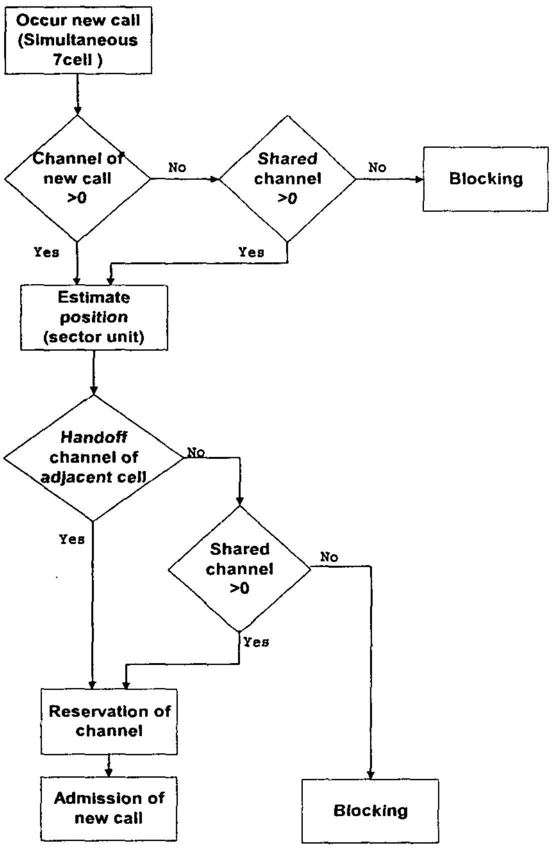

Fig. 2. Call admission process of new call

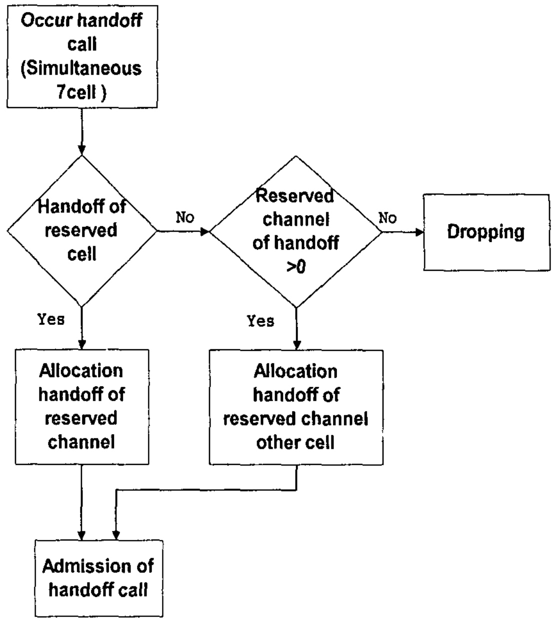

Fig. 3. Call admission process of handoff call

4. CHANNEL ALLOCATION ALGORITHM

In the existing algorithm, all of channels are set to the new call and the handoff call. There is no flexibility between the channel of handoff call and the channel of new call.

The proposed channel allocation is showed in Fig. 4. If the handoff call exceeds the channel of handoff call that is set basically, the shared channel is used for the channel of handoff call. When the new call exceeds the channel of new call that is set basically, the shared channel is allocated the channel of new call. As the proposed channel allocation algorithm is used, the blocking probability and the dropping probability are reduced.

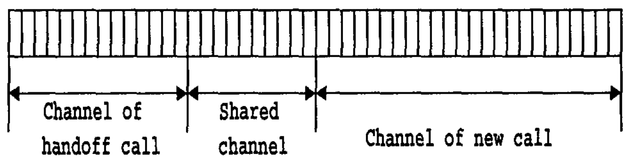

Fig. 4. Channel allocation

5. PERFORMANCE EVALUATION

5.1. The Simulation

The proposed algorithm is compared with the algorithm A, B, and C. In the algorithm A, there is no the shared channel and the adjacent cell for handoff is three. In the algorithm B, there is the shared channel and the adjacent cell for handoff is six. In the algorithm C, there is no the shared channel and adjacent cell for handoff is six. The blocking probability and the dropping probability are checked via the simulation.

The total number of the occurrence call is 800,000, and the cell model is assumed in a regular hexagon shape. The new call and the handoff call are generated in a ratio of 8 to 2[12]. The call is generated at the rate of 1/6. The arrival time and the departure time are generated in exponential distribution. The channel of handoff call, the shared channel, and the channel of new call are set in a ratio of 3 : 2 : 5.

5.2. Results

The simulation results of the blocking probability are described in Fig. 5. When the proposed algorithm is compared with algorithm B and C, the blocking probability is improved up to 60%. The blocking probability of algorithm A is similar to the blocking probability of proposed algorithm.

In the blocking probability, the proposed algorithm is improved comparing with the existing algorithm. In addition, the dropping probability is described in Fig. 6. When the proposed algorithm is compared with algorithm C, the dropping probability is improved up to 25%. In case that the proposed algorithm is compared with algorithm A, the dropping probability is improved up to 12.5%. If the proposed algorithm is compared with algorithm B, the dropping probability is declined up to 10%. Although the simulation result does not show better performance in comparison with algorithm B, it is very hard to implement the algorithm B. From that idea, we decide that the proposed algorithm shows better performance than the existing algorithm in the dropping probability.

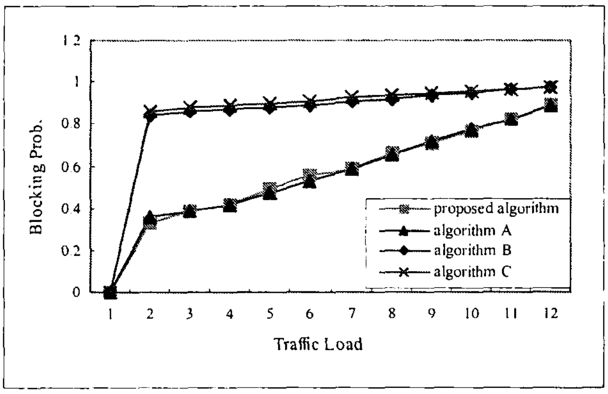

Fig. 5. Blocking probability

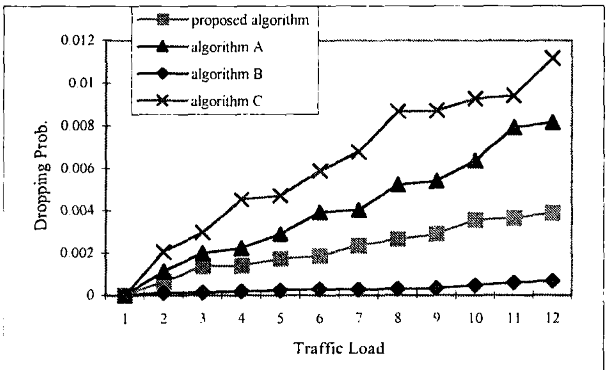

Fig. 6. Dropping probability

6. CONCLUSION

In this paper, the reservation process of handoff call is proposed. One cell is divided into six sectors to reduce the squander of wireless resources. In addition, the channel of three adjacent cells is reserved by considering the position of mobile terminal. The shared channel is allocated between the channel of handoff call and the channel of new call for more efficient channel allocation. The proposed algorithm is compared with the algorithm A, the algorithm B, and the algorithm C according to the blocking probability and the dropping probability.

More efficient channel allocation scheme considering both velocity and direction is preparing for future research. In addition, the modification of the channel allocation algorithm by classifying of service traffic is under research.

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