Technical Disclosure Commons

August 2021

EXTENDED SCREENS FOR AN ONLINE MEETING BY GROUPING NEIGHBORS

Yasi Xi

Bhargav Pandya

Grant Pan

King Jin

Follow this and additional works at: https://www.tdcommons.org/dpubs_series

EXTENDED SCREENS FOR AN ONLINE MEETING BY GROUPING NEIGHBORS

AUTHORS:
Yasi Xi
Bhargav Pandya
Grant Pan
King Jin

ABSTRACT

An online meeting typically includes some number of participants or users. Techniques are presented herein that significantly enhance the user experience of users who join an online meeting from the same physical location and sit next to each other. Aspects of the presented techniques take the best advantage of neighboring screens in an extended screen manner, which can significantly improve user experience. For example, all of the duplicated local and remote video grids may be removed and all of the remote video grids may be shown in as large a fashion as possible. Broadly, aspects of the techniques presented herein include three steps – a local group initiator finding their neighbors, selecting some of the found neighbors for grouping, and setting the layout for the selected neighbors.

DETAILED DESCRIPTION

An online meeting typically comprises some number of participants or users. Consider an example as shown in Figure 1, below, which depicts elements of an online meeting with 31 participants. In this example, consider that users U01, U02, and U03 have joined the meeting from a "San Jose Meeting Room" and that the users are sitting at the same table next to each other, while other users have joined the meeting remotely. It is important to note that in the exemplary meeting that is depicted in Figure 1, below, there is no 'telepresence' facility in the "San Jose Meeting Room" and, thus, there is no way for users U01, U02, and U03 to be automatically associated with the same device.
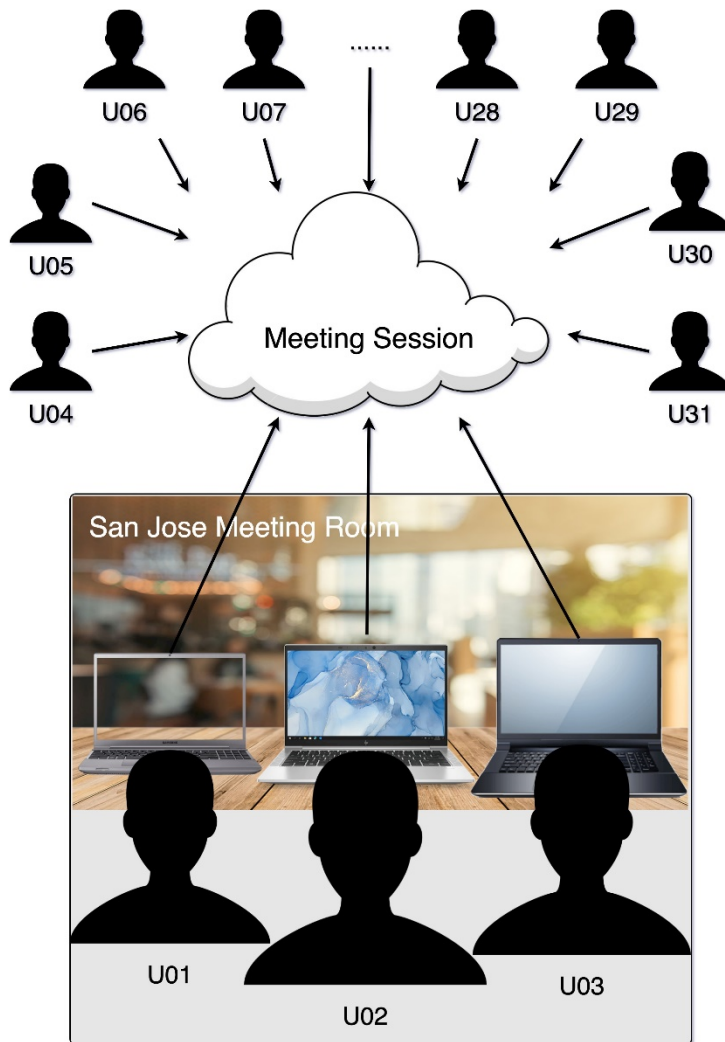
Figure 1: Illustrative Online Meeting

In the exemplary meeting that is depicted in Figure 1, above, assume that all of the participants have enabled video. Figure 2, below, illustrates what the users U01, U02, and U03 see from their perspective. Since 31 participants have joined the meeting, there are 30 video grids that are shown on each display screen for users U01, U02, and U03. Such a display is the normal user experience of an online meeting.

2   6670

Figure 2: Exemplary Video Display of Users U01, U02, and U03

However, as is highlighted in Figure 3, below, there are actually a significant number of duplicates in the video grids on the three neighboring screens.
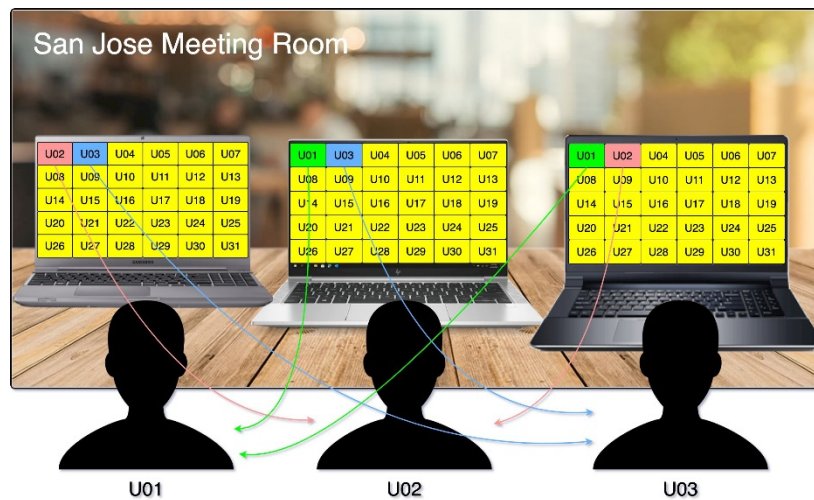

Figure 3: Locally and Remotely Duplicated Video Grids

The duplicates that are depicted in Figure 3, above, are of two different kinds of duplicates.

A first kind of duplication may be characterized as "local duplicates." For example, user U01 is clearly aware users U02 and U03 are nearby. Consequently, there is no need to display the video grids of users U02 and U03 on user U01's screen. If user U01 wants to see or have eye contact with either user U02 or user U03, user U01 can simply turn their

3   6670

head. In other words, the pink and blue video grids of users U02 and U03 that are shown on the left-hand (i.e., user U01's) screen in Figure 3, above, are "locally duplicated." Similarly, the green and blue grids that are shown on the middle screen are "locally duplicated" for user U02, and the green and pink grids that are shown on the right-hand screen are "locally duplicated" for user U03.

A second kind of duplication may be characterized as "remote duplicates." As is shown in Figure 3, above, all of the yellow grids that are shown on the three screens are duplicated. Only one copy of them is needed and the others may be removed when users U01, U02, and U03 are sitting next to each other.

Techniques are presented herein that address the duplication issue that was described and illustrated in the narrative that was presented above. In particular, aspects of the presented techniques support, among other things, the grouping of neighbors in a manner of an "extended screen," the removal of all of the local and remote duplicates for the video grids, and the distribution of all the remote video grids (that are to be shown on each screen of the local group) in a reasonably balanced manner.

Figure 4, below, illustrates the current user experience with duplicates (as shown in the upper portion of the figure) and the enhanced user experience without duplicates (as shown in the lower portion of the figure) that is possible according to aspects of the techniques presented herein. As can be seen in the figure, by applying aspects of the techniques presented herein all of the local and remote duplicates have been removed. Additionally, each remote video grid is shown in a much larger fashion than before. In brief, aspects of the techniques presented herein have taken the best advantage of the neighboring screens and provided the best user experience in which each remote video grid is shown in as large a fashion as possible.

Before (with local and remote duplicates)
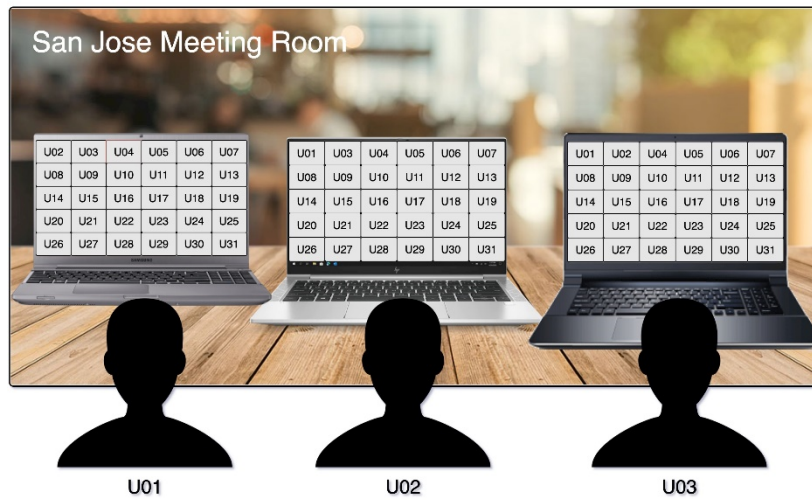
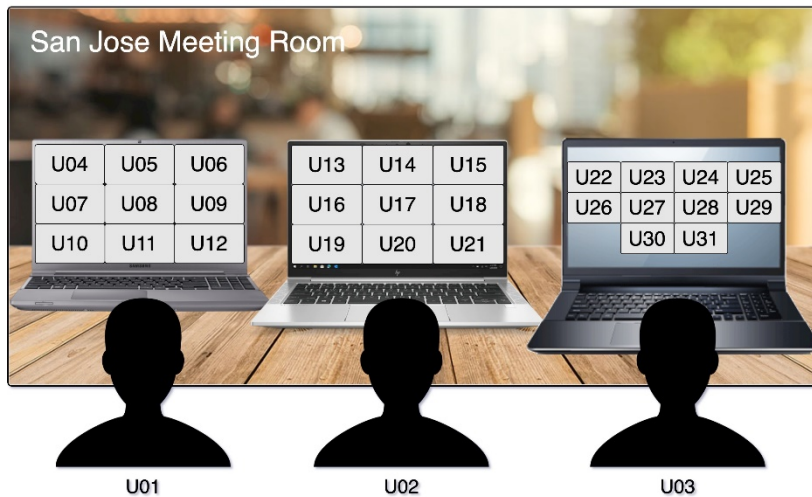**After (without duplicate)**

Figure 4: Illustrative User Experience Comparison

Aspects of the techniques presented herein comprise three steps. Those steps (which, in brief, include a local group initiator finding their neighbors, selecting some of the found neighbors for grouping, and setting the layout for the selected neighbors) will be described and illustrated in the narrative that is presented below.

A first step involves finding one's neighbors. In order to group neighbors in a manner of an extended screen, the initiator of a local group should be able to find their neighbors. Such an activity may be done through proximity detection. Figure 5, below, illustrates such a "find neighbor" sequence. It is important to note that in Figure 5, below,

(1) the same scenario is employed as was presented in Figure 1, above, and (2) user U01 is the initiator of the local group and users U02 and U03 are sitting next to user U01.
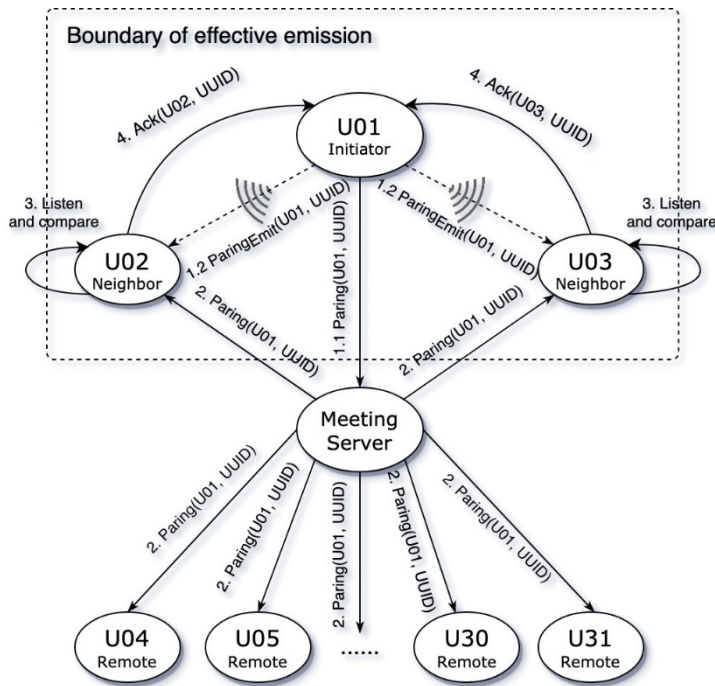

Figure 5: Illustrative 'Find Neighbors' Sequence

The first step according to aspects of the techniques presented herein (comprising finding one's neighbors) consists of four sub-steps, which will be described in the following narrative in connection with Figure 5, above, as follows:

1. U01 initiates the local grouping.

    i. U01 selects a button in the meeting client to send a message to the meeting server – i.e., Pairing(U01, UUID). In such a message "U01" indicates the initiator of the message and "UUID" is a random string that serves as the message identifier.

    ii. Meanwhile, U01's meeting client starts emitting an ultrasound message – i.e., Paring$_{Emit}$(U01, UUID). Only meeting clients that are in the neighborhood are able to detect such an emission.

2. The meeting server receives the message from U01 and then broadcasts it to all of the other participants in the meeting (i.e., users U02, U03, U04, . . ., U31).

3. Once U02 and U03 have received the Pairing(U01, UUID) message from the meeting server they begin listening for any proximate ultrasound messages. The users will subsequently "hear" the Paring$_{Emit}$(U01, UUID) message. The parameters in the Pairing(U01, UUID) message and the Paring$_{Emit}$(U01, UUID) message may then be compared to confirm that it has passed security validation.

4. Thereafter, U02 and U03 send an Ack(02, UUID) message and an Ack(03, UUID) message, respectively, to user U01.

Thus, the first step is completed when U01's meeting client has received the Ack(02, UUID) and Ack(03, UUID) messages from users U02 and U03 and U01 has successfully found his neighbors.

A second step involves selecting neighbors. Once the local group initiator, user U01, has found all of their neighbors (as described above in connection with the first step), user U01's meeting client displays a dialog box for the user to use to select one or more neighbors from the detected neighbor list to form a local group. For example, in Figure 6, below, a neighbor list consisting of user U02 and user U03 is displayed for user U01 and U01 has selected both of them for the next step.
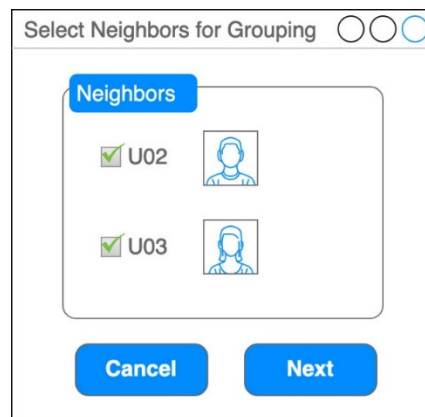

Figure 6: Illustrative Neighbor Selection Dialog Box

7   6670

A third step involves configuring a layout for the selected neighbors. After the candidate neighbors have been selected by the local group initiator, a dialog box is displayed for the local group initiator to configure the layout for the initiator and for all of the selected neighbors. For example, as depicted in Figure 1, above, user U01 is sitting to the left of user U02 and user U02 is sitting to the left of user U03. Consequently, as illustrated in Figure 7, below, the initiator (i.e., user U01) may pull "Me" to the left, pull user U02 to the middle, and place user U03 to the right. After that, the local group is successfully formed.
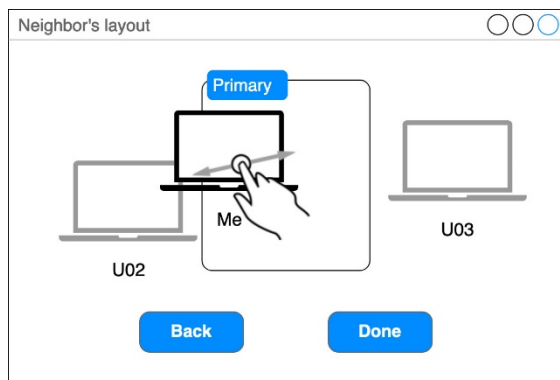

Figure 7: Illustrative Neighbor Layout Dialog Box

It is important to note that in the layout as depicted in Figure 7, above, that the middle position represents the primary user of the local group. Since the primary user is in the middle, the primary meeting user's client delegates the other users in the local group for audio input, audio output, and video input.

Through the application of aspects of the techniques presented herein, as described and illustrated in the above narrative, an enhanced user experience may be achieved. Aspects of such an enhanced user experience will be briefly described below.

As depicted in Figure 8, below, a meeting server is able to identify the "local duplicates" for the local group. As a result, the local duplicates may be removed from the screens of the local group.
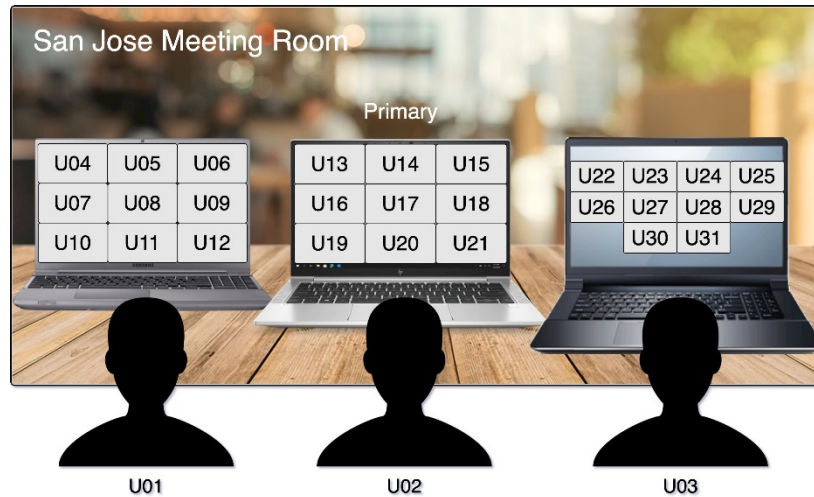
8   6670

Figure 8: Illustrative Video Grids on Local Group Screens

Further, as illustrated in Figure 8, above, a meeting server is able to identify the "remote duplicates" for the local group. As a result, the remote duplicates may be removed from the screens of the local group as well. Additionally, all of the remote video grids are distributed to be shown on each screen of the local group in a reasonably balanced manner with each one of them shown in as large a fashion as possible. Still further, the primary user in the local group takes care of the audio input, audio output, and video input for the local group.

Moreover, as illustrated in Figure 9, below, all of the users in the local group (i.e., users U01, U02, and U03) are displayed as a group in the meeting participant list indicating their grouping.
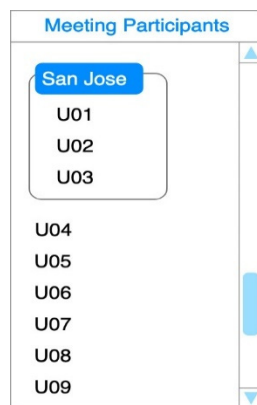

Figure 9: Exemplary Local Group Display in Participant List

9 6670

Finally, as illustrated in Figure 10, below, when a remote participant starts sharing (e.g., desktop sharing or application sharing) the sharing is shown on the screen of the primary user and the video grids are distributed to the other screens of the local group in a reasonably balanced manner.
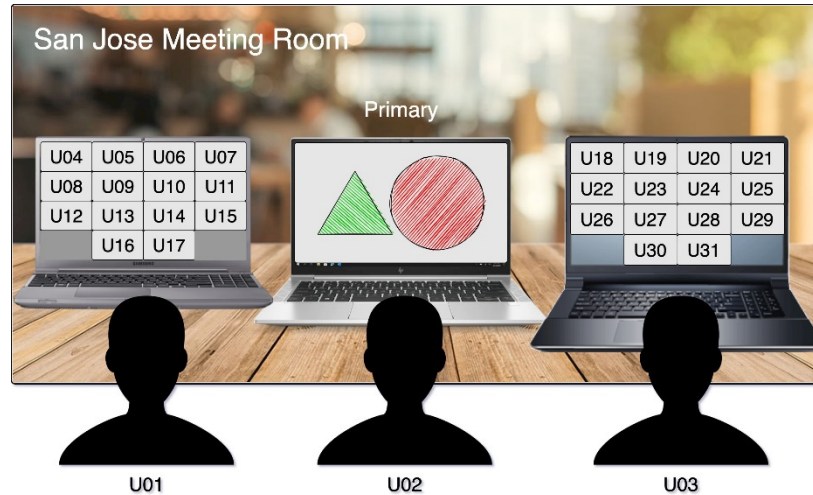

Figure 10: Exemplary Local Group Video Grids During Sharing

It is important to note that under aspects of the techniques presented herein a limit may be defined for how many neighbors may be selected to form a group. For example, two or three neighbors may be recommended for a local group and a specific upper limit may be identified in a detailed implementation.

In summary, techniques have been presented that significantly enhance the user experience of users who join an online meeting from the same physical location and sit next to each other. Aspects of the presented techniques take the best advantage of neighboring screens in an extended screen manner. For example, all of the duplicated local and remote video grids may be removed and all of the remote video grids may be shown in as large a fashion as possible. Aspects of the techniques presented herein comprise three steps – a local group initiator finding their neighbors, selecting some of the found neighbors for grouping, and setting the layout for the selected neighbors.

6670