

ARA: The Active Reading Application

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ABSTRACT

The Active Reading Application (ARA) brings the familiar experience of writing on paper to the tablet. The application augments paper-based practices with audio, the ability to review annotations, and sharing. It is designed to make it easier to review, annotate, and comment on documents by individuals and groups. ARA incorporates several patented technologies and draws on several years of research and experimentation.

Categories and Subject Descriptors

H.4 [Information Systems Applications]: Miscellaneous

General Terms

Design, Human Factors

Keywords

Mobile, Reading, Annotation

1. INTRODUCTION

“The linear, continuous reading of single documents by people on their own is an unrealistic characterization of how people read in the course of their daily work.” [1]

Work-related reading is a misnomer. Most “reading” involves an array of activities, often driven by some well-defined goal, and can include skimming, searching, cross-referencing, or annotating. For example, a lawyer might browse a collection of discovery documents in order to find where a defendant was on the night of October 3, 1999, annotate that document, and cross-reference it with another document describing conflicting information from a witness.

More than that, reading can be collaborative and can involve multiple displays. For example, a designer might skim documents on a phone to find a graphic that supports an

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MM’11, November 28–December 1, 2011, Scottsdale, Arizona, USA.
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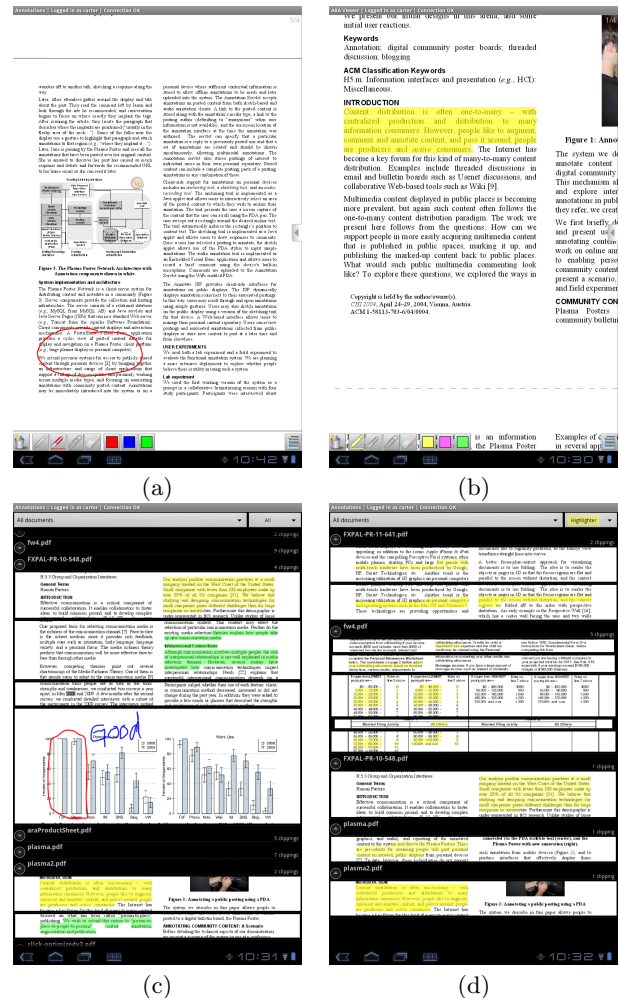


Figure 1: ARA supports document annotation. Users can ink directly on the document (a) or highlight text in the document (b). An annotation overview screen shows regions annotated across all documents (c). A variety of filters can be applied to the overview screen, for example to show only highlighted areas (d).

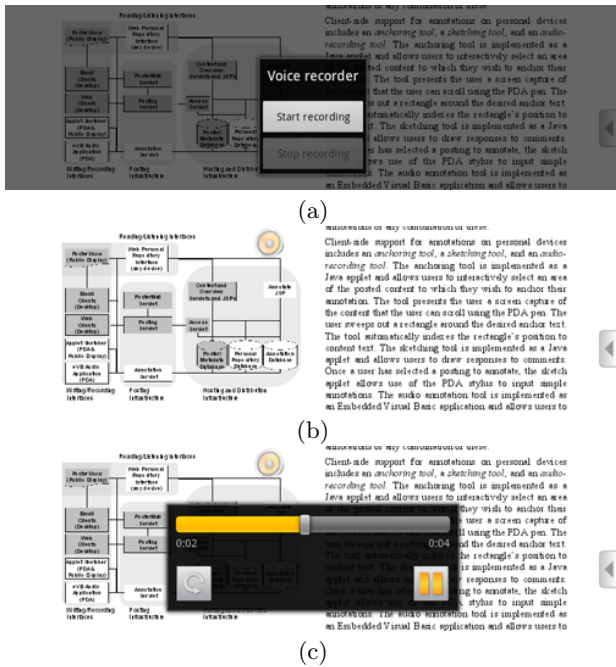


Figure 2: When mobile it can be difficult or impossible to sketch directly on the tablet. For these situations ARA supports audio-based annotations. Like sketches, audio clips are linked directly to the document and are synchronized with a remote server. After the user clicks an area to annotate, and records their message (a), an audio icon appears on the page and the annotation is uploaded (b). When a user clicks the icon (c) the audio starts playing immediately and an interface appears allowing the user to control playback.

idea in a collaborative brainstorming session and send it to a colleague's tablet for review.

There are many examples of passive reading applications on mobile devices, such as Adobe's *Acrobat Reader*, but most are designed for the linear, continuous reading model that tends not to apply to most work-related reading. Other projects, such as *XLibris* [2], support a richer variety of annotation and cross-referencing features. The Active Reading Application (ARA) borrows heavily from this work while translating concepts from the early, relatively slow and memory constrained platforms for which *XLibris* was designed to modern touch displays.

2. ARA

ARA builds on the strengths of the paper but augments it with computation. Rather than simply emulating paper, it evolves paper-like interaction to the next level. With ARA, students and knowledge workers can highlight, mark, and comment on documents, just as they might on paper (Figures 1, 2). But they can also go beyond paper: They can read and annotate a wide variety of documents, and refer to these over time. Doing this on paper would involve carrying large numbers of documents, which can get heavy.

An annotation overview screen allows users to see only those passages of documents that they found interesting,

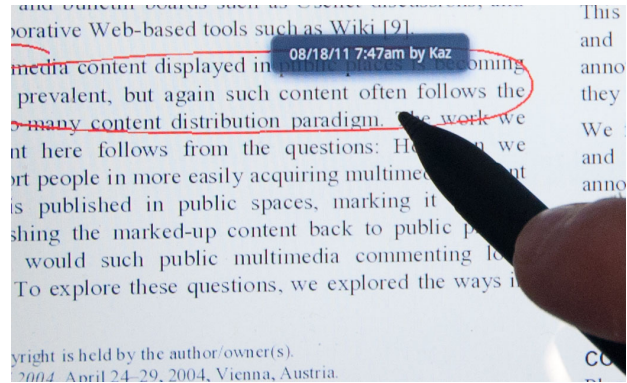


Figure 3: ARA can take advantage of the extra affordances of digital styluses. Here, a user hovers the pen over an annotation, causing ARA to display the annotation's creation time and owner.

compelling, controversial, or otherwise important based on the presence of annotation marks (Figure 1 (c,d)). This technique makes it easy to find the important passages in a large document even after considerable time has passed.

Knowledge work is seldom solitary, which is why ARA also supports seamless sharing of annotations on documents. Collaborators can see each other's annotations and hear audio notes almost instantaneously. ARA can improve the effectiveness of teleconferencing by augmenting conversations with shared views of the documents being discussed. Furthermore, users can continue to add shared annotations even when the tablet loses its connection to the server – annotations will be stored locally and synchronized when the connection returns. This ability allows distributed teams to work together in ways not possible with paper.

ARA supports both touch- and stylus-based annotations, enabling users to easily switch between gross and fine-grained markup. The stylus also supports other types of input not possible with touch-only displays, such as hover (Figure 3). However sometimes marking up a document with a pen or finger can be difficult, in particular when a user is mobile and does not have both hands free. To support users on-the-go ARA also supports audio annotations (Figure 2). Crucially, behind-the-scenes these annotations behave the same as inks or highlights – all annotations are stored, integrated into the overview screen, uploaded, and potentially shared.

3. FUTURE WORK

ARA is a work-in-progress. We are currently experimenting with a variety of extensions, including more sophisticated sharing techniques and multi-touch and simultaneous pen-and-touch-interaction. We are also exploring the integration of other types of multimedia content.

4. REFERENCES

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