An Efficient and Scalable Meeting Minutes Generation and Presentation Technique

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Abstract. Meetings are essential for a group of individuals to work together. An important output of meetings is minutes. Taking and distributing minutes is a time consuming task. Also, any new member of a meeting series will not be able to easily refer to old minutes if they are in written or e-mail format. Our contribution to this problem is to propose a new approach for taking meeting minutes that will allow dynamic and cooperative note taking. In addition, resulting minutes will allow any new participant to spend a smaller integration time.

Keywords: dynamic meeting minutes, storytelling interfaces.

1 Introduction

Meetings are essential for a group of individuals to work together. They are a platform, where ideas are transferred and debated on. Techniques to make meetings more efficient are constantly researched and different technologies for telepresence and integrated workspace are developed.

An important output of meetings is minutes. Minutes should be taken by one person and should be distributed to and approved by every participant. Its content is generally under discretion of minute taker. After minutes are compiled, it should be distributed to and approved by participants of the meeting. This whole process takes up time lowering utilization. In addition, the content of minutes does not always help capture the process of decision-making. This creates another problem: Any new participant and any absent participant over a series of meetings will not be able to fully grasp the content of previous meetings.

In order to address these issues we've proposed and interactive note taking medium. This medium allows tracking authors of ideas as well as taking snapshots of the medium in order create visual meeting minutes dynamically. With this approach, minute takers will spend less time and resulting minutes can be approved in much less time. Its visual nature allows any newcomer to the group to grasp the concepts and see the evolving of ideas from the beginning.

The rest of the paper is organized as follows: Section 2 is about related work in the field, Section 3 is about our approach to the problem, Section 4 is about usability studies and Section 5 contains results and discussion.

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2 Approach

In order to prove proposed approach, web based software is developed and used in usability studies. The task was designed to allow us to compare timings between two experiments - one using developed software and one using classical whiteboard and note-taking approach.

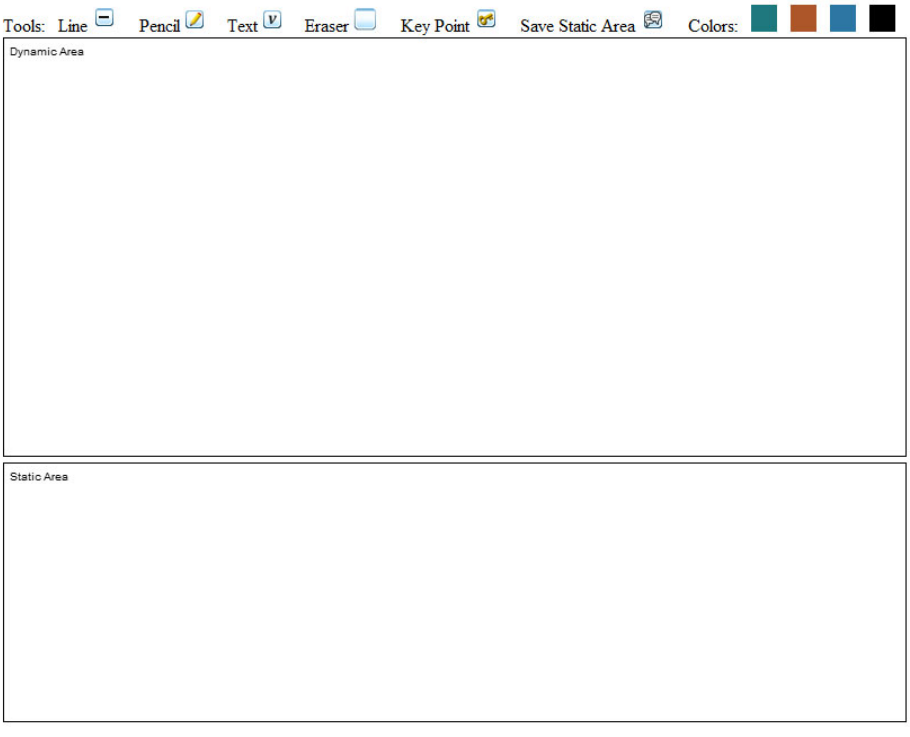

Fig. 1. Blank GUI, at the start of a meeting series

For the usability studies we limited number of participants to four, denoted by four different colors. Participants can either draw or enter text to the medium. There are two parts: One part is dynamic area that is cleaned at the start of each meeting; the other part is static area which contains time stamped snapshots of the medium. Static area is persistent throughout a series of meetings, acting as a constant reminder and visual minutes of previous meetings.

Capturing important information in static area helps to capture state of a meeting when the snapshot is taken. This allows all participants to follow through the evolution of an idea. It will also show links between ideas and how a meeting is played out in the end. This is significant with respect to traditional minutes, since it only contains the final decision and actions. This way if snapshots are taken regularly, another person can reconstruct the progress in the meeting just by looking at the

snapshots. This feature is especially beneficial to any new participant in a series, as can be seen from our usability study.

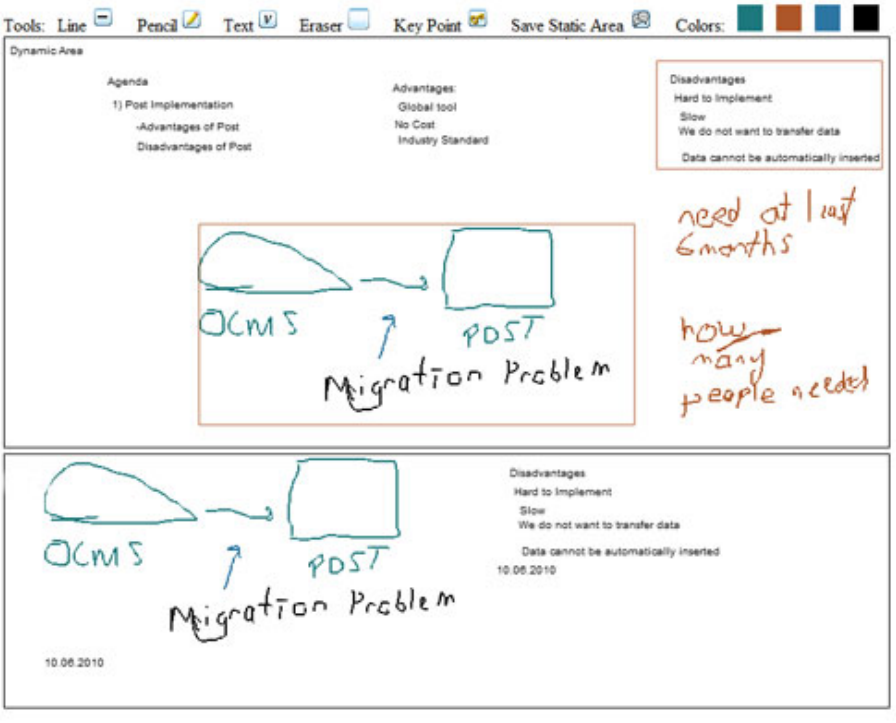

Fig. 2. Screen shot of medium during a study session

Another benefit of this approach is persistance of important information. If a project spans thorough a long time interval; some ideas and information will be forgotten and lost in the meeting minutes. It is a common practice to make an list of important ideas and go through them regularly. With this approach, every important information can be marked dynamically and will be present at the static part of the medium in a reminding but unobstrusive manner.

Last benefit of our approach is on dynamic creation of meeting minutes. For traditional text based approach, one participant must take notes and get approval from involved parties. This also gives an implied authority over minutes to minute taker. Minute taker may take concious or unconcious liberties with minute content, which would lead approval problems and lost time for a business. In our approach, all participants take part in note creation and everybody can see the visual notes before leaving the room and approve it for distribution. This way, there will be less communication and effort spent on approving a meeting minute.

3 Related Work

Although they are so important and serve as a common practice for discussing things among people, meetings currently are not considered as adequate as they are expected to be. The estimations regarding the meeting productivity by different types of managers give a range between %33 - %47 [11].

One of the main reasons for this inefficiency is information loss, i.e. the failure to record important information, decisions and actions and how this affects future actions [4]. Thus, capturing information during the meetings becomes a crucial practice which has to be done efficiently to prevent loss. Conventional method for this practice is note taking which is done manually either by a person responsible for that or by everybody individually. However this is not an easy process and studies show that people are experiencing problems such as failure to note facts which turn out to be vital later, insufficiency of notes since there is not enough time to write everything, reduced ability to participate and difficulties to pay close attention [5, 12, 13, 14].

The predominant tools for note taking used today are pen, paper, whiteboards and laptops (for private note taking) [4], there is an interest in more powerful capture tools [3,13,15,16,17] that will enhance the capturing process by making it automated, creating environments which can capture utilizing more than one media (i.e. audio, video, text) and which can link them to each other contextually or depending on time.

Systems that include all or part of these capturing abilities together are mainly called as smart meeting systems. They are also able to serve as incorporated to shared workspaces [6] that improve the group interaction process and facilitate the collaborative work within the group providing an environment to share information among the members. Moreover, since face - to-face meetings are time consuming and there are distributed working groups in which people are not able to gather physically, internet is used by these systems to make the groups virtually collocated. There are many smart systems developed recently by researchers [18,19,20,21,22,23,24,25].

Yu et al. [10] proposed a three layered generic architecture to model a smart meeting system. These layers are meeting capturing, meeting recognition and semantic processing. The first one is the physical level that includes the capturing environment, devices and methods. The second one serves as the structural level which is responsible for the low - level analyzing of the recorded media content. The last one handles the high level manipulations on the semantics such as meeting annotation, indexing and browsing. This structure is based on the system requirements which can be listed as multimodal sensing, multimodal recognition, semantic representation and interactive user interface.

4 Usability Study

The task was to discuss and debate on a given problem. The groups are told to come to a conclusion after doing two sessions. Each meeting was limited to 25 minutes. We had 10 participants divided into two subgroups of 5. Both groups consisted of graduate students of different universities.

We had two different tasks for the subgroups. Task 1 was to determine whether there should be a final exam or term project for the graduate courses. Task 2 was to

determine whether migration from old software to new software should take place or not.

The groups are constructed as such that two participants are in favor of the idea and the other are in opposition. Replace member is selected from the opposition group since opposing an idea requires more background knowledge about the topic. This was we were able to observe if a newcomer with no-prior knowledge is able to integrate into the debate and make contributions to the debate.

One group was taken in a room where a classical whiteboard and a controller present to help with minute taking and compiling process. The controller did not take part in the debate, but tried to compile as much information as possible into a meeting minute. The other group was taken in a room, same as described above, with addition of a projector to allow participants to use developed software to create minutes on the fly. Web based software was operated by a controller based on directives from experiment group.

The experiment starts with 4 participants from a subgroup is taken into test room and given Task 1. After 25 minutes of discussion and debate; the meeting adjourns. At the end of the meeting, controller passes minutes to all participants and gets approval before meeting 2. In parallel, the other subgroup is taken into another test room and given Task 2. After 25 minutes of discussion and dynamic note taking using developed software, the meeting is adjourned. Since notes are dynamically created and projected on the wall; all participants approved generated notes quickly before leaving the room.

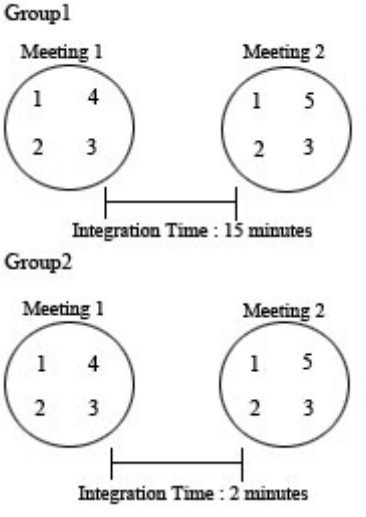

Fig. 3. Meeting setting and integration time for two different groups. After meeting 1, participant number 4 is replaced with participant number 5 in both groups. One of the aims was to measure how quickly participant 5 is integrated into the discussion. In group1 (traditional approach) this time is 15 minutes, in group 2 (our approach) this time is reduced to 2 minutes.

Second round of sessions are done the next day to simulate time gap between meetings. In second round one participant from each subgroup is removed and another participant without prior knowledge of the task is added (Fig 3). No communication between replaced participant and newcomer is allowed during time gap between meetings. In one group the newcomer is given printed meeting minutes and spent 15 minutes in the beginning by reading and grasping the discussion from previous session. The other new participant supplied with dynamically created minutes projected on the board using developed software. It took only 2 minutes before he stated that he was ready to proceed.

5 Results and Discussion

This data supports our two claims: In the traditional minute taking approach the minute taker; in this case controller has to pass meeting minutes to each participant and get approval. Since participants do not see minutes until they are written down, they treat it as new content and have to read it from the beginning. With the interactive whiteboard approach, minutes are created by all participants during the meeting, and visible throughout the meeting; so approval process takes little amount of time.

Any newcomer to a meeting must spend some time to review previous meetings notes and process the information. We call this time, “integration time”. In the traditional minute taking approach, any newcomer is presented with a stack of paper or e-mails to read before attending the meeting. In our usability study, traditional method produced 3 A4 papers of minutes. Even with this small size of minutes, the newcomer’s integration time was 15 minutes. With the whiteboard approach, the newcomer is only presented with the time stamped information on the static area. The integration took only 2 minutes before the newcomer said the meeting can begin. This shows a significant improvement over traditional approach.

Our study shows that dynamically created visual meeting notes are beneficial in above mentioned aspects.

6 Future Work

We used web based software to test our approach. One major limitation of this software is the assumption that participants are present in the same room. The software only provides a digital medium where participants can describe ideas. In order to test this approach in a more complex environment, software that supports visual and audio communication is needed. This way, participants can be distributed to remote locations and a series of meetings can be conducted using this new software and timings can be analyzed. Physical presence is an important aspect of communication and testing our approach with telepresence would be an interesting challenge.

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