Mnemosyne and Anki spaced repetition systems

MEMORY REMINDER

We show you two free spaced repetition systems that can help you learn and remember thousands of flash cards in just minutes a day.

BY DAVID A. HARDING

I don't have to review 4000 flash cards every day. Instead, I only need to review a handful, sometimes less than a dozen, because a software spaced repetition system (SRS) predicts when I'll forget each flash card and makes me review it before I forget [1]. How can a program predict when I'll forget something? The program, or rather its author, knows about the forgetting curve, which means that people forget new memories faster than they forget old memories. For example, if you just learned the Pythagorean theorem today and you don't review it again, you'll probably forget it by next week, but if you remember it from high school, you'll probably remember it for at least the next year.

For a spaced repetition system to work, you must tell it how well you remember a fact each time you answer its flash card (i.e., you grade your memory). The program uses your grade to predict when you'll forget that fact. Each time you remember something correctly, the program schedules it further away. For example, if you tell it you learned the Pythagorean theorem today, it makes you recall it tomorrow; if you answer correctly, it makes you recall it in six days, then in 12 days, then 20 days, and then 30, 50, 100 days, and so on. Within the first 18 months, you may only need to review each card 12 times. For 4,167 flash cards, that's 50,000 reviews, which sounds like a lot but it's an average of only 90 reviews a day to keep more than 4,000 flash cards memorized. That's how I reviewed just three flash cards a minute, for 30 minutes a day for 18 months to memorize more than 4,000 flash cards. And I don't intend to stop: In 30 years, with the same routine, I plan to memorize (and keep memorized) more than 100,000 flash cards.

In 1987, Dr. Piotr Wozniak wrote SuperMemo, the first commercial spaced repetition program; he continues to develop and sell it for Microsoft Windows. In this article, I'll introduce two free software programs – Mnemosyne and Anki – that both use modified versions of that 1987 SuperMemo algorithm [2].

Mnemosyne

Mnemosyne is named for the Greek goddess of memory and mother of the muses, but the name also belongs to a European species of butterfly that Mnemosyne uses as its mascot [3]. To install Mnemosyne, start the Synaptic package manager – *System | Administration | Synaptic Package Manager* – and enter *mnemosyne* in Synaptic's *Quick Search* box. Then mark the package for installation and click the *Apply* button.
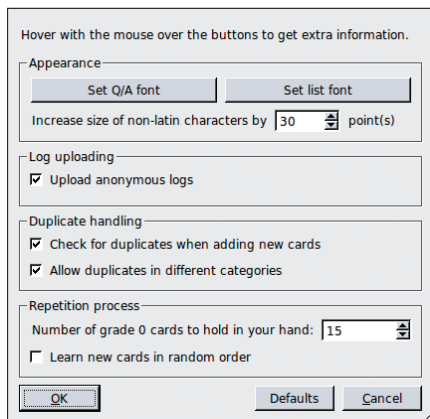

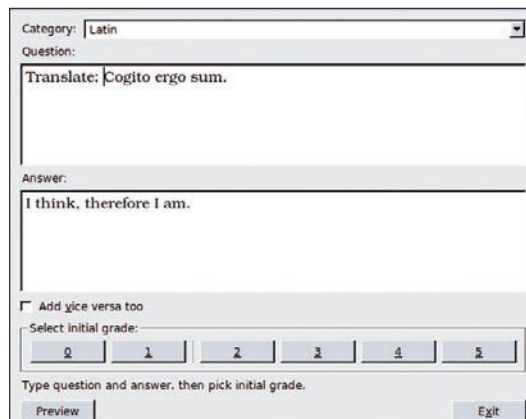**Figure 1: Mnemosyne's preferences dialog.**

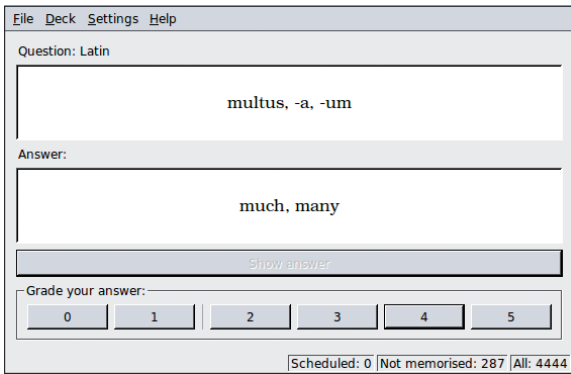**Figure 2: Adding a new card in Mnemosyne.**

Figure 3: Mnemosyne in review mode.

Once the package is installed, go to the *Applications | Education* menu and click *Mnemosyne* to start the program, or type Alt-F2 to open the application launcher and type *mnemosyne*.

Before you try Mnemosyne, you should read this warning: By default, Mnemosyne collects anonymous statistics about how effectively you memorize your flash cards. The program's author, an associate professor at Ghent University in Belgium, plans to use these statistics to improve Mnemosyne's card scheduling algorithm. I've looked at the statistics; they don't include any material on your cards or anything about the user; however, you can prevent Mnemosyne from sending these statistics. Go to the *Settings* menu and clicking the *Configure Mnemosyne* option (Figure 1).

To stop the uploads, uncheck *Upload Anonymous Logs* in the configuration dialog and look at the other options. I like the option to increase the font size for characters that use a non-Latin (non-English) character set. Setting this option makes reading Japanese and Chinese flash cards much easier. In the *Repetition Process* section, the "number of grade zero cards to hold in your hand" sets the number of unmemorized cards you want to review over and over again until you memorize them. Clicking *OK* saves your new settings, and then you can exit the configuration dialog.

Adding Cards

Clicking *Deck | Add Cards* opens a dialog with three fields: category, question, and answer (Figure 2). If you plan to enter cards from many different subjects, I recommend entering each subject as a different category. Later, I'll explain how to hide some categories and make a custom flash card deck.

Beneath the *Answer* field is an option to *Add vice versa too*. Marking this box creates a second card for every card you enter – the second card's question field contains the first card's answer and its answer field contains the first card's question. To complete the card, choose its initial grade, which I'll discuss in more detail later. If you're not sure, choose grade zero (Figure 3). You can tab between the text fields and press Ctrl + 0 through Ctrl + 5 to add the flash card with the corresponding grade.

Mnemosyne doesn't limit cards to question and answer pairs or plain text. When you add cards, right clicking on the question or answer field brings up the context menu. In that menu, the three-sided option lets you make foreign-language flash cards with a written form, pronunciation, and translation. When you add a three-sided flash card, Mnemosyne generates two real flash cards. Selecting the *Add vice versa too* checkbox generates four flash cards.

The *Add Image* and *Add Sound* options do what you expect.

In either the question or answer field, you can enter standard HTML markup, including formatting and tables. You can also render mathematical formulas with LaTeX by enclosing the formula between " < $ > " and " < /$ > ".

Learning and Review

Next, exit the *Add Cards* dialog to return to the default learning and review mode. In the learning mode, Mnemosyne displays questions, one after another, until you learn them all. When you know the answer or realize that you don't know the answer, click the *Show Answer* button.

In addition to showing the answer, Mnemosyne also activates six buttons, numbered 0-5, below the answer. Buttons *0* and *1* indicate that you didn't remember the answer or got it wrong. If you select either, Mnemosyne will show you a few other unmemorized cards and then display this card again. Buttons 2-5

indicate how well you remembered the answers. If you select any of them, Mnemosyne won't show you this card again, at least not until tomorrow. To display a tool-tip describing what each button indicates, mouse over the grading buttons.

To focus your studying on one particular category or group of categories, go to *Deck | Activate Categories* (Figure 4). By default, Mnemosyne activates all categories. If you always memorize cards within minutes of entering them, you might not find this feature useful, but if you get a backlog of cards to memorize, this feature helps prioritize your study.

Mnemosyne and all spaced repetition systems predict when you'll forget the answer to a flash card and schedule a review of the question shortly before then. Mnemosyne schedules cards daily, so you should run it daily. If you miss a few days here and there, Mnemosyne adapts. When you start Mnemosyne, it first shows the questions it thinks you'll forget, in the order in which it thinks you'll forget them. Answer each question the same way you did before. Each time you answer correctly, Mnemosyne schedules the next review of the question further into the future. Because I've been using Mnemosyne for more than a year and a half, the program schedules some of my cards 500 days into the future.

Editing Cards

As you continue using Mnemosyne, you'll probably find mistakes in your cards or ways to make them easier to remember. To edit the current card, go to *Deck | Edit Card*. Find other cards by going to *Deck | Edit Deck*. Pressing the *Delete* key deletes the current card, and then Mnemosyne asks you to confirm
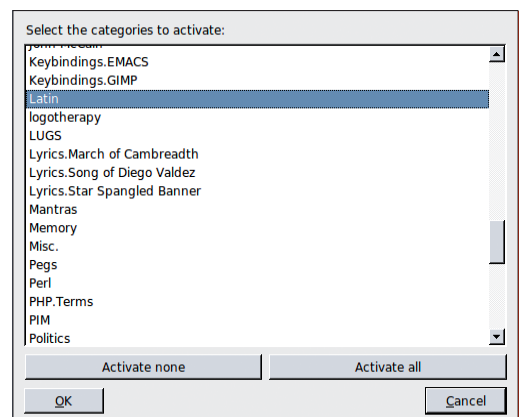

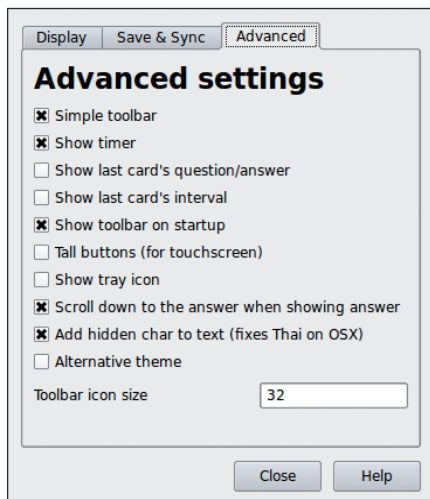**Figure 4: Mnemosyne's activate categories dialog with the only the Latin category active.**
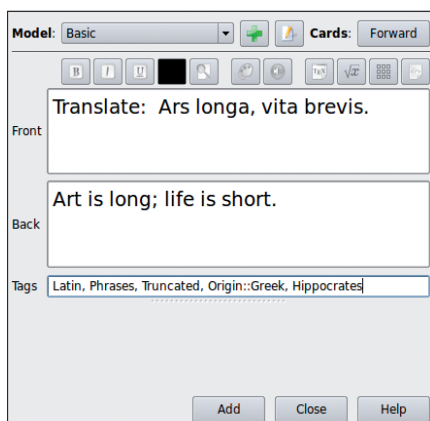
Figure 5: Anki's preferences dialog.

Figure 6: Adding a new card in Anki.

the deletion before removing the card permanently.

Importing and Exporting

Flash cards formatted for Mnemosyne are available for upload and download from the Mnemosyne website. To import or export flash cards, use the corresponding option in the *File* menu. You can import flash cards in several formats: SuperMemo, CueCard, two text formats, and Mnemosyne XML. You can export your flash cards to text, CueCard, and the Mnemosyne XML format.

Statistics

To view text statistics about your deck and the current card, look under *Deck | Show Statistics*. Some people find flash card statistics motivating, and others use them to limit how much time they spend reviewing cards each day.

Plugins

Plugins downloaded from the Mnemosyne website let you add new features.

Most plugins come as ZIP files, so you must unzip them and put them in the Mnemosyne plugin directory, *.mnemosyne/plugins*.

Anki

Anki's author wrote the program to help him learn Japanese, so he gave it the name of the English pronunciation of the Japanese word for memorizing. To install the *anki* package, use Synaptic (see previous instructions for installing Mnemosyne). To start the program, select Anki from the *Applications | Education* menu [4].

Anki doesn't upload any user statistics automatically, but you have the option of keeping a copy of your deck on Anki's online server, which makes it easy for you to use the program on multiple computers and lets you use Anki's online version. To start, set up an account on the Anki website and then go to *Settings | Preferences*, click the *Save & Sync* tab, and enter your username and password.

You can change other settings in both the Preferences dialog and from the Settings menu. I suggest you restrict your changes to the Preferences and Font & Colors dialogs until you get used to Anki (Figure 5). Later, I'll explain how to adjust the Current Model settings.

Adding Cards

To add cards, select *Add Items* from the *Edit* menu (Figure 6). In Anki, you don't make flash cards directly. Instead, you enter *facts* and *models* and Anki combines them to make flash cards. The *Model* drop-down selects the rules Anki follows to make your cards, and the default, *Basic*, builds simple two-sided cards.

To enter facts, use the text fields. In the *Front* text field, enter the card's question, and enter the card's answer in the *Back* field. Using the *Cards* drop-down menu, you can create a second card for every card you enter. In Basic mode, this drop-down works exactly like Mnemosyne's vice versa checkbox, and in other modes it does more.

In the final text field, you can enter tags for this card separated by commas; tags let you disable groups of cards. Clicking *Add* adds the card to your deck.

You don't need to choose an initial grade because all cards in Anki start out as unmemorized. You can tab through
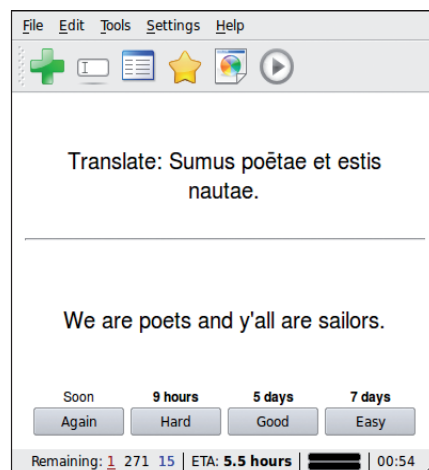

Figure 7: Anki in review mode.

the fields and press Ctrl + Enter to add the card to your deck. Icons above the text fields let you add formatting, audio, graphics, and LaTeX math formulas.

To get three-sided or even more advanced cards, edit Anki's models. To add a new model in the *Add Cards* screen, press the green plus sign (+) next to the Model drop-down menu. Anki comes with models for learning Japanese and two Chinese dialects, but you can add another Basic model and customize it. After adding the new Basic model, click the *Edit Model* icon next to the plus sign, give the model a new name, and set up the model's parameters. On the *Fields* tab, set up the parameters of each fact, and use the *Cards* tab to set up how Anki should generate cards using the facts. If this model accepts more than two facts for each question, extra fields appear on the *Add Cards* screen.

Learning and Review

To return to learning mode, close the *Add Cards* dialog. Anki displays the word "Learning" in the bottom right corner of the screen. Read the question and click *Show Answer* when you know the answer, and then grade the card. Unlike

INFO
[1] About Spaced Repetition Systems: *http://en.wikipedia.org/wiki/Spaced_repetition*
[2] 1987 SuperMemo Algorithm: *http://www.supermemo.com/english/ol/sm2.htm*
[3] Mnemosyne Project: *http://mnemosyne-proj.org/*
[4] Anki: *http://ichi2.net/anki/*

Mnemosyne, Anki has only four grades: Again, Hard, Good, Easy. Beneath each grade, Anki prints the amount of time until you'll next see this card if you give it that grade.

To focus your study by disactivating unimportant cards and prioritizing important cards, go to the *Deck Properties* dialog in the *Settings* menu. The *Suspend Cards* field contains a list of tags. Anki hides any cards with these tags during learning and review. The three priority fields – Very High Priority, High Priority, and Low Priority – prioritize other tags. Anki shows cards with priority tags before other cards in the learning and review cycle.

By default, Anki only lets you learn 20 new cards each day, but you can adjust the threshold in the *Deck Properties* menu. When you finish learning new cards, Anki tells you how long you have to wait until the next review (Figure 7). If you don't finish learning all the cards, Anki interrupts your learning for the review. Anki schedules reviews in increments of minutes – not days like Mne-

mosyne – but you should still review your Anki cards at least once a day.

Editing Cards

When learning or reviewing cards, you can edit the current card by going to *Edit | Edit Current*, and *Edit | Edit Deck* lets you edit any card in the deck.

Importing and Exporting

You can import cards as a tab- or semi-colon-separated file, Mnemosyne deck, CueCard deck, or Anki deck. You can export cards or facts as a tab-separated file or Anki deck.

Statistics

Under the Tools menu, Anki shows many more statistics than Mnemosyne and includes several graphs. After you use Anki for several weeks, the graphs will clearly show you Anki's use of the forgetting curve.

Conclusion

Both Mnemosyne and Anki help you memorize the greatest amount of infor-
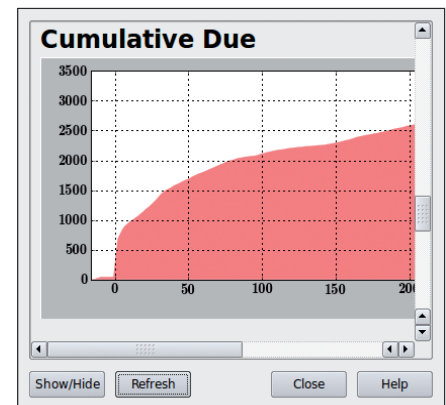

Figure 8: One of Anki's graphs showing how the number of cards you need to review each day diminishes over time.

mation in the least amount of time, but either one also requires a serious commitment from you.

You can't take advantage of the forgetting curve or the SuperMemo predictive algorithm unless you run the program every day. But if you do, in just a few minutes every day, you'll soon have hundreds – then thousands – of new facts at your disposal. ■