The Evolution of Cybergenres

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Abstract

The combination of the computer and the Internet has resulted in the emergence of cybergenre, a new class of genre. Cybergenre can be characterized by the triple, <content, form, functionality>, where functionality refers to the capabilities afforded by this new medium. When an existing genre initially migrates to this new medium, it is usually as a faithful reproduction of the existing genre in both content and form with little new functionality. It may then evolve into a variant cybergenre as it incorporates functionality afforded by the computer and Internet. Cybergenres also include novel genres, either not based on previously existing genres or substantially different from existing genres on the basis of increased functionality. These novel genres may have either persistent or virtual instantiations. This paper proposes a taxonomy of these cybergenres and examines the evolution of the news cybergenre and the mathematics dictionary cybergenre within the context of this taxonomy.

1. Introduction

A genre is a, "classifying statement," [11] and is characterized by having similar *content* and *form* where content refers to themes and topics and form refers to, "... observable physical and linguistic features ...," [18]. It allows us to recognize items that are similar even in the midst of great diversity. For instance, the detective novel is a particular genre and we are able to recognize novels as members of that genre, even though the novels themselves may be very different. Once recognized as being of the same genre, we can then more easily compare the individual novels. Similarly, the newspaper is a genre which is different from magazines and provides us with a framework in which to compare various newspapers.

As Yates and Orlikowski [18] have shown in their study of the evolution of the business letter of the late 19th century into the electronic mail of today, genres evolve over time in response to institutional changes and social pressures. In some cases, the changes to an existing genre are so extensive that they lead to the emergence of a new genre. One of the triggers for the emergence of variants of existing genres or of new genres is the introduction of a new communications medium [19].

The combination of the computer and the Internet has been such a powerful trigger that it has resulted in the emergence of a new class of genre, which we call cybergenre, existing in this new medium. Figure 1 illustrates a (fuzzy) taxonomy of the classes of subgenres of the class of cybergenres, where the leaf nodes of the tree are examples of these and the dotted lines represent evolutionary paths between subgenre. The taxonomy is fuzzy as the distinctions among the classes are not clearly defined.

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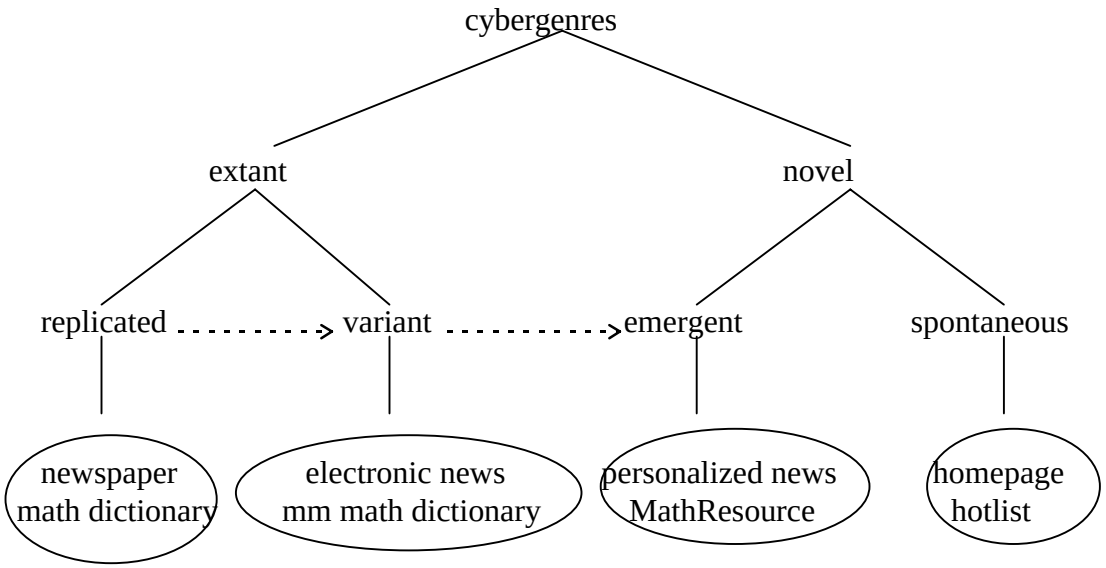

Figure 1. The Evolution of Cybergenres.

Cybergenres may be *extant* (i.e., based on existing genres) or they may be *novel* (i.e., not like any existing genre in any other medium). The new functionality afforded by the new medium drives the evolution (as shown by the dotted lines in Figure 1) of replicated genres, i.e., those based on genres existing in other media, through variations on those genres until novel genres emerge that are significantly different from the original genres. In addition, the new medium supports the spontaneous creation of new genres that have never existed in other media.

Instantiations of novel cybergenres, both emergent and spontaneous, may be either persistent or virtual. Virtual instantiations rely on processes to generate content and/or form as needed and so may be different for different users or even different for the same user at different times. Persistent instantiations rely on stored data and/or forms so that, at any given point in time, simultaneous users could expect the same content and/or form.

The remainder of this paper examines one path of evolution of emergent cybergenres by tracing the evolutionary progression of two cybergenre: electronic news and the electronic dictionary. Both of these are emergent novel cybergenre that developed by a similar progression of steps from the replicated genre through variant genre to an emergent novel genre. The key evolutionary aspect appears to be the functionality afforded by the new medium.

2. Cybergenre

We define cybergenre as two main classes of subgenres, extant and novel. The class of *extant* subgenres consists of those based on genre existing in other media, such as paper or video, that have migrated to this new medium. The class of *novel* subgenres consists of those genres that have developed in this new medium and have no real counterpart in another medium.

When a genre existing in a noncomputer medium migrates to a computer environment, it

tends to be faithfully replicated and, initially at least, not to exploit the capabilities of its new medium. This is consistent with McLuhan's [9] observation that, "The objectives of new media have tended, fatally, to be set in terms of the parameters and frames of the older media." As an example, Crowston and Williams [2] sampled 100 pages on the Web and found that 80 of the pages more or less faithfully replicated the genres in the traditional media.

We expect and see that these genres typically evolve from an electronic replication of the original, through an initial adaptation to the medium, to genres that fully exploit the new medium and may be recognized only marginally as the original genres. A driving force behind this evolution is the availability of additional capabilities or functionalities inherent in the new medium. Erickson [4] proposes that, "… on-line interaction has the potential to greatly speed up the evolution of genres." While non-digital genres can be characterized by the tuple, <content, form>, we characterize cybergenres by the triple, <content, form, functionality>, where functionality refers to capabilities now available through the new medium.

The following subsections describe the individual subclasses of cybergenre.

2.1. Extant cybergenres

The class of extant cybergenres includes those genres that are based on genres as they appeared in their source media. These genres range from faithful reproductions or *replications* of the original genres to significant *variants* of those genres.

Replicated cybergenres. Replicated genres, including most digitized text documents, are relatively faithful reproductions of the genres as they appeared in their source media. The content and form are virtually the same and there is little new functionality based on the new medium.

Variant cybergenres. Variant genres are based on existing genres but have evolved by exploiting the capabilities afforded by the new medium. The form and content may be somewhat different and there should be substantial new functionality. As an example, a hyperlinked document with images or video components is a variant of the standard text document.

2.2. Novel cybergenres

Novel cybergenres are those genres wholly dependent on the new medium. They may be completely new genres, not based on any genre existing previously in another medium, or they may be based on genres originally replicated in the new medium but which have evolved so far from the original that they are classed as being new genres. The primary distinguishing feature of these genres is a level of functionality that makes it fully dependent for its existence on the new medium.

Instantiations of novel genres, both emergent and spontaneous, may be either persistent or virtual. In virtual instantiations, content and/or form are generated by a process only as needed and may be different for different users or even different for the same user at different times. Persistent instantiations, on the other hand, depend on a store or dataset of content and form.

Emergent cybergenres. Emergent cybergenres are genres that have evolved to the extent that they are new genres. The typical evolutionary path is from simple replication through variant to emergent. The key evolutionary force is the progressive exploitation of the new functionalities afforded by the new medium.

Spontaneous cybergenres. Spontaneous cybergenres have no counterpart in other media and include such cybergenres as the home page, the hot list, and FAQ's [2].

2.3. Example of the evolution of news cybergenre

Replicated news cybergenre. The ink-on-paper newspaper has evolved over 300 years into a well-recognized genre, characterized by a consistent set of content and forms. The content consists of items of international, national, local, and sports news, etc. The form consists of short articles arranged in a broadsheet layout with a juxtaposition of text and photographs. This <content, form> pair allows us to recognize similarity in the midst of difference, i.e., we know that it is not a magazine or an academic journal. The genre provides the user with interaction options that are familiar, such as going to a section and turning the page.

The earliest versions of newspapers on computers mimicked the broadsheet format [1] of the ink-on-paper newspaper (Figure 2). There was almost no difference in either content or form from the ink-on-paper newspaper and very little added functionality. While there was some concern over the acceptability of the newspaper in electronic versus paper form [10], the electronic form appeared to be inevitable.

An initial adaptation to the new medium was the introduction of graphics and video while maintaining the broadsheet metaphor. Apple Computer, Inc., was one of the first to demonstrate such a system at the EDUCOM 1990 Conference [6]. It downloaded integrated video, graphics, and text into Hypercard. At this point, the genre had evolved somewhat in content and form but had little new functionality.

Variant news cybergenre. The replicated news cybergenre evolved quickly, adding new functionality building on the capabilities of the new medium. The Electronic News Project[1] [12, 13, 16] has developed examples of variants of the news cybergenre. The focus of this project has been the organization and delivery of newspaper text and photographs and television news clips in an integrated and interactive multimedia presentation across high bandwidth communication networks. Figure 3 is an example of this variant cybergenre. The smaller video clips consist of keyframes identified automatically in the full video clips. These keyframe sequences play slowly without audio so that the user has some idea of the content of the video clips. By clicking on one of these small windows, the full video clip is brought up and played at 30 frames per second with audio and full VCR-type controls. The interface for this digital newspaper looks and acts like a newspaper but includes the video clips and blow ups of stories and photographs. There is substantially more functionality than incorporated by the initial replicated news genre. The functionality includes the VCR-type controls on the video, blow ups of stories and photographs, and interaction based on string searching and hypertext links. These are all capabilities not available in the traditional paper medium.

Interestingly, the first World-Wide Web news providers adopted the Web's single document window mode of presentation. Now, the dominant Web-based news genre appears to be evolving *back* to something closer to its original genre in print (Figure 4). This appears to be because the broadsheet form of the print newspaper genre is so well suited to the task of "reading the news," where the enjoyment of the process of reading the news is as important as the information gained [3, 14]. In one study of reading electronic news [17], it was found that not only did readers overwhelmingly prefer to read news using the interface based on the broadsheet form rather than a hierarchical linked one-story a page format, but that the readers required no training to use the basic broadsheet

[1]The Electronic News Project involves Dalhousie University, Acadia University, the University of Waterloo and has been support by the National Sciences and Engineering Research Council of Canada, MT&T, Canadian Broadband Applications Research Program, the Halifax Herald, and ATV/ASN.

interface.

Emergent news cybergenre. Further evolution of the news cybergenre has led to the emergence of novel forms of the news, often with the virtual instantiation of news content. Personal agents filter the incoming news, software agents roam the Internet finding news, and users can interact with contributors and/or other readers [5]. This means that news content as seen by one person is different from the news content delivered to another person. It is generated dynamically and, generally, does not persist beyond that particular point in time.

An example of such personalized news is the *Krakatoa Chronicle* [7]. The *Krakatoa Chronicle* is intended for access on the Internet by Java-based browsers. In the *Krakatoa Chronicle* system each article is assigned both a personal weight (i.e., a weight computed for each reader based on the reader's profile) and a community weight which is the average of the personal weights for that article. When creating "today's newspaper", the personal weights and community weights are combined to determine which articles will be included in the newspaper.

Researchers at GMP-IPSI have developed the Individualized Electronic Newspaper (IEN) [5], as part of the larger issue of active publications, i.e., publications that have programs attached to them to allow the publications to act on its environment. The IEN is an individualized publication, composed on demand for the reader and then delivered electronically.

The news cybergenre has evolved from a replicated paper newspaper genre through dynamic and interactive genre variants to novel cybergenre based on virtual instantiations of form and content. Although much of the core <content, form> of the original are still met, additional functionality has been incorporated that results in the emergence of a novel cybergenre of news.

2.4. Example of the Evolution of the Math Dictionary Cybergenre

Replicated math dictionary cybergenre. As a genre, dictionaries invoke a certain content (independent information units about distinct terms) and a certain form (short entries in a linear ordering). The first computer-based dictionaries were simple reproductions of the paper genre. The content and the form were the same as the paper genre. Functionality included scrolling through the items and searching for a term and jumping directly to the definition within the order. Figure 5 is an example of what such an entry might look like.

Variant math dictionary cybergenre. A progression of on-line dictionary interfaces have been developed as part of a long-term exploration into the use of mathematical texts on-line [8, 15]. Figure 5 actually shows not a replicated dictionary interface, but an interface that has adopted several value-added features available in the new medium. Unfortunately, some features cannot be distinguished in the black and white reproduction necessary in the "printed conference proceedings" genre. This interface has typed hypertext links indicated by colour, word search, multiple subject views, and cut-and-paste. Although the content and form have remained consistent with the paper dictionary genre, however, there is considerable added functionality. We noticed that the similarity in <content, form> of the variant dictionary to the original paper dictionary meant that students using the electronic version required no instruction in the use of the software.

Emergent math resource cybergenre. This genre has now evolved to the point where it is no longer just a mathematics dictionary, rather it is a mathematics resource. While it maintains the <content, form> and basic process of the earlier genre, there is a new level of functionality afforded by the new medium. This novel genre

permits the user to interact with the entries to draw graphics, manipulate 3D renderings, try out different problems or enter values for computation. The user now interacts directly with the contents as a more intense way of understanding and generating mathematical results for other purposes. Figures 6 and 7 illustrate these capabilities.

In Figure 6, the user is investigating "integrals". The user may input or change a default function and set the parameters consisting of the range and the number of rectangles to be used in determining the value of the integral. Figure 6 also shows the result of the integral for the function and parameters as specified by the user. Figure 7 shows the result after the user has requested a plot of the function under the specified conditions. Whenever the user changes the function and/or parameters, a new value is calculated and a new plot generated.

The increased functionality permits each user to interact with the system for a range of tasks beyond the narrow scope of "finding a definition". Each user can input a different function and/or set of values for the same entry, generating different results and plots on the fly. As a result of this vastly increased functionality, the genre is no longer "just a dictionary". Rather, a cybergenre has emerged that is now a math resource that allows the user to actually manipulate the content in meaningful ways.

3. Summary

A new class of genre, called cybergenre, has been proposed. While genres in other media can be characterized by the tuple, <content, form>, cybergenres are characterized by the triple, <content, form, functionality>. The functionality afforded by this new medium results in novel genre, both emergent and spontaneous. Spontaneous genres are directly dependent on the functionality unique to the new medium. Emergent novel genres evolve progressively from replicated genres through variants of the replicated genres until a novel genre emerges. Again, the distinguishing feature is the new functionality in the new genre.

A (fuzzy) taxonomy of cybergenres has been proposed as a means of attempting to understand the types and directions of this evolutionary progression. In particular, this taxonomy recognizes that novel genres will continue to emerge in this new medium. Some of these, such as the hotlist and homepage, will be spontaneous in nature while others will emerge through an evolutionary pattern. Some novel genres will emerge as virtual genres, i.e., genres whose instantiations are virtual. These instantiations are generated by process and may be different for different users and even different for the same user at different times.

We suggest that it is appropriate to rely on the progressive evolution of genre from replication to novel to maintain the notion of fixity [20] in changing systems. The continuation of a thread of <content, form>, even as the functionality changes, provides a familiar and strong metaphoric reference for users that transcends changes in functionality. It is appropriate to design applications for the Internet by starting with associated non-digital genres and evoking a natural progression of the genre to exploit the medium [2, 20]. Such an approach provides continuity for the users and a common thread to the development of novel cybergenre.

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Figure 2. Replicated Newspaper Genre

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Figure 3. Variant News Genre

Figure 4. Web-Based Variant News Genre

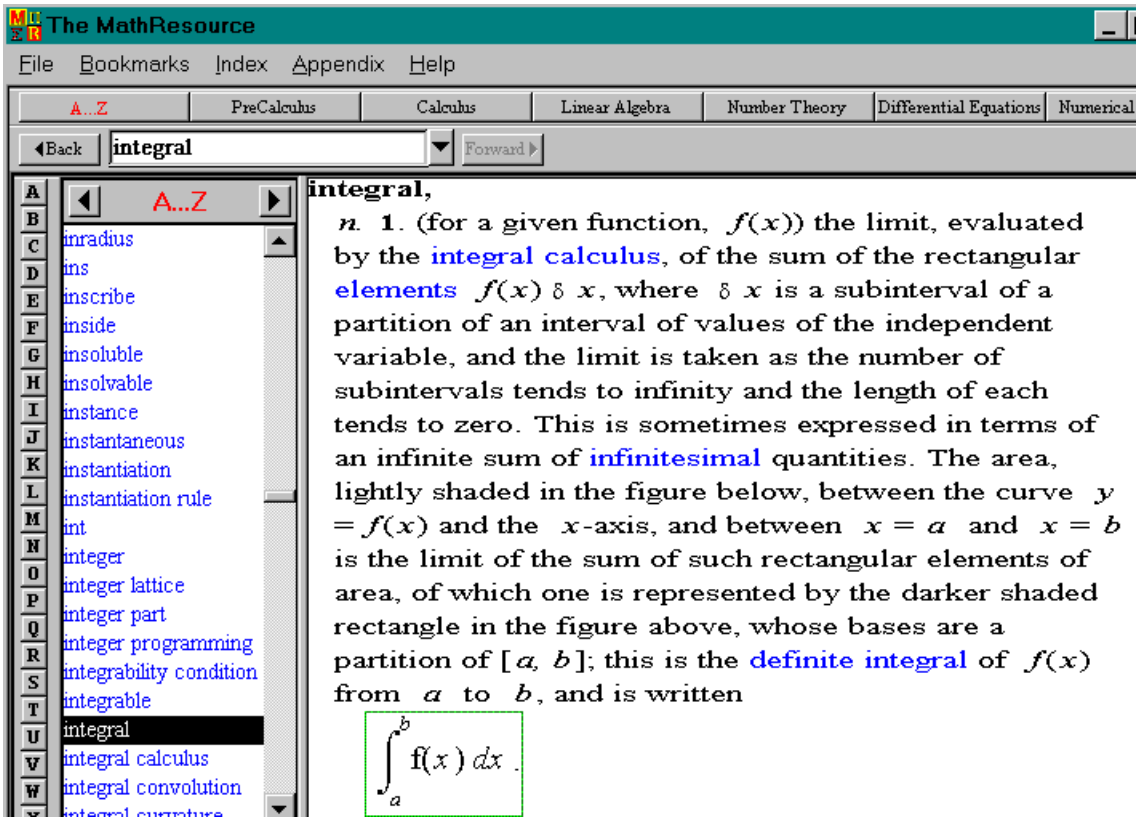

Figure 5. Replicated Math Dictionary Cybergenre

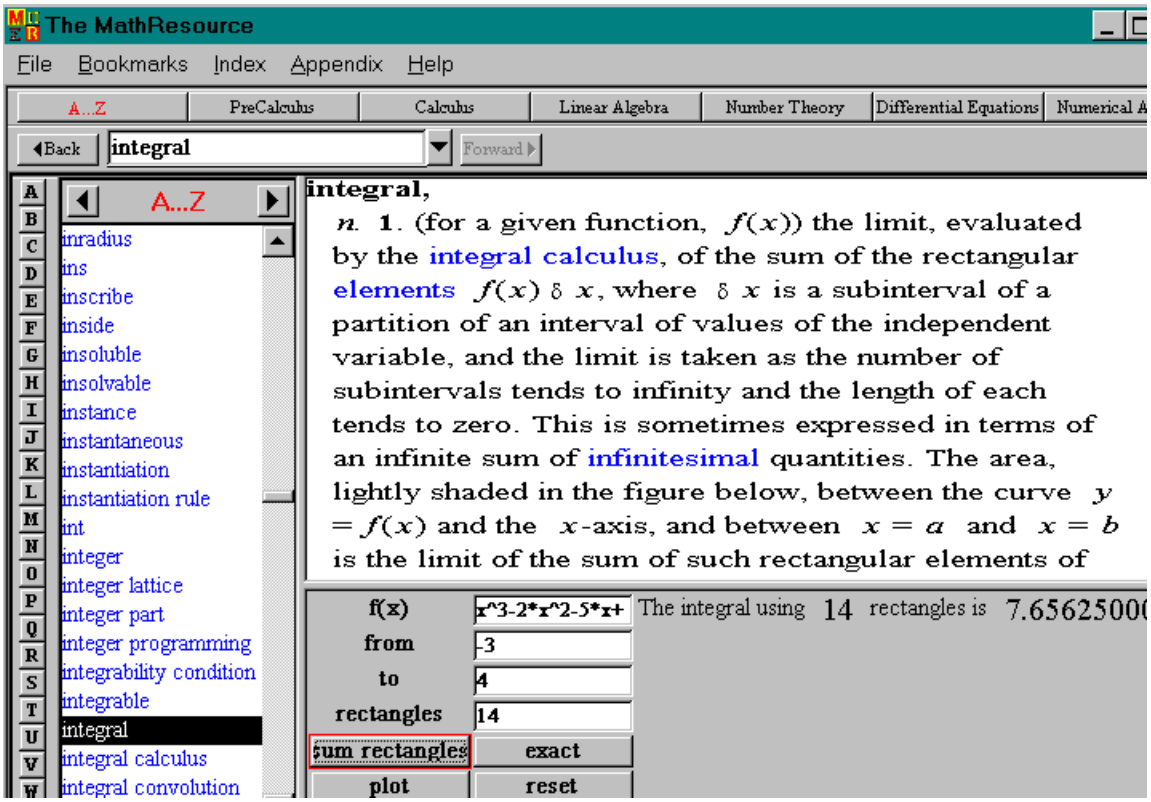

Figure 6. Emergent MathResource Cybergenre.

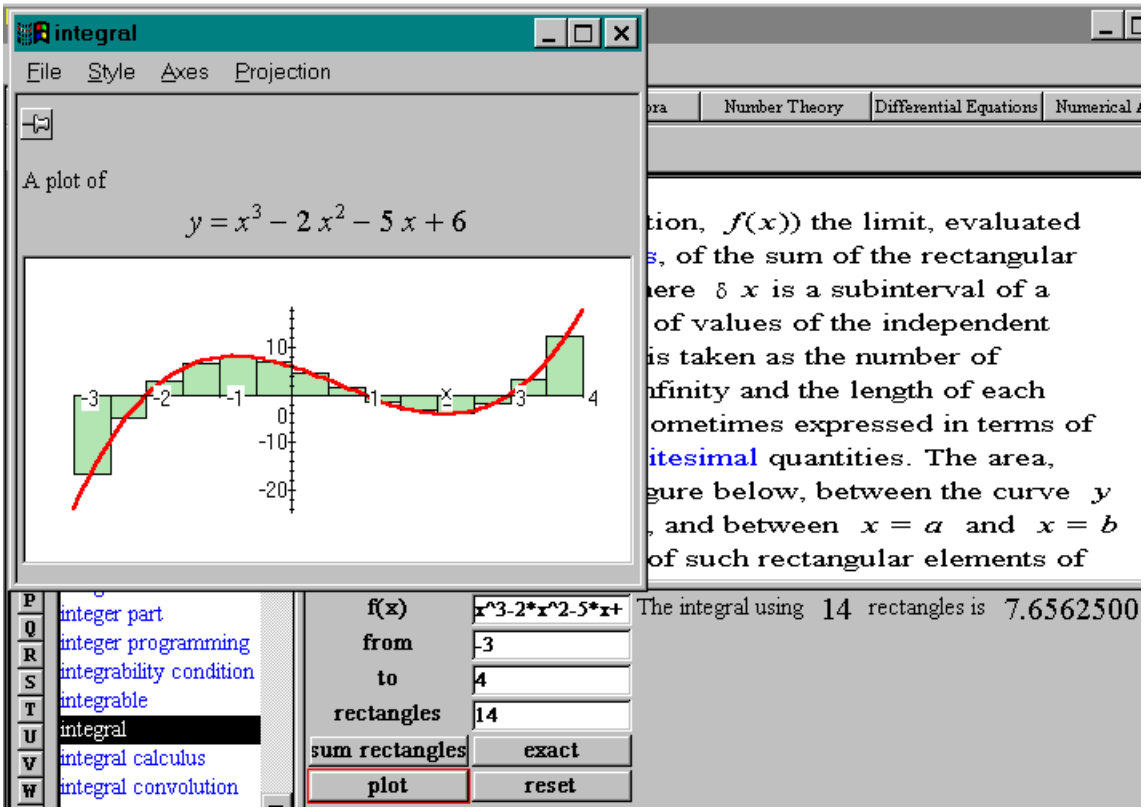

Figure 7. Emergent MathResource Cybergenre with Plot.