

Another set with cardinality $|\mathbb{Z}|$

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Let's have an algorithm that starts with
0.1 in binary, and constructs a tree in breadth-first fashion

0.1
0.01 0.11
0.001 0.011....

You get the idea... It's obvious that this tree has the same cardinality as \mathbb{Z} , since this is a nonhalting algorithm (or since I can give an integer to every node, etc.) Now, I want to prove that such a subdivision procedure cannot generate all x in $(0,1)$ in an intuitive way. Is the easiest method proof by contradiction?

Regards,

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