Reserve Paper J1.8

Augmenting an Internet Course, a Multi-level Model

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For the past four years, the author has been serving as a mentor to the AMS DataStreme course as both Operational and College Faculty Mentors. During this time, I have observed the students who take the course have diverse backgrounds.

When teaching an introductory survey course in a classroom setting, I traditionally start the semester with a short questionnaire which inquires about the students math and physics background. By far the most frequent response is that ninth grade high school algebra is the last math taken; however, it is rare for a class not to include students who have had calculus. Since I typically provide some material of interest to the students with advanced mathematics in the lecture. At the same time I make sure the students who don't have the background are aware that they are not responsible for it. I decided to try a different model for Internet Web pages to allow students with the appropriate background and interest to explore a concept in depth.

Most web sites are designed for page turning or branching from the general to the specific. Page turning, the most frequently used method of description is designed to provide a level depth of material for the student. However, the page must assume all the students have a single level of preparation for the material. The site described here is a multi-level page designed to address the variation in student background. In a sense, it is a slice of a matrix of material which cuts through the depth of knowledge with one topic instead of providing a number of interrelated topics all at the same level of sophistication.

The web site evolved out of a dispute over the Coriolis Force. In Physics class, both the centrifugal and Coriolis forces are described as "fictitious forces" because they arise only when the observer is making measurements relative to a rotating frame of reference. Indeed there is a third "fictitious force" if the rotating frame is being accelerated according to Coriolis' theorem. In the basic survey course, one explanation of the phenomenon is rarely enough for some students, especially those who have a physics or mathematics background. The resulting pages begin at http://www.nws.noaa.gov/om/start.htm .

Figure 1 shows the structure of the web pages which make up the site. The first page the student sees when clicking on "How Come Lows Don't Fill and Highs Smooth as the Winds Blow" is the introduction which describes the question in more detail. A fundamental but non-mathematical answer is given in then next two pages. The second of these two pages illustrates how a parcel would move over a turning Earth using a road map.

At this point, the student can

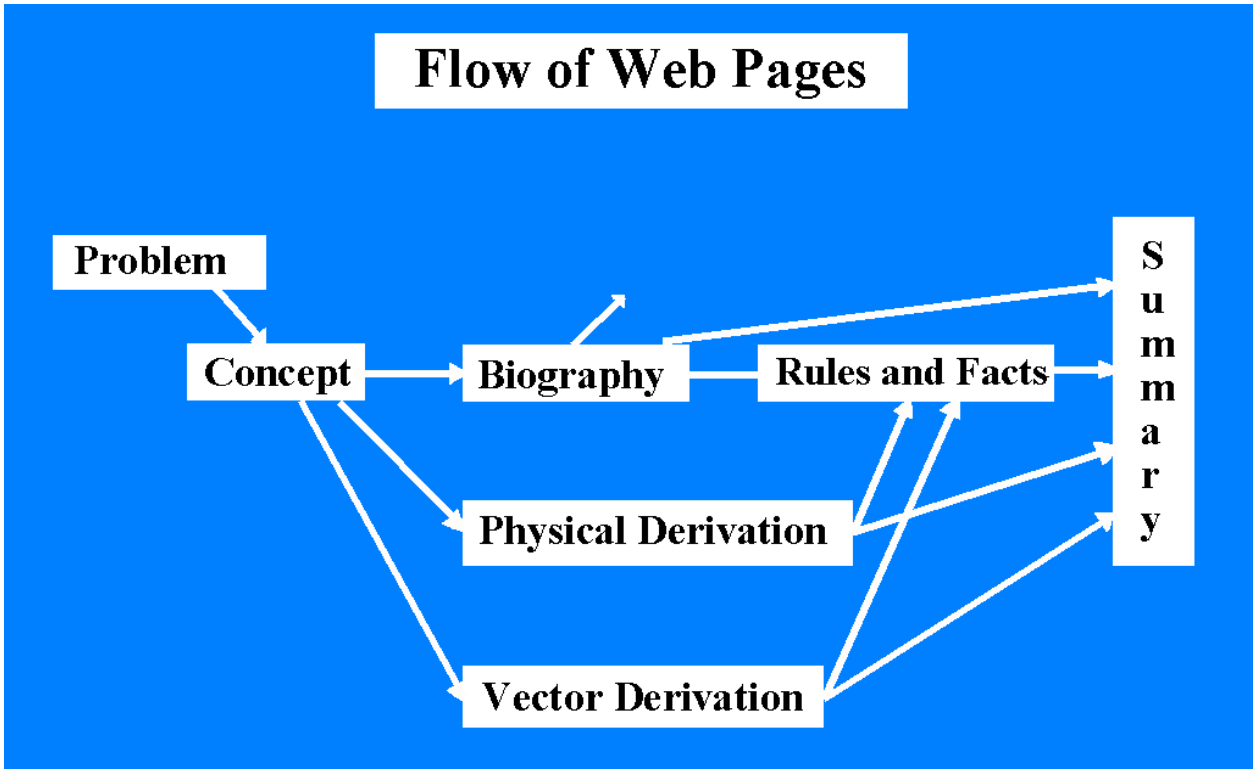

Figure 1 Structure of the Web site at http://www.nws.noaa.gov/om/start.htm

move into what interests him or her. Some students are fascinated by history so they can branch to a brief biography of Coriolis. The full reference and more biography is available from that page. The arrow going nowhere is to remind us that the student can go anywhere on the net at any time; however, most students taking this path will either go to the simple rules or to the summary. Those who have read the text but would like to understand it better by going over it again in different wording, can branch to a physical derivation which is similar but not the same as in the textbook. The physical derivation does not include equations; however, it does include a vector diagram illustrating how a parcel, originally stationary is affected by the sum of forces.

Some students, especially mathematics and physics teachers are quire competent in vector notation and have a differential calculus background. For those DataStreme students, the fundamental vector derivation is given. If they go through the derivation, they have a classic presentation of the Coriolis Theorem. In essence, the Coriolis action on the winds is shown to be a fundamental mathematical property of viewing the motion of the winds (or any moving body) from a rotating frame of reference, the Earth. The multi-path, multi-level web site described here is portion of a matrix web site such as used in some commercial ".com" enterprises; however, not all concepts in meteorology are so well understood. Such an approach would benefit students with limited time and resources who find a need or desire to delve into particular aspects of a science.