Kolmogorov's Automata Zoo

Ladies and gentlemen, may I welcome you into Kolmogorov's Automata Zoo, where information and computation come together. At the front of the property we have a display of some specimen that are of interest to the to the general public. We keep our infinite collection ranked on index in the main building along with their (often infinite) state graphs.

As you can see our exhibition is arranged symmetrically. On the left you will find the information producers, on the right information to consumers. In the middle, the hybrid systems. The symmetry axis is the time. We begin our tour with some extreme instances. On the far left you can see the machines that produce monotone information and never die. Their counterparts on the right are not born, but they can die. The most aggressive information producer, according to our experts, is the **non-deterministic coin-flipper**. You will see the beast there on that huge pile of bits down. They are difficult to maintain, because they pollute their cages with non-compressible information. Fortunately, you can see the far right its counterpart, the **omnivorous bit eraser**. It eats everything that occurs on its tape. We feed the omnivorous bit eraser with the waste of the coin-flipper, a symbiosis that you will see in Automata zoo. However more to the left, slightly closer to the center you can see the **unary counters**, animals that produce information very slowly, and exponentially less as they grow older. We have two types, the **zero-counters** and the **one-counters**. Recently some new unary counters were born, you see them fill their tapes with bits enthusiastically. At the back of the cage you see some very old unary counters with enormous tapes quietly producing their bits. They hardly produce any information. We think they are even older than the **busy beavers** over there in the cages in the middle, but we cannot measure their age. The difference is that busy-beavers when they die will have produced no new information. Here we have a little busy-beaver lined up for the public. Do you see how the huge tape is for such a small machine. A large busy-beaver can easily fill an immeasurable number of buildings such as this. So we keep them in depot. The counter-part of a busy-beaver is a **busy-eater**, right there. They are extremely difficult to keep in captivity. They eat huge immeasurable amounts of food the size of which needs to be exact to the bit. Do you see that old unary counter in the corner? He is ill. He is in a Kolmogorov dip. Such dips are extremely rare. No matter how many bits it produces, the total amount of information on his tape keeps decreasing. Our computer doctor, Prof. Kolmogorov, thinks that such a dip is at its maximum when the unary counter has produced the exact amount of food for a busy eater, but we can not measure this. The counterparts of the unary counters are the **unary erasers** right there. They are kept on a strict diet of only zeros or only ones. As soon as even one bit of pollution is found in their food they fall silent and die. Also on the right, more to the middle, you will see systems that will be familiar. The **recursive functions** with, on the left, their counterpart: the **quasi-reversible systems**. In the middle of the exhibition you will find **reversible systems**, but also machines that do not terminate because they are cyclic or information neutral. We have, finally, especially for our researchers a cage with machines that keep track of their own computing time, and a cage with for-next and while-wend loops with Kolmogorov dips. I hope you have found our exhibition educating. Please come back to study our collection. We hope we can count on you….