

The cat sat on
the cat again

Program a robot to
speak using
probability

Most humans learn speech instinctually. Robots on the other hand have to be trained and there are several different ways to do so.

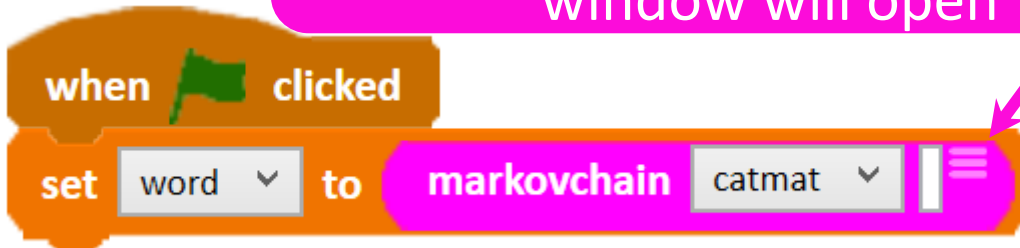
One of the ways to teach a robot to talk is with a Markov chain. By feeding the robot a source text it learns the probability of which word will follow another. By this method a robot can generate text of its own, using the source text as its vocabulary. Let's try out a simple example.

[Load the program](#)



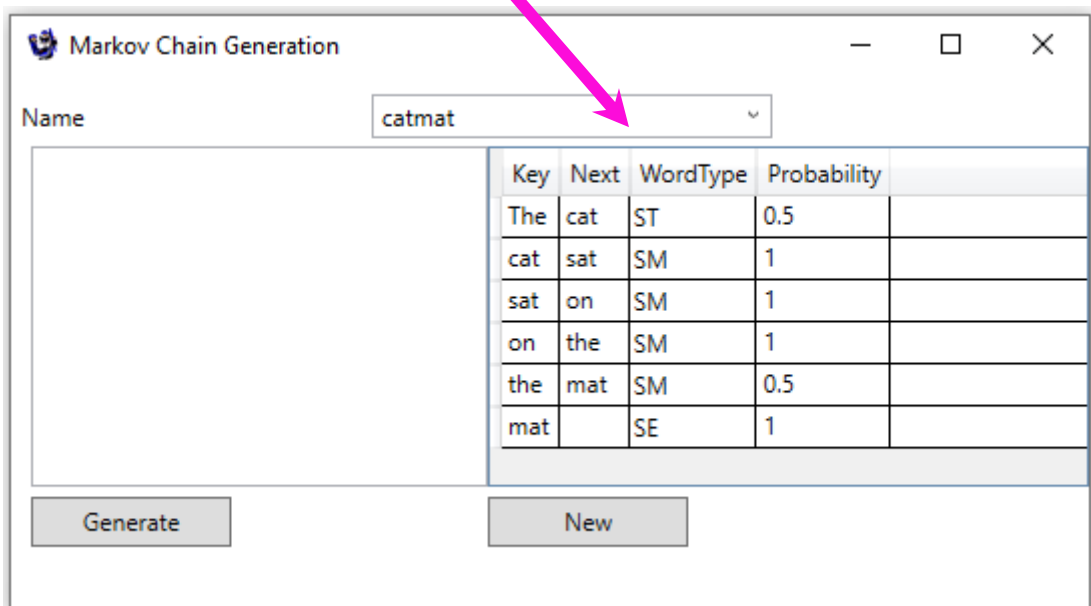
This markovchain block establishes “The cat sat on the mat” as the source text.

If you click on these three lines then a Markov chain generation window will open



When you click the green flag, the variable “word” will be set as a word from the source text. By leaving the parameter window empty, the robot will pick a start word (ST) for you.

The Markov chain generation window shows you the words in the chain, their type and their probability



What word would the robot choose to start their text?

The markovchain block automatically assigns words in the chain a type. They are either an ST, start word, an SM, middle word or an SE, end word. “Mat” is the end of our chain because no word follows it.

The empty window in this operator block represents the end of the chain



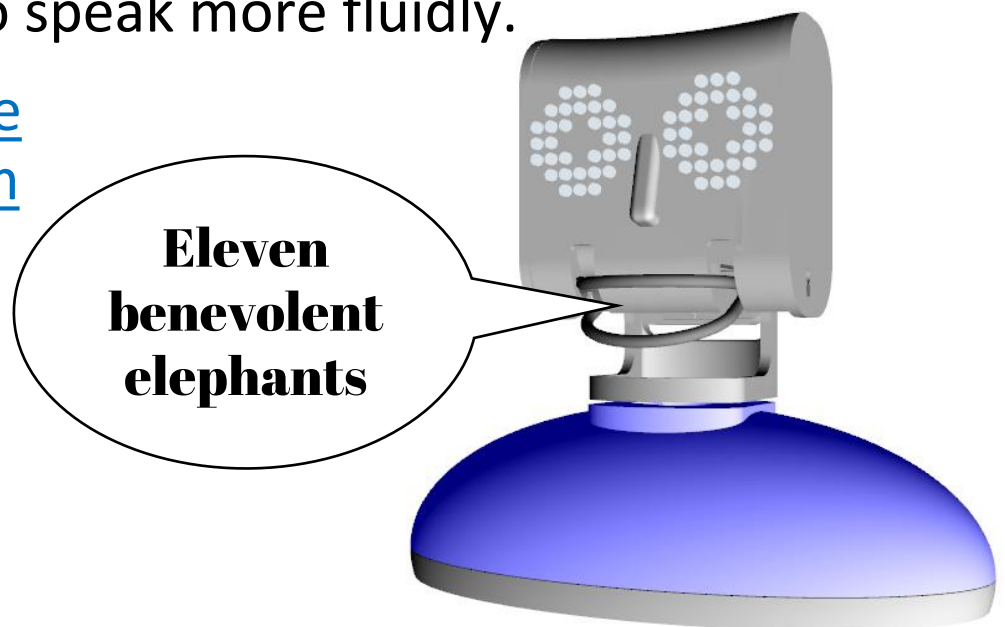
The robot will say the word chosen from the chain

When you click the green flag, this program will set the variable “word” to the ST word from the chain. Then it will say that word. Next it changes the “word” to either an SM or an SE word from the chain and says that. It repeats this until the “word” matches the SE word, “mat”.

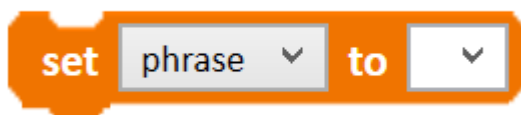
You'll find when you run the program that the robot will say the words in slow stilted way. Why do you think that is? Can you think of a way to speed it up?

Let's try out this new program that allows the robot to speak more fluidly.

[Load the program](#)



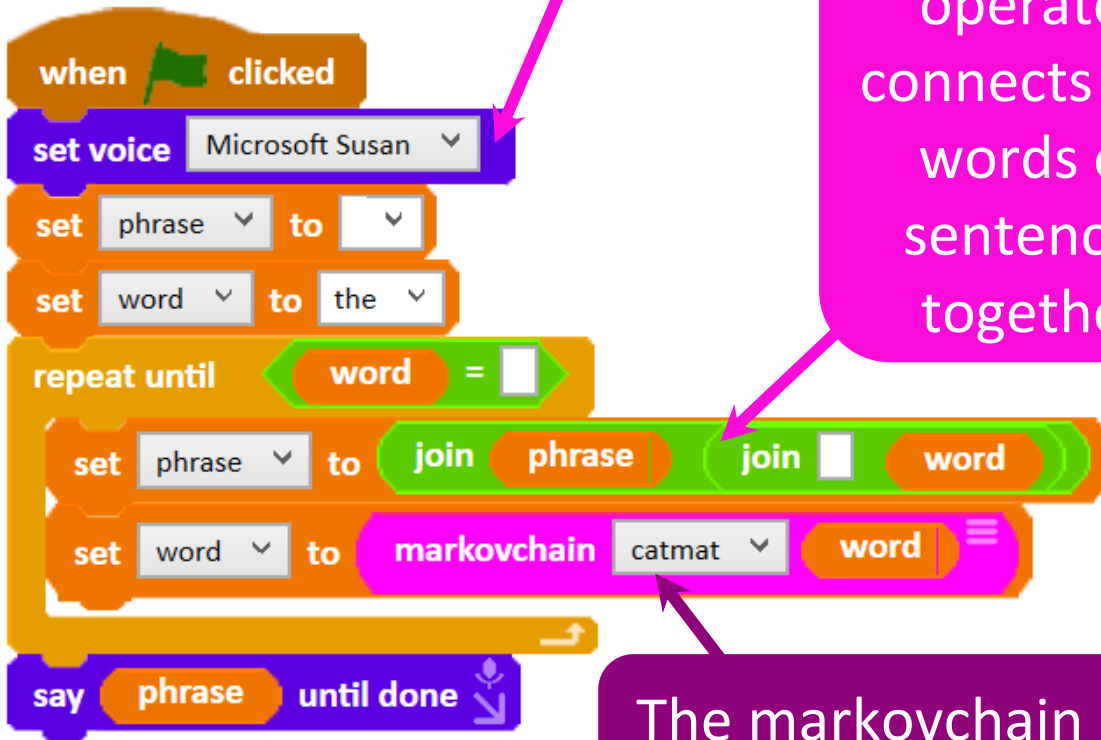
The key to speeding up the robot's speech is this variable block.



You need to create a new variable called "phrase".

You can change the robot's voice with this block

The join operator connects two words or sentences together



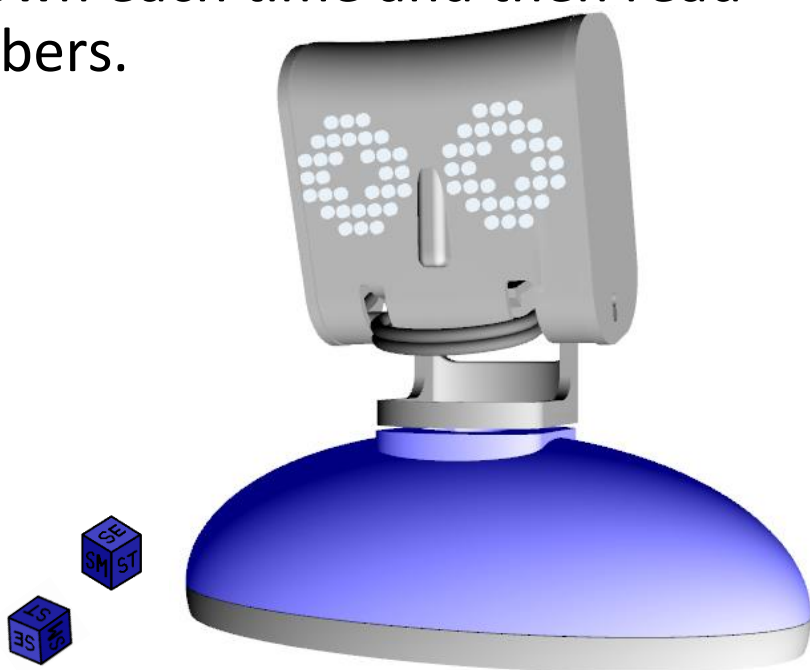
The markovchain block generates the text

This program works the same way as the first one we tried but there's one important difference, the "phrase" variable.

The robot runs the Markov chain and the generated words are joined together into the "phrase" variable. Then the robot says the "phrase".

Can you see how this speeds up the robot's speech?

Think of it like this. If you rolled a dice six times and said the number each time, you would sound a lot slower than if you wrote the number down each time and then read out all six numbers.

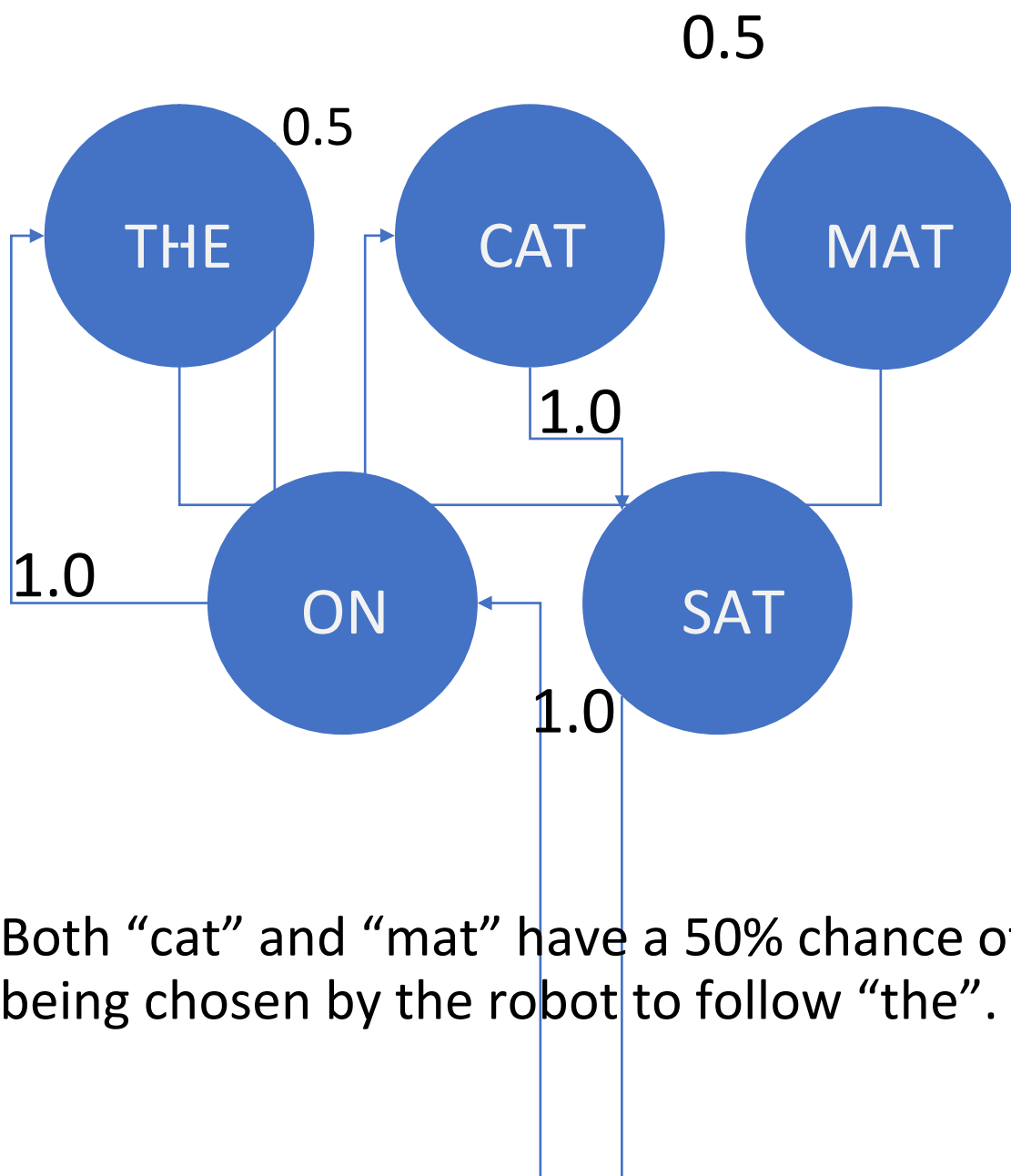


If the start word appears multiple times in the source text and the words after it are different then the following words have a smaller probability of being chosen.

In our example the word “the” appears twice and the words that follow it are “cat” and “mat”.

When the robot generates their text what is the chance of “cat” being chosen to follow “the”?

This is another way to picture our Markov chain. You can see the probability that each state has of transitioning to another state.



Both “cat” and “mat” have a 50% chance of being chosen by the robot to follow “the”.

Why not try using your own source text? You can use the Markov chain generation window to generate your own chains.

How do you think the length and content of the source text alters the text the robot generates?

The cat sat on
the cat sat on
the cat sat on
the...

