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Memo:me, an AR Sticky Note With Priority-Based Color Transition and On-Time Reminder

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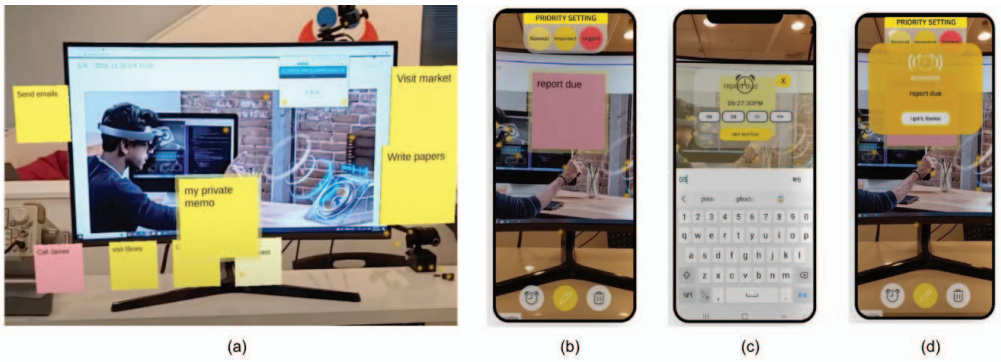

Figure 1: Main features of *Memo:me*. (a) users attach virtual sticky notes to daily objects and planes, (b) users set the priority by choosing different colors, (c) users enter time for each sticky note for automatic color change and reminder, (d) users are reminded of certain sticky notes on time

Abstract

We propose *Memo:me*, an AR sticky note with priority-based color transition and on-time reminders in smartphones. For the priority-based color transition, the user can choose by himself among three different colors, or the system changes the color automatically 10 minutes before the entered time. For the on-time reminder, *Memo:me* provides a visual notification and a sound at the designated time. We enabled users to create virtual notes on planes, or carry daily objects with the virtual notes attached. We expect that our system would benefit users to manage their tasks in a time-appropriate manner.

Index Terms: Human-centered computing—Human computer interaction (HCI)—Interaction paradigms—Mixed/augmented reality;

1 Introduction

Annotating a text to objects is beneficial because it triggers relevant memory and assists users in doing planned things. One of the representative ways of annotation is physical notes, where people attach physical sticky notes to the objects. However, attaching physical notes to the user's real environment brings inevitable demerits: (1) physical notes are likely to be lost in mobile or exposed environments; (2) physical notes do not protect privacy in shared spaces such as offices. To address these challenges, Augmented Reality (AR) has emerged as a promising solution to replace conventional physical paper notes with virtual sticky notes.

Previous attempts to develop AR sticky notes have broadened the potential benefits of sticky notes by diversifying the method to create and place them [3–6]. Users can either publish a text on detected planes [3, 5, 6] or place content in captured spaces [4]. However, these approaches often support users to add notes only on detected planes, and necessitate users to scan their area to attach notes. Furthermore, most current AR sticky notes are confined to merely creating and posting notes without time-relevant reminders. Although Spatial and Microsoft Mesh App supports color options [3, 5], the effort to provide automatic color transition has been rare.

Therefore, we propose *Memo:me*, a smartphone-based AR sticky note with on-time reminders and priority-based color transition. In summary, we make the following contributions. First, *Memo:me*, a virtual sticky note that can be attached to portable objects or can be placed on planes (Fig. 1 (a)). Second, *Memo:me* enables users to differentiate priorities by choosing differently saturated colors by themselves (Fig. 1 (b)). Third, *Memo:me* automatically changes the color of notes 10 minutes before to reflect increased priorities (Fig. 1 (c)). Finally, *Memo:me* provides a visual reminder with a beep sound when the time reaches the entered time (Fig. 1 (d)).

Imagine that you have an important private meeting. When you create *Memo:me*, a reminder pops out with a sound when the time comes. Now you can keep your memo private, and control tasks timely with your desk clean. Our system can be also beneficial when users have to move to other places frequently while carrying the notes; when users have to attach multiple notes to a single object; and when the physical object must not be damaged by the notes.

2 Implementation Detail

We propose an AR sticky note with priority-based color transitions and time-based reminders. For the hardware, we used the Galaxy S20+ 5G to build our application. For the software, we used Unity

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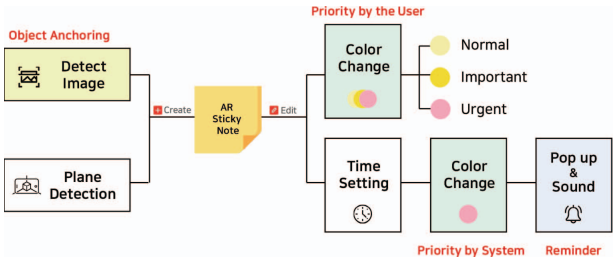

Figure 2: Implementation details

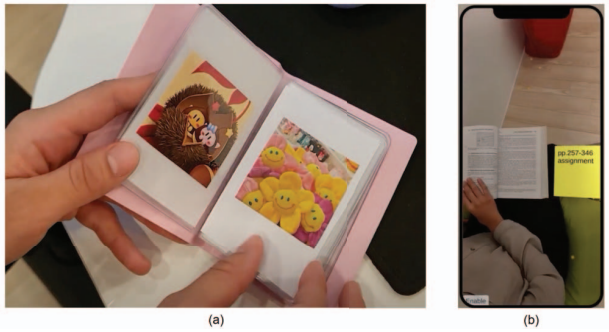

Figure 3: Envisioned application. (a) users choose marker images to attach to the objects. (b) users carry books with the virtual sticky notes attached

2020.3.33f1 and AR Foundation 4.1.9 to develop the prototype application. Implementation details are illustrated in the Fig. 2.

2.1 Creating AR Sticky note

Memo:me can be generated on planes by plane detection, or on physical objects with 2D image markers (Fig. 2). For plane detection, we used the AR Plane Manager of AR Foundation. When a plane such as ground or walls is touched, the application generates a translucent temporary note, and when the *add* button is pressed, a sticky note is created in the touched place.

For anchoring, we used 2D marker-based image tracking using AR tracked image manager AR Foundation (Fig. 3 (a)), which allowed users to carry physical daily objects with virtual notes attached (Fig. 3 (b)). Users can edit, delete, move, and rotate the generated AR note by dragging, and this function was implemented by using AR Raycast Manager of AR Foundation (Fig. 1 (a)).

Moreover, we enabled the users to adjust the relative position and rotation of each virtual note to the image marker by allowing them to enter the coordinate value of x, y, and z for each note. We expected that this additional function would benefit users to place each virtual note in the exact position and rotation value they want.

2.2 Setting the Priority

We chose a method of color change to reflect priorities in multiple memo situations. We used highly saturated colors to attract more visual attention, and we used red to imply an emergency and make the user easily notice the memo [7, 9, 10]. We developed two ways of priority settings (Fig. 2).

Priority Setting by the User: When the user selects a sticky note, buttons to choose between *Normal*, *Important*, and *Urgent* appear to reflect priorities (Fig. 1 (b)), and the notes changes to a chosen color. The *Normal* is shown in low saturated color (light yellow), the *Important* is shown in highly saturated color (dark yellow), and the *Urgent* is shown in red to give the impression of urgency.

Color Transition by the System: When the user enters a specific time for each note, the system automatically changes the color of the note 10 minutes before the entered time (Fig. 1 (c)). The note changes its color from yellow to red to attract the user's attention and to inform the increased priority. The time of 10 minutes can be adjusted according to the user's preference. The benefit of this function is that the user can recognize that an urgent event is approaching.

2.3 Reminder

The time setting mentioned above was also used for the reminder (Fig. 2). Referring to the prior study [8], we designed reminders to provide multi-modal notifications using both the visual effects and sound when the time arrives at the designated time (Fig. 1 (d)). A visual notification showing the memo contents appears at the top of the screen with a sound for an immediate check. We also enabled the user to close the notification by touching the button *I got it, thanks*.

3 Discussion and Conclusion

We presented *Memo:me*, a smartphone-based AR sticky note with color transition and on-time reminder. Although we used 2D marker-based image tracking to prove our idea first, 2D image markers can be simply replaced in later works with 3D object tracking methods such as MediaPipe Objectron [2], or ARKit Object Tracking [1].

Moreover, expanding our application to an AR HMD, or conducting a user study to verify its usefulness, usability, and user perception compared to traditional paper notes will be beneficial to prove its value. Overall, we believe that our approach is a key solution for managing daily tasks on time, and can be expanded further.

Acknowledgments

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