Tangible Hypermedia using the ARToolKit

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Abstract—
We propose a demonstration of the use of hypermedia in augmented reality. The system explores some possible modes of interaction that embody the functionality of open hypermedia and contextual linking using commonplace and easily understandable real world metaphors.

Keywords— **Augmented Reality, Tangible Interfaces, Contextual Hypermedia**

I. Augmented reality hypermedia

A number of tangible interfaces could be envisaged for interacting with hypermedia information in an augmented reality environment. Our paper, "Links in the Palm of your Hand: Tangible Hypermedia using Augmented Reality" [5], introduces a number of possible interfaces and presents a demonstrator system, implemented using the ARToolKit [1], which illustrates some of these. This demonstrator is used to provide information about specific details of an object in an augmented reality environment by annotating the objects features with dynamic labels, resulting in a 3D version of a labelled diagram.

When the user first picks up an object on a marker card there are no labels attached to it. The demonstrator allows users to add labels that are relevant to their interests by shaking one of the spice pile markers, causing small particles to drop from it and fly onto the object markers. As particles land on an object, information labels pop up on that object, as shown in Figure 2. If users sprinkle too many labels onto an object, causing label overload, they can pick it up and shake it so that the labels on the object fly off and disappear.

Each spice pile represents a different "spice" of context (an area of information), so as the combination of spices on the model changes its labels change to reflect the new recipe. For example, there may be a "technical context pile" and a "historical context pile" that when mixed together would load labels relating to both these subjects. Each particle landing on an object alters the objects context, which causes the system to query a FOHM [4] based linkserver [3] that returns any relevant labels. Evolving information is possible, as labels can change and might disappear; in Figure 3 as more context is added, more detail is presented on the label.

Note that particles remain on the base of the object marker when they land, informing the user about how much context has been applied and the nature of the context mixture.

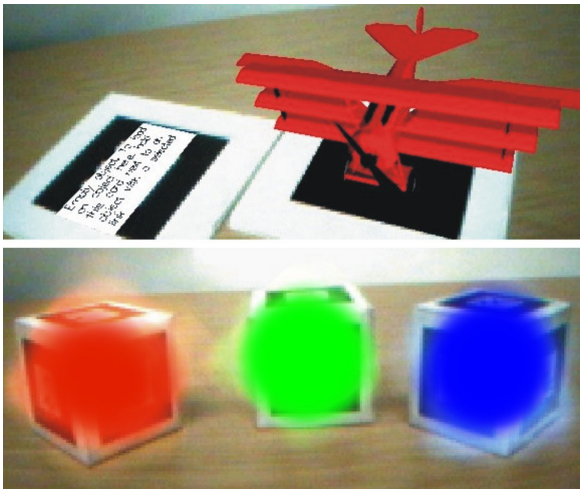

Fig. 1. Object markers (top) and spice markers (bottom). Note that the spice markers are glowing in different colours

Certain labels also act as link anchors, drawn in yellow, that users can select and follow by rotating the object so that the link anchor label they are interested in is the one closest to them. The currently selected label is highlighted by a blue border; labels with several lines of text are unfolded as they are selected so that the whole label can be seen (Figure 4). Users then hold up an empty object marker card to the side of the current object, triggering the destination object to be loaded on the new marker. This is shown in Figure 5. Both objects are now visible side by side and any links between them are shown by drawing an elastic line between the two anchors, with a text label in the middle describing the link. Several objects can be loaded and viewed this way; when a spice pile is shaken, the sprinkled links and labels are distributed evenly amongst all of the visible objects.

II. Conclusion

Augmented reality systems combine real world scenes and virtual scenes, allowing users to manipulate 3D objects in a natural way. As well as allowing users to view 3D models from different perspectives, augmented reality can be enhanced by adding a hypermedia system that provides contextual information in the form of labels and links. Our demonstrator allows users to experience tangible hypermedia for themselves and ma-

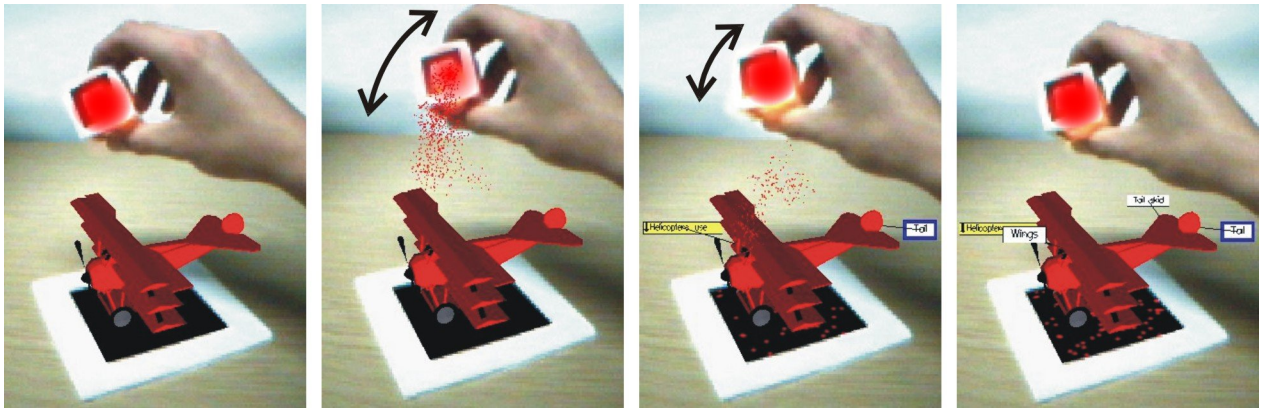

Fig. 2. Sprinkling labels onto an object

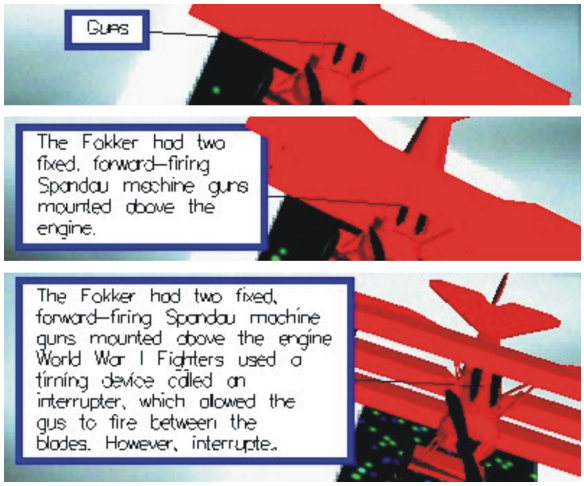

Fig. 3. Evolution of a label as context is sprinkled on

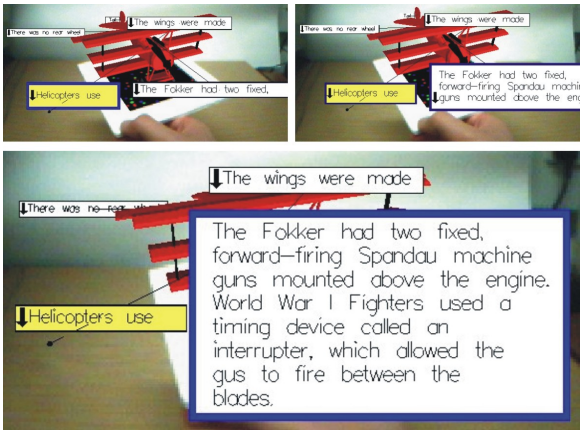

Fig. 4. Selecting labels

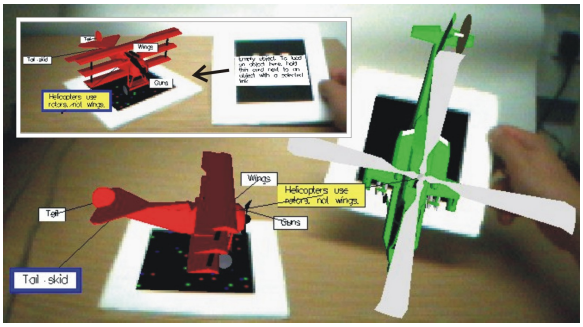

Fig. 5. Selecting and following a link

nipulate complex information spaces with familiar interaction techniques.

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