9. Related Work

This chapter traces the system's roots in computer science and artificial intelligence.

9.1 Case-Based Reasoning

The original design for The Electronic Scrapbook was inspired by research on Case-based reasoning (CBR) and case-based planning (CBP). As the design evolved, it came to be something different, which I will call "knowledge-based templates."

In the traditional definition of Case-Based Reasoning (CBR), the computer is first given a description of a starting state. It retrieves a case from memory which is similar to the problem at hand, adapts that case to the current situation, and applies it [KS 84; RS 89].

In editing film or video material, describing the starting and goal states is the core of the problem. The starting state is raw, undescribed, unedited footage (rushes). The goal is a polished, edited presentation.

The story models used in The Electronic Scrapbook are similar to cases. Each story model tells the computer how to deal with a specific situation. One case in Kristian Hammond's "Chef" case-based planning program[1] tells the system how to make beef with green beans [RS 89]; a case in The Electronic Scrapbook tells the system how to tell the story of two siblings growing up.

In traditional CBR, the system selects a case and adapts it to the situation at hand. In The Electronic Scrapbook, the user performs the actions of case selection and case adaptation. The user selects a story model and runs it to generate a rough cut. The user may then modify the rough cut directly or modify the story model used to generate the rough cut and try the model again. The process is iterative and cooperative between the system and the user.

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[1]The differences between case-based reasoning and case-based planning can be subtle. Janet Kolodner's Cyrus program is an example of case-based reasoning: the system reads stories about the life of Cyrus Vance and answers questions. The Chef program is an example of case-based planning: the system plans how to get from a starting state (raw ingredients) to a goal state (a finished dish). In CBR, the goal of the system is the result (answers to questions); in CBP, the goal is how you reach the result (the recipe).

The Electronic Scrapbook is more similar to CBR than CBP; the final video rather than the process of generating the video is the goal. However, it should be noted that enjoying the act of creating the video is a fundamental goal of the system. In that sense, the distinction between CBR and CBP begins to blur.

While the details of these processes are different, the most important similarity is that they are both knowledge-based -- a library of specific domain knowledge is used to solve the problem at hand. The most important difference is that in the Electronic Scrapbook, the user is a partner in the creative process.

9.2 Text-Based Story Generation

9.2.1 Manipulating a Limited Vocabulary

The essential problem of video editing is to select and order a subset of the limited quantity of available material. This is similar to work that has been done in text-based story generation, which begins with a limited vocabulary [Meehan 81]. One difference is that the starting video material is incomplete and imperfect -- one may not have a shot of the family piling into the car on the way to the beach, even though this is an easy way to start a story about a trip to the beach. The challenge is to make the best of the available material.

Another difference is the addition of an extra step: the need to describe the starting material. This is currently accomplished by helping the user to transcode from video to a semantic representation. In the future, more of this work will be accomplished by having the computer examine the video signal directly. Information can also be gathered at the camera and recorded in unused portions of the video tape such as the vertical-blanking interval [DSP 91].

Grammatical and rhetorical rules are somewhat but not entirely analogous to stylistic constraints of video editing.[2] Most of the conventions of video editing are stylistic guides and not firm rules. Video provides an opportunity to explore the concept of style of presentation more easily than text.

9.2.2 Goals

Many story-generation systems are goal driven. In James Meehan's Tale-Spin system, the goals of the characters drive the process of creation of a story: Wilma bird flies to the river because she is thirsty [Meehan 81]. In Natalie Dehn's AUTHOR system, the goals of a computer-simulated author shape the story: the protagonist's mother falls ill to enhance the drama of the story [Dehn 89]. In the Electronic Scrapbook, the system anticipates the goals of a typical human author: it is likely that a home-video artist would want to tell a story about a child growing up, so a story model on that topic is provided.

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[2]The film theorist Christian Metz formally tackled the question "In what ways and to what extent is cinema like verbal language?" See the discussion of Metz's work in [Andrew 76].

9.3 Scripts

As was discussed in section 6.4, events in the Electronic Scrapbook are similar to Roger Schank's work on scripts [SA 77]. For example, a story-model could be created based on Schank's famous example of eating in a restaurant. Eating-in-a-restaurant is an event with component scenes ordering, eating, paying, and the like.

In Schank's work, each slot in the script is filled once. In working with video material, there may be elements duplicated and elements missing. For example, there may be thirty minutes of video showing Ken eating a fish dinner. How much of this video should be used? The Electronic Scrapbook uses stylistic constraints to choose between segments.

Eating in a restaurant is an example of a highly-structured event. One almost always orders food and pays a check (either before or after eating), and these likely scenes can be used to structure a story about this event. In this example, stylistic constraints are used to cut down on the total amount of video used.

In contrast, an event like `child-playing` is less structured. It has no likely scenes that can help structure the story. In this example, the stylistic constraints play a central role in shaping the resulting story. Events and stylistic constraints are complementary; each story model has its own balance of semantic and aesthetic concerns. Stylistic constraints extend the power of scripts.

9.4 The Cyc Project

The idea of creating a representation of everyday life was inspired in part by the Cyc project, an effort to create a large "common sense knowledge base" at the Microcomputer Consortium (MCC). Doug Lenat, leader of the project, believes that computer representations are brittle because computers lack "common sense." He defines common sense as the myriad facts about ordinary life which we usually take for granted: that dogs usually have four legs, and that breathing is a bodily function which is a "Composite Physical & Mental Event Type" [LG 90, p. 32]. A team of engineers is attempting to represent "consensus reality" as part of this ten-year project.

Will something like "common sense" emerge when Cyc has a critical mass of information? This is an open question. The ambitions of The Electronic Scrapbook are much more modest in scale. The "suburban ontology" is a special-purpose knowledge representation designed to aid in the performance of a specific task.