

Re: Cantor and the binary tree

Source: <http://sci.tech--archive.net/Archive/sci.math/2005-05/msg05070.html>

- *From:* Virgil <ITSnetNOTcom#virgil@xxxxxxxxxxx>
 - *Date:* Thu, 26 May 2005 20:07:18 -0600
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In article <MPG.1cffeb8ae6ef9356989d51@xxxxxxxxxxxxxxxxxxxxxxxxxxxx>, Tony Orlow (aeo6) <aeo6@xxxxxxxxxxx> wrote:

> Virgil said:
>> In article <MPG.1cffa39924382800989d30@xxxxxxxxxxxxxxxxxxxxxxxxxxxx>, >> Tony Orlow (aeo6) <aeo6@xxxxxxxxxxx> wrote:
>>
>>> Virgil said:
>>>
>>>> So WM is wrong yet again.
>>>>
>>>> And TO too!
>>>>
>>>> Virgil, you have repeated this nonsense now six or so times verbatim. If >>>> you >>>> were paying attention, I think you'd realize this is not related to what >>>> WM >>>> is >>>> claiming. Look at my argument concerning insertion of a node, and respond >>>> to >>>> that. It's the relative number of paths vs. nodes that WM is addressing, >>>> in >>>> response to your claims that you have an infinite tree with uncountable >>>> paths >>>> (because you're hung up on leaf nodes for some reason) and countable >>>> nodes, >>>> when paths are always less numerous than nodes. Pay attention. It's no >>>> wonder >>>> these discussions with you go around in circles, when you don't even know >>>> what >>>> they're about.
>>
>> Each node in a maximal binary tree is the end node of a finite path from >> the root node, but no node is the end node of an infinite path from the >> root node,
>>
>> So that any assumption that the number of nodes equals the number of >> unending paths requires proofs that neither WM nor TO have produced, or >> can produce.

Re: Cantor and the binary tree

>>

>> I can produce a bijection between the number of nodes in such a tree and
>> N , and I can produce a bijection between the number of unending paths and
>> $P(N)$.

>>

> Do it.

(1) Given any finite path, let the root node be labeled 1 and thereafter, let each left child in that path be labeled 0 and each right child in that path labeled 1.

Then the last node in that finite path is represented by the binary integer formed by the sequence of binary digits for all those nodes taken in order from root to the node in question.

And if the binary tree is maximal, having no leaf nodes, there will also be a node for each binary integer.

Thus, I have created a bijection from the set of nodes to the set of naturals, $N = \{1,2,3,\dots\}$. QED

(2) Given any infinite path in a maximal binary tree, create a subset S of N as follows:
if the n th child node of the tree is on a right branch from its parent node, n is to be a member of S , but if on a left branch, n is to be excluded.

It is easily seen that
every infinite path defines a subset of N ,
different infinite paths define different subset of N
every subset of N is created by some infinite path

Thus I have constructed a bijection from the set of infinite paths to the set of all subsets of N , i.e., to $P(N)$. QED.

Both bijections constructed as requested.

• *References:*

- ◆ *Cantor and the binary tree*
◇ *From:* mueckenh
- ◆ *Re: Cantor and the binary tree*
◇ *From:* Robert Kolker
- ◆ *Re: Cantor and the binary tree*
◇ *From:* Robin Chapman
- ◆ *Re: Cantor and the binary tree*
◇ *From:* mueckenh
- ◆ *Re: Cantor and the binary tree*

Re: Cantor and the binary tree

◇ *From:* Virgil

◆ ***Re: Cantor and the binary tree***

◇ *From:* mueckenh

◆ ***Re: Cantor and the binary tree***

◇ *From:* ae06

◆ ***Re: Cantor and the binary tree***

◇ *From:* Virgil

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◇ *From:* ae06

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