**Logical Wiki Locks**
**A Cognitive Task Analysis**

Link:
http://share.wikispaces.com/logical+lock

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**Yes, I Wiki even more.**

I began my examination of Wikipedia.org and the use of wikis as educational tools during my “Summer 2006 A” session at Columbia in a course entitled “Computers, Problem Solving and Cooperative Learning.” Within my first and second term papers for this course, I studied the attributes of wikis as a springboard for using computers as tools by teachers to structure curriculum units involving cooperative learning and problem solving in the classroom. I created a literature unit (fifth grade target audience), a social studies unit (fifth grade target audience) and a science unit (fifth grade target audience) using the wiki software provided by the website Edublogs.org. I selected the wiki software provided by Edublogs called “Wikispaces” instead of Wikimedia which runs the Wikipedia.org site. Edublogs provides software which is easy to use by both teachers and students. I found the Wikimedia software to require a more advanced knowledge of HTML and I thought that the learning curve and maintenance of an HTML intensive wiki would prove to be too time consuming for the teacher.

I continued my study of wikis during my “Summer 2006 B” session at a course entitled “Computers, Language and Literacy”. The term paper which I wrote for this Literacy course examined wikis as an excellent example of a linguistic register as proposed by Halliday.(Halliday 1985) During the “Computers, Language and Literacy” course, my classmates and I used a wiki provided by Moodle. Moodle is software which allows teachers to create a comprehensive online classroom environment, including wiki software.

What I discovered through the use of the Edublogs wiki and the Moodle wiki was that neither software provided any edit locking capability. What this means is that, in an online cooperative learning environment, many students and their teacher could be editing at the same time. Without an edit lock, the editors could be editing the same text at the same time. A save of their edits would not guarantee that their work was included in the new version of the wiki.

There is one main and important difference between the edit format of Wikipedia powered by the Wikimedia wiki software and the edit capabilities contained in Moodle and Edublogs software. The Wikipedia edit format has **section** edits. There is a small link displayed as [edit] on Wikipedia pages. If you hover your mouse over this word, you will see the words "Edit section: section name". This tells you which portion of the page you can edit by clicking on the link. The entries on a wiki page are large, so the wiki software makes this more manageable by providing section edits. In order to determine how Wikipedia manages editing conflicts, I signed up as an editor. By doing so, I was able to find the edit tips which describe this situation:

**"Edit conflicts**
If someone else makes an edit while you are making yours, the result is an edit conflict. Many conflicts can be automatically resolved by the Wiki. If it can't be resolved, however, you will need to resolve it yourself. The Wiki gives you two text boxes, where the top one is the other person's edit and the bottom one is your edit. Merge your edits into the top edit box, which is the only one that will save."(Wikipedia 2006)

The Wikipedia software resolves the conflicts by helping the editors manage the conflict. This requires a tremendous amount of sophisticated wiki software to manage this type of situation. This service is not provided by Moodle or Edublogs.

I resolved this problem by establishing a “logical wiki lock”. In the absence of a physical (software) lock, the editors of a wiki must cooperate with one another to edit the first text line of the wiki as follows:

**Logical Lock: This wiki is currently being edited by (edit your name here) on (edit the date here) at (edit the time here). SAVE!**

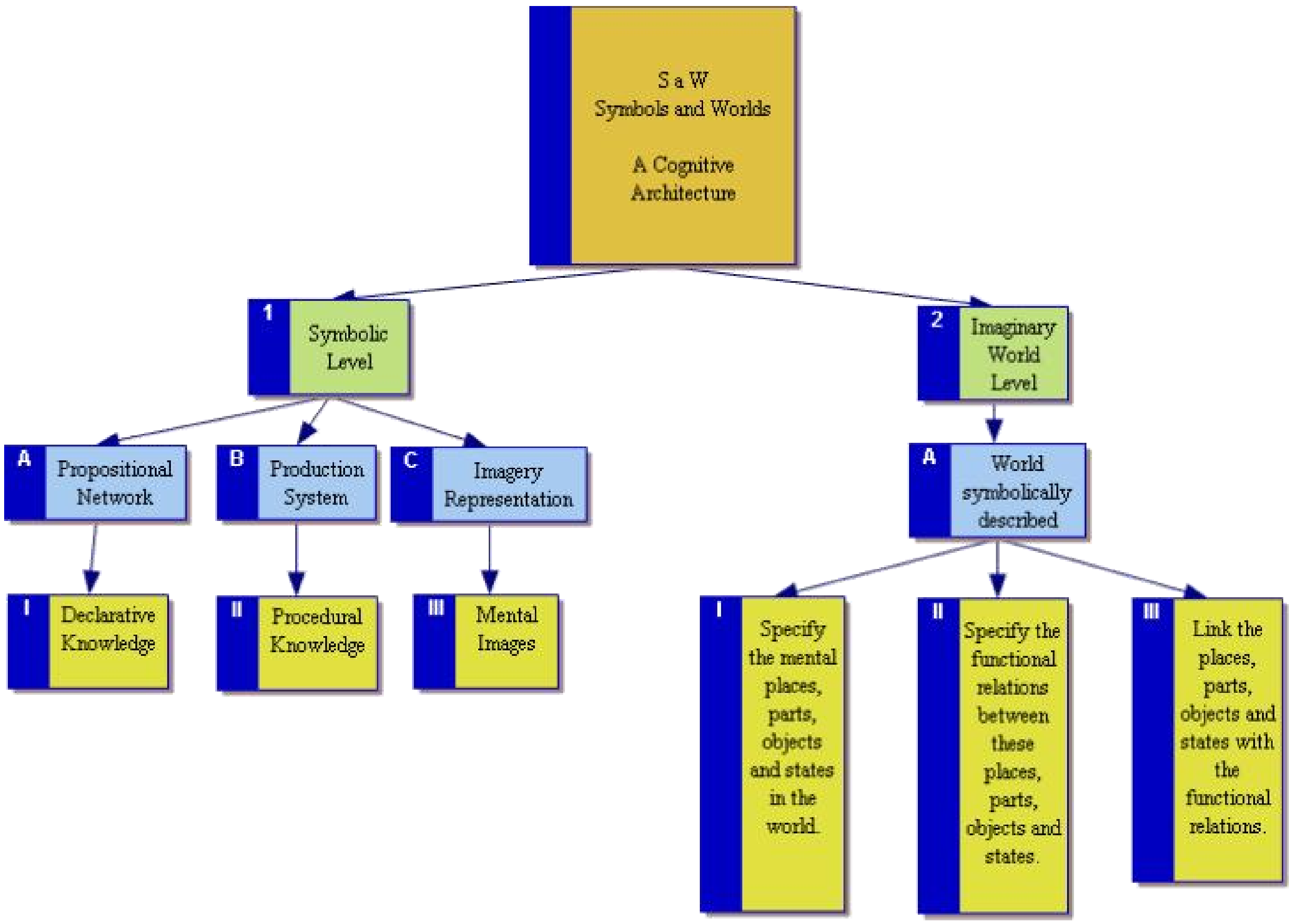
To see the logical lock in action, click here to visit my wiki page which explains logical locks. By editing and saving this line with their name, date and time, the editor reserves the wiki for their personal edit. I usually establish a time limit of 20 minutes of editing time for any student or teacher. This is actually plenty of time, because I encourage the editors to create their contribution in a word document on their PC, claim (edit and save the lock) the wiki for their edit if available, and copy and paste their contribution from their word document to the wiki. When they are done, the editor returns (edits and saves) the logical lock to its original, and therefore “available for edit” condition.

What I found, however, is that not all students and teachers grasped the concept of the logical wiki lock right away. It took several iterations of explanation as to why we need a logical lock in the absence of a physical (software) lock. This is precisely why I chose this topic to apply the “SaW” Cognitive Task Analysis to this concept.

Let us first take a look at the components of “SaW”, and then we will apply them to logical wiki locks.

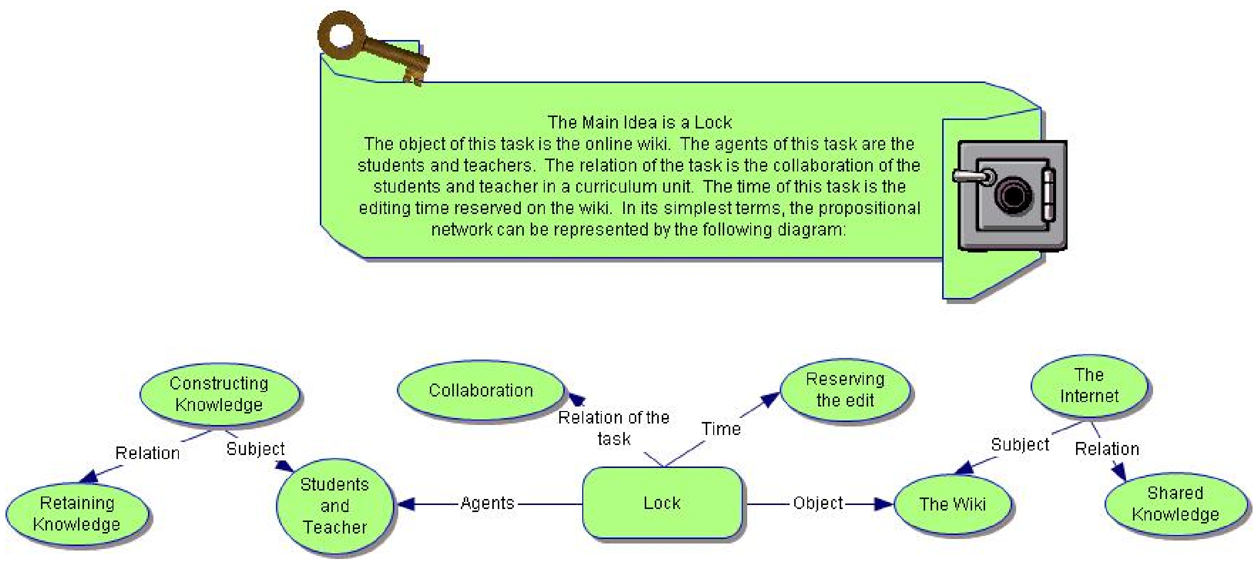
**<u>What is "SaW"?</u>**

This acronym stands for Symbols and Worlds. The Cognitive Architecture set forth by Dr. Black makes a distinction between two areas of representation and understanding.  I created the following Inspiration diagram to discover the structure of SaW:




**<u>Symbolic Level – Propositional Network (Declarative Knowledge)</u>**

According to Anderson, a **proposition** is "the smallest unit of knowledge that can stand as a separate assertion."  A **propositional representation** is a "propositional representation of meaning as a set of propositions." And a **propositional network** is "a propositional representation in which the relation and arguments of the proposition are linked in a network." (Anderson 2005) The main idea of the cognitive task that I am conducting is the concept of "lock". The object of this task is the online wiki. The agents of this task are the students and teachers. The relation of the task is the collaboration of the students and teacher in a curriculum unit. The time of this task is the editing time reserved on the wiki. In its simplest terms, the propositional network can be represented by the following Inspiration diagram:




Taken as declarative knowledge, the propositional network provides the students with the main concept of the lock and the need to integrate this concept into how it relates to the other entities which are part of the success of the curriculum unit involving the use of a wiki in a collaborative learning environment.

**Symbolic Level – Production System (Procedural Knowledge)**

The next component of SaW is Production Systems which involves procedural knowledge. I have to convey to students and teachers that they must do something

**before** they begin their edits in order to add their thoughts and knowledge successfully to the wiki. Also, a procedure has to take place **after** they have completed their edits as well. Having been a Programmer/Analyst for many years in the banking industry, I have written many IF statements. The format I like to use is what I call a "fall thru" method. The first level and subsequent levels of the IF statement contain the procedures to be accomplished under certain conditions. THEN, the default action catches the remaining tasks which fall thru and do not meet any of the IF criteria. Here is the procedural knowledge needed to understand the logical wiki lock:

IF the wiki is not locked by another editor,
THEN do the next four steps to achieve my goal of contributing my work:

1. Perform the edit lock procedure to contain my name, date and time and save the wiki
2. Copy and paste my edits from my word document into the wiki that I have reserved
3. Perform the edit unlock procedure to take my name, date and time out of the lock to be replaced by the default words of (name)(date)(time) and save the wiki
4. Check that my edits have been properly saved and that the logical lock is now showing that I am no longer reserving the edit

ELSE
Check back in a few minutes to see if the logical lock has been reset and that the wiki is now available for editing.

It is within the realm of possibility that a prior editor has forgotten to edit the logical lock back to its original condition. In that case, a time limit of 20 minutes is established for any one editor to complete their edits. This should be a very adequate time period if the editor creates a word document and performs a copy and paste into their reserved wiki. Otherwise, if a student or teacher observes that the wiki has been locked for more than 20 minutes, then the following procedure can be followed:

IF the wiki has been locked for more that twenty minutes
THEN perform the next courtesy steps:

1. Instant message the classmate/student/teacher either on the computer or cell phone to remind them to unlock their edit
2. If the classmate/student/teacher does not respond, then proceed with the edit sequence to lock the wiki with your name and edits.

ELSE (20 minutes has not been completed or the editor is not done)
Check back in a few minutes to see if the logical lock has been reset and that the wiki is now available for editing.

**Symbolic Level – Imagery Representation (Mental Images)**

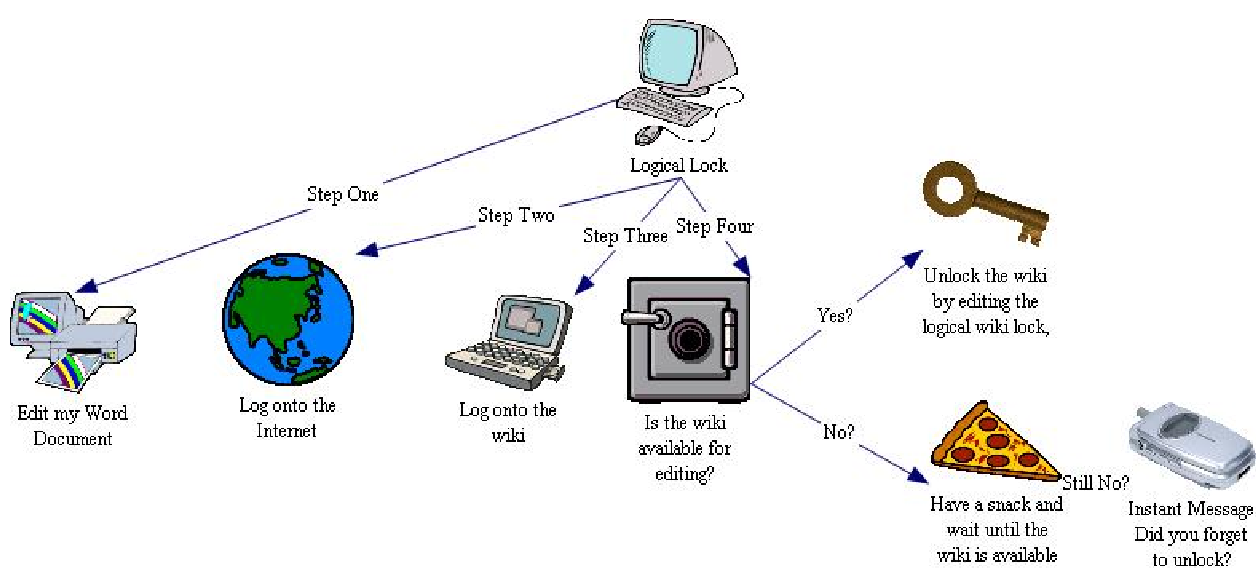
The next component of SaW is Imagery Representation which involves mental images. During Session 5, we all created a mental model of how a light bulb works. My contribution was elementary at best, but it did contain my perceptions of the inner workings of a light bulb. I can make a guess that almost everyone has a mental image of a lock. But, how many people have a mental image of a "logical lock"? A physical lock stops you from doing something whether or not you have put much thought to the process. A lock on a bathroom door, a lock on a suitcase, a lock on a diary, are some examples of physical locks. But how about a logical lock? When I am teaching about logical locks, I like to give the following examples as illustrations:

1. When my grandmother was living with my family years ago, she managed to lock herself in the bathroom. The lock froze in the "locked position" and we had to remove molding to pry open the mechanism and spring her from the bathroom. Now, after having raised two children who have a penchant for being able to reach and figure out how to lock a door from the inside and lock me out of a room, I have adopted a "no locks on any doors except exterior doors" policy. But, what if you want some privacy in the bathroom? A small wooden sign which hangs on the doorknob inside the bathroom, but gets switched to the outside doorknob when needed reads, "Awfully big stink happening in here. Stay out

until I'm done." That's a logical lock. It requires reading. It requires thought. Children do not necessarily put those two skills together at the same time, but with repetition, it eventually works.

2. We traveled to Rome, Italy this summer. Locks on suitcases can no longer be used because of the rampant airport security procedures. But a friend gave us a package of funny luggage tags. It was very easy to spot my suitcase, because it had a "This is not your suitcase" tag on it. My daughter's suitcase had a tag which read, "Nothing but dirty laundry in here". That is a logical lock.
3. My favorite example of a logical lock is my private supply of cookies. When I bake our favorite batch of lemon sunshine cookies, I leave the majority of the batch for my family, but place my private supply in the refrigerator in a container marked, "Chopped Broccoli". That is a logical lock.

In terms of my collaborative editors, however, my logical lock imagery representation would look something like this:



The whole concept of Cooperative Learning embodies working together to construct and share knowledge. The logical wiki lock is the first step to unlock learning in a collaborative classroom. Wiki on!

**Applications of Cognitive Learning Principles**

The second part of my paper will discuss the practical applications of the cognitive learning principles that we have covered in Computers and Cognition. At Columbia, I have always enjoyed linking different aspects of concepts that I have learned in one course to the concepts that I am currently learning.

During my research for a project during my Computers, Problem Solving and Cooperative Learning course, I came across a web site hosted by the National Center for Teaching Thinking (NCTT). The lesson plans contained on this web site are categorized by Thinking Skills. I adapted a lesson plan suggested by this site to a literature unit (fifth grade target audience) which utilizes problem solving skills. The NCTT site suggests that, “Students will learn to solve problems skillfully by clearly stating the problem, generating possible solutions, and finally selecting the best solutions on the basis of consequences.”(Thinking 2006) This prediction made by NCTT parallels the essential features outlined by Anderson as “essential features…of problem solving”:

Anderson’s first essential feature is goal directedness which he defines as a behavior that is clearly organized toward a goal. This parallels the NJTT first step in problem solving which states that, “Students will learn to solve problems skillfully by clearly stating the problem.”

The second essential component outlined by Anderson is subgoal decomposition which is to decompose the original goal into subtasks. This mirrors the NJTT format which states that "Students will generate possible solutions."

Finally, Anderson talks about operator application which is "…an action that will transform the problem state into another problem state".(Anderson 2005) The NJTT final step in problem solving is for the students to select "… the best solutions on the basis of consequences."

In their book entitled Theoretical Foundations of Learning Environments, Jonnasen and Land state that, "…traditional instructional approaches have been criticized widely for failing to support higher order thinking and problem solving while cultivating complaint … and superficial understanding."(Jonassen 2000) The authors, instead, talk about student-centered learning environments which "…provide interactive, complimentary activities that enable individuals to address unique learning interests and needs, study multiple levels of complexity and deepen understanding. Technology is frequently employed as a tool to support experimentation, manipulation and idea generation." (Jonassen 2000)

I believe that a student-centered, problem solving environment which utilizes technology as a tool will yield an excellent basis for knowledge. A key ingredient in problem solving which I have learned from this course is the development of problem-solving operators. The word operator, according to Anderson, is "…an action that will transform the problem state into another problem state. A problem state is a representation of the problem in some degree of solution."(Anderson 2005)

In order to develop a student-centered learning environment and teach problem solving techniques, Anderson suggests that, "It might seem that the most efficient way to learn new problem-solving operators would be simply to be told about them. Sometimes, however, examples that we can use as models for how to solve problems serve as better means of instruction."(Anderson 2005)

Anderson further explains that "…analogy is the process by which a problem solver extracts the operators used to solve one problem and maps them onto a solution for another problem. "(Anderson 2005) I can correlate the use of analogies to teaching practices. If we, as teachers, allow our students to construct the components of a problem, then the student will be able to better understand and retain the knowledge gained by having an in depth participation in the development and solution of a problem.

In his book entitled Learning to Solve Problems with Technology, Jonassen states, "When given the opportunity, students of all ages readily experiment with technologies, articulate their own beliefs, and construct, co-construct and criticize each other's ideas. When learners are allowed to assume ownership of the product, they are diligent and persevering builders of knowledge."(David H. Jonassen 2003)

I believe through the use of wikis and webquests, a teacher can establish a student-centered, problem-solving environment which will yield learners who construct and retain knowledge. I have written a social studies webquest entitled "Let's Learn About New Jersey." (second grade target audience) I like to use webquests because they allow the student to work at their own pace to discover the facts about a topic on the internet, but in a contained environment that I have set up for them. This "user interactivity" is the topic of the Mayer/Chandler article that we read a part of Session 7.

The authors indicate that user interaction "…reduces the learner's cognitive load on working memory thereby enabling the learner to progressively build a coherent mental model."(Mayer 2001) The learner can "…strive to fully understand one segment before moving on to the next, thereby reducing the change of cognitive overload."(Mayer 2001)

Within my New Jersey webquest, I included a page about the Pascack Historical Society Museum which displays many Lenape Indian artifacts. I did not use audio narration on this page, but instead used pictures and text to describe each image. According to Mayer/Heiser/Lonn in the article about Cognitive Constraints, the authors indicate that a redundancy effect occurs. "When students also received concurrent on-screen text that summarized or duplicated the narration, they performed worse on tests of retention and transfer than did students who receive no on-screen text." (Mayer 2001)

Perhaps I will eliminate the text in future webquests and replace the text with narration about the picture. Mayer/Heiser/Lonn state that, "A straightforward implication of the cognitive theory of multimedia learning is the split-attention hypothesis, which states that when words are presented visually, learners must split their visual attention between the on-screen text and the animation, thereby failing to adequately attend to some of the presented material."(Mayer 2001)

However, in the Mayer article entitled "For Whom is a Picture Worth a Thousand Words?", Mayer/Sims conclude that, "Researchers need to examine more fully the role that individual differences might play in multimedia learning."(Mayer 1994) The authors indicate that:

1. “Students who possess domain-specific knowledge may not need visual aids with text because they can generate their own familiar analogical representations as they read or listen to an explanation of a system.
2. Mainly inexperienced students benefit from pictures being coordinated with words.
3. Students who possess high levels of spatial ability are more likely than low-spatial ability students to be able to build mental connections between visually based and verbally based representations.
4. High-spatial ability students benefit from pictures being coordinated with words.
5. Low-experience, high spatial ability students are the most likely to benefit from instruction that carefully synchronizes the presentation of verbal and visual forms of scientific explanation.”(Mayer 1994)

Based on the findings of the “Picture” article summarized above, I believe that it is apparent that we have to be very cognizant of our students’ learning styles. I came across a very interesting website entitled Learning Styles Online. This site provides an online test and produces results, in graph form, of a student's learning style. The site also provides learning strategies for each style. The Learning Styles Online site also has a group feature which enables a teacher to collect the style of their class on one graph. By doing so, the teacher would be able to fine tune lesson plans depending on the "mix" and "overlap" of styles in their classroom.

In conclusion, I am better able to design my wikis and webquests for teachers and students because I have a better idea about cognition as it pertains to multimedia learning. The "Picture" article by Mayer/Sims provides very important analysis on computer based instruction as it pertains how students learn. Mayer and Sims indicate, "…in spite of advances in educational technology, the field of educational psychology lacks a corresponding research-based theory of how to design computer based instruction using words and pictures. "(Mayer 1994) This is especially interesting to me since I like to design and implement educational software in many forms. Since the Mayer/Sims article was written over a decade ago, I searched for subsequent publications by Mayer and Multimedia Learning. Mayer has written The Cambridge Handbook of Multimedia Learning. I have ordered a copy of this book from Barnes and Noble and hope to apply the concepts outlined by Mayer in my wikis, webquests and websites. I hope that you enjoyed reading my paper as much as I enjoyed writing it!

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