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Optimizing Meetings-to-Room Assignment

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[0001] A large organization can have a plurality of meetings scheduled for a given day. Each meeting can be attended by employees, managers, and customers. To meet the needs of the various meetings, the organization can employ a campus (one or more buildings in a geographic area) that includes multiple meeting rooms. Each meeting room can have an associated capacity which represents the number of people who can attend a meeting in that room. Generally, organizations use a manual booking process to assign meetings to a specific meeting room based on a first-come-first-served selection process. Distributing meeting rooms on a first-come-first-served basis can result in inefficient use of meeting space (e.g., some meetings may be booked in a meeting room with a capacity that exceeds the number of expected attendees) and wasted time spent by attendees traveling to and from the meeting rooms.

[0002] One solution to these potential inefficiencies is the use of an automated process associated with a meeting room optimization system to assign meetings to meeting rooms. These meetings can be assigned to meeting rooms in such a way as to maximize the use of available meeting room space and minimize the travel time of the attendees. The meeting room optimization system can access current meeting room data and meeting participant data day in the future. Using this information, the meeting room optimization system can determine which meeting should be assigned to each meeting room to allow for the most efficient use of space and the least amount of travel time for the participates. To make this determination, the meeting room optimization system can calculate a cost associated with each meeting/room pairing. Using these costs, the meeting room optimization system can determine which overall configuration results in the smallest total cost for the meetings of the day. The meeting room optimization system selects the room/meeting assignment configuration that minimizes the calculated cost. The meeting room optimization system can update the room assignments for each meeting the next day and send updated meeting information out to each participant.

[0003] More specifically, the meeting room optimization system can access meeting data for the next day for a particular campus. The meeting data includes room data, meeting data, and participant data. Room data can include a listing of all potential meeting rooms that can be used

for meetings at the campus. The room data also includes data describing, for each meeting room, the capacity of the meeting room, the location of the meeting room, and any accessibility information for the meeting room.

[0004] The meeting data can include a listing of all meetings planned for a given time period (e.g., the next day). Data for each meeting can include a time of the meeting, the owner (or creator) of the meeting, a current meeting room assigned to the meeting, a listing of potential participants, and any information about the potential participants likelihood of attendance (e.g., whether the potential participant has accepted or rejected an invitation to the meeting).

[0005] User data can include a list of potential participants (e.g., the employees of the organization). For each potential participant, the user data can list a desk location for each potential participant and any movement restrictions or limitations associated with the potential participant (e.g., a potential participant may require a wheelchair ramp to attend a meeting). The meeting room optimization system may calculate the distance from each known desk location to each possible meeting room in advance to be used in the future. The calculated distances can be stored for future use in calculating costs.

[0006] The meeting room optimization system can perform some initial cost calculations as a first step in identifying the optimal room assignment configuration. As noted above, the system calculates (or accesses if pre-calculated) a cost metric for each potential attendee for all possible meeting rooms. In some examples, the cost metric is a measure of the total distance between a specific desk (or room) and a meeting room. In some examples, the cost meter can also include other factors such as stairs and/or elevators. Furthermore, a cost metric can also be personalized for a specific potential attendee based on that person’s movement capabilities.

[0007] The meeting room optimization system can calculate a capacity cost for each room and each prospective meeting. The capacity cost is calculated to represent the degree to which a meeting matches the capacity of a meeting room. The capacity cost is calculated such that meetings with more participants than a given room have a high capacity cost. Meetings with a number of participants that is close to the room capacity have a low cost and meetings with fewer participants than the capacity of a given room have medium costs. In this way, the capacity cost promotes assignment of meetings to rooms with capacities similar to the estimated attendance.

[0008] The meeting room optimization system can divide the total time (e.g., a day) up into multiple time blocks, each of uniform duration. In this example, the day can be broken up into fifteen-minute increments. Each meeting can then be determined to occupy one or more fifteen-minute increment blocks. The meeting room optimization system constrains the assignment of meetings to rooms such that a given room can only have a single meeting assigned during a particular 15-minute increment. Similarly, the meeting room optimization system only assigns a user to a single meeting during any given 15-minute increment.

[0009] In addition, once a meeting has been assigned to a room for a first increment of time, the meeting cannot be moved for future time increments. Figure 2 shows a series of three meetings assigned to a room over twelve intervals. Each meeting lasts a certain number of intervals, after which another meeting can be scheduled in the room.

[0010] One way of calculating the capacity cost for a given meeting/room pairing is to determine the difference between the capacity of a meeting room and the projected number of attendees for a given meeting. The difference can then be multiplied by a cost factor such that the larger the difference between the expected attendance and the capacity of the room, the higher the calculated capacity cost. Because having too many attendees for a room usually causes more problems than having a larger meeting room than is needed, the cost factor applied when the attendance is greater than capacity can be larger than the cost factor applied when the attendance is less than the capacity of the room.

[0011] The meeting room optimization system can determine which attendees are likely to attend a given event. This determination uses attendance information submitted by the potential attendees themselves. For example, each potential attendee, when added to a list of potential attendees, may receive a meeting invite, with the option to indicate whether they will attend the meeting.

[0012] Each invitee can indicate, through a user interface, whether they will attend the specific meeting. The meeting room optimization system can access these indications when determining which potential attendees will actually attend a given meeting. The meeting room optimization system determines that all potential attendees will attend unless the potential attendee has explicitly indicated that they will not attend the meeting. For example, if a potential attendee has not responded to the invitation at all, the meeting room optimization system will plan as though

they are attending even though the meeting data represents them as “maybe attending” or potentially attending.

[0013] The meeting room optimization system can also use the timing of the meetings to determine potential attendees. Thus, the meeting room optimization system determines whether any potential attendees are scheduled to attend more than one meeting at any given time. If so, the meeting room optimization system can determine which meeting the respective potential attendee is most likely to attend and internally represent the respective potential attendee as attending that meeting. For example, the meeting room optimization system can first determine whether the potential attendee is the owner or creator of any of the meetings to which they are invited. If so, the meeting room optimization system will determine that the potential attendee is most likely to attend the meeting they created and/or own.

[0014] If the potential attendee does not own any meetings, the meeting room optimization system determines whether the potential attendee has indicated they plan to attend any specific meeting. If so, the meeting room optimization system can determine that the potential attendee will attend the meeting to which they affirmatively responded. If the potential attendee does not have any meetings that they own/created and have not indicated they will attend a particular meeting, the meeting room optimization system can determine that they will attend the meeting with the least number of attendees. For example, if a potential attendee is scheduled for three meetings, the first meeting being a large group meeting with 35 potential attendants, the second meeting being a team meeting with 15 potential attendants, and the third meeting being a one-on-one meeting, the meeting room optimization system will estimate that the potential attendee will attend the third meeting with only two attendees. Lastly, the meeting room optimization system will determine, if none of the other criteria are sufficient to identify the meeting that the potential attendee is likely to attend, the meeting room optimization system can determine that the potential attendee is likely to attend the shortest meeting (in terms of meeting duration).

[0015] The meeting room optimization system can also use one or more other factors when computing cost. For example, the meeting room optimization system can use a different cost metric when estimating the cost for a user traveling from a permanent desk location to a meeting than the cost metric that is used when estimating the cost for a user traveling from a first meeting to a second meeting. Specifically, the cost metric may be higher for travel between meetings

because participants traveling between meetings typically have less flexibility than participants traveling from their desk to a meeting.

[0016] In addition, the meeting room optimization system can ensure that no user with a movement-based disability has a meeting they are attending moved from a room that accommodates the user to one that does not accommodate the user. For example, if a user requires a wheelchair ramp, the meeting room optimization system will not move a meeting they are attending from a room that includes a wheelchair ramp to a room that does not.

[0017] Once the costs have been determined, the meeting room optimization system can use an integer programming model to identify the combination of rooms and meeting assignments that results in the lowest overall cost while still meeting the constraints of the system. Specifically, the constraints are 1) that each meeting has exactly one room booked, 2) that no room can be booked by more than one meeting at any time, and 3) participants with disabilities cannot be moved from a room that can accommodate them to a room that cannot.

[0018] Using the above constraints and the data describing the list of meeting rooms, the list of meetings, and the expected participants, the integer programming model can loop through a number of intervals, computing, at each interval, the total costs for one or more configurations of rooms and meetings. The integer programming model is configured to determine a configuration that minimizes the total cost of the meetings while following the constraints. Figure 1 displays an example of matching specific meetings to rooms based on calculated costs. Each meeting on the left can be connected to a room on the right. Each line has an associated number that represents a calculated cost of assigning that meeting to connected room. In this example, the red lines represent the meeting/room pairings that represent the lowest total cost (but not necessarily the lowest cost for each room).

[0019] It should be noted that not all of the meetings have a line connecting them to each room (e.g., some room/meeting pairs are not considered at this stage). In some examples, particular meeting/room pairings have at least one factor that causes the cost to be so high that it can be eliminated in pre-processing. For example, if the room is much smaller than the estimated attendance, the capacity cost may be so high that that pairing is removed from consideration in an early process before the depicted matching stage occurs. In other examples, constraints of the matching system can result in a determination that a specific room can not be matched with a

specific meeting without regard to costs at all. For example, moving a person with disabilities from a room that does accommodate them to a room that does not accommodate them is disallowed by the constraints of the matching system. As a result, any room/meeting pairing that would result in moving a person with disabilities from an accommodating room to a non-accommodating room is not considered.

[0020] In some examples, the integer programming model is a binary integer programming model such that variable values are limited to zero or one (true or false). The binary integer programming model can output a yes or no for each proposed room/meeting pairing.

[0021] Once the model outputs a list of meetings and the rooms to which they are assigned, the meeting room optimization system can then update the meeting data for any meeting whose assigned room has changed. This method can reduce wasted room space and reduce travel time for meeting participants, resulting in an increase in productivity.

ABSTRACT

This publication describes a system for improving the efficiency of meetings by automatically matching meetings with the most appropriate meeting room. To perform this matching, the system can calculate a cost for each meeting/room pairing. The system can utilize an integer programming model to evaluate a plurality of configurations, each configuration containing a different combination of meeting/room pairings. The configurations can be scored, and the system can select the configuration with the lowest total cost. The system then updates any meeting with a changed room.

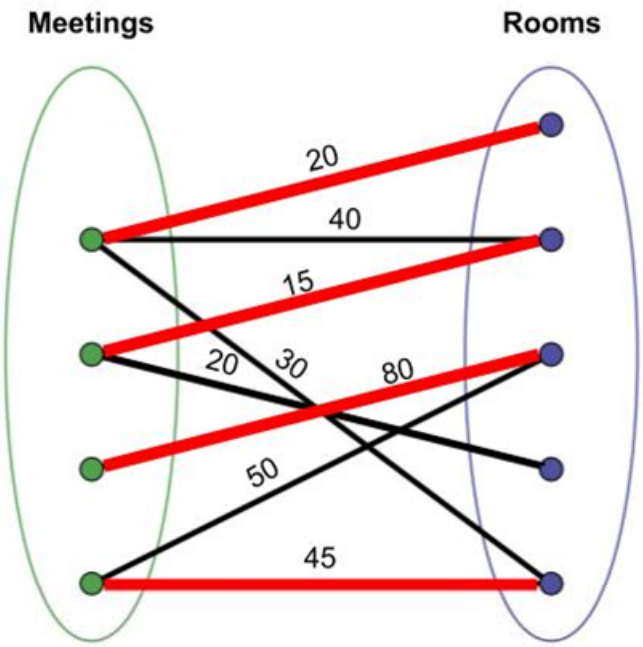

FIG. 1

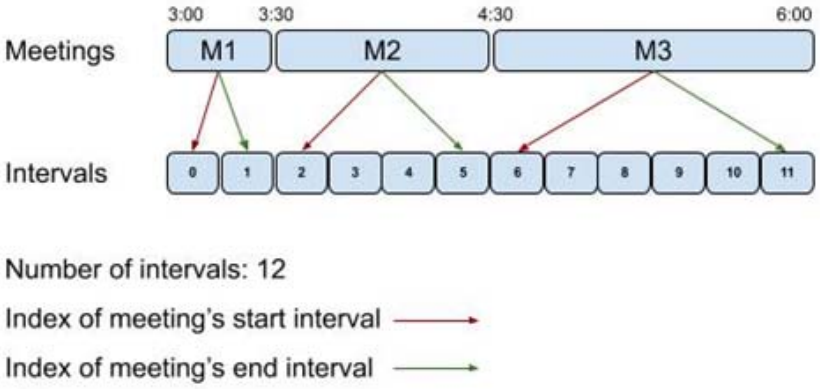
3:00
3:30
4:30
6:00
Meetings
M1
M2
M3
Intervals
0
1
2
3
4
5
6
7
8
9
10
11
Number of intervals: 12
Index of meeting's start interval
Index of meeting's end interval

FIG. 2