The helper scheduling problems
in home health care support service

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Background

In recent years, "care problem" is getting worse because of the rapidly increase of population of elder-aged. There is a great demand for care support service. In this situation, the government of Japan is planning to adopt the "long term care insurance system" from April 2000.

One of the care support services is home health care service which dispatch helpers to patients who need care at home. As a result of adopting the public aid, it is expected that the number of patients who use this service will increase. On dispatching of helpers, the problem is how to make schedules satisfying all requests from users. Regarding this as a business, it is important to keep the cost down. Now, the scheduling of service depends on the experience of the person in charge at care service center. However, the present situation does not sufficiently correspond to the number of patients which is rapidly increasing.

In the future, for more patients and more care service center, this scheduling problem might become serious problem but there dose note exists any concrete algorithm to solve this problem.

Purpose and Methods of Research

The purpose of this thesis is to formulate this problem and to provide efficient algorithm for solving this problem.

Hence, we formulated the problem for finding a schedule satisfying all requests from patients and keeping cost down, and called such problem a "helper scheduling problem". We begin with grasping the present situation for scheduling. Based on questionnaire to

helpers and patients, we discuss with the person in charge of scheduling for clarifying constraints and objectives of this problem.

It occurred frequently that a completely new schedule is required when a small modification is made. Since such modification is frequent occurrence, we give attention to this, and simplify the model without making it too different from the real problem.

So we regard this model as parallel machine scheduling problem, and solve this problem by reducing this problem to a network flow problem, in which requests are represented by edges. Then, this problem can be solved by using the algorithm proposed by Ahuja which find 0-1 maximum flow of maximum weight, such that the schedule is made in such a way that all requests correspond to edges on the same path are served by the same helper. Then we can find minimum number of helpers required for satisfying all requests, and minimizing earliness and tardiness of serving requests.

Results and Remarks We apply our algorithm to make schedules using real data which is provided by the care service center cooperated with us. The schedules which is made by our algorithm is useful even if a small modification is made. Of course, this is the effect of simplification. But we succeeded the avoid the case that a completely new schedule is required when a small modification is made. In the discussion with the care service center, we found out new restrictions which are overlooked when formulating the problem, but it does not make any influence to the usefulness of our scheduling algorithm. We concluded that this formulation does not reflect all restrictions of real problem but at least contains some of them, and solution space is reasonable close to the real one.

We success to provide a primitive plan for the scheduler, so it means we accomplished the aim to make a model to support scheduling. The poor plan make scheduling more difficult. So our model is worth for scheduling at the care service center.

Therefore this model is helpful for management of health care support service, and we propose this model for primitive model of helper scheduling problem in our country.

This model is simplified and does not reflect all restrictions of real problem. In the future, the "long term care insurance system" will be adopted, and more restrictions will appear. In ideal, the care service center will have a system which automatically makes schedules. However, to add more restrictions, the problem becomes hard to solve and the constructed schedules will allow only small modifications. So, it loses helpfulness for scheduling. Therefore, it should be careful to add more restrictions.