

Re: Cantor and the binary tree

Source: <http://sci.tech-archive.net/Archive/sci.math/2005-05/msg04912.html>

- *From:* Tony Orlow (aeo6) <aeo6@xxxxxxxxxxxx>
 - *Date:* Thu, 26 May 2005 10:20:37 -0400
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Virgil said:

> In article <MPG.1cfe8ee5a9650528989d2a@xxxxxxxxxxxxxxxxxxxxxxxxxxxx>,
> Tony Orlow (aeo6) <aeo6@xxxxxxxxxxxx> wrote:
>
>> Virgil said:
>>> In article <1117019521.876753.199630@xxxxxxxxxxxxxxxxxxxxxxxxxxxx>,
>>> mueckenh@xxxxxxxxxxxxxxxxxxxx wrote:
>>>>
>>>> Virgil wrote:
>>>>> In article <1116939502.814879.192170@xxxxxxxxxxxxxxxxxxxxxxxxxxxx>,
>>>>> mueckenh@xxxxxxxxxxxxxxxxxxxx wrote:
>>>>>>
>>>>>> Cantor and the binary tree.
>>>>>>>
>>>>>>> If we accept that, in binary digits, $\text{SUM}\{n = 1 \dots \infty\} 2^{-n} =$
>>>>>>> 0.111...
>>>>>>> = 1
>>>>>>>
>>>>>>> then all the real numbers of the interval [0,1] are realized as
>>>>>>> infinite paths of the binary tree
>>>>>>> .
>>>>>>> 0 1
>>>>>>> 0 1 0 1
>>>>>>>
>>>>>>>
>>>>>>> too (read from top to bottom). Each number is given by a path
>>>>>>> stretching over infinitely many nodes (bits). All nodes (bits) of the
>>>>>>> tree are countable. The paths are not, according to Cantor's famous
>>>>>>> diagonal proof.
>>>>>>>
>>>>>>> So far so good.
>>>>>>>
>>>>>>> One does not assume it, one proves it, as I have done several times.
>>>>>>>
>>>>>>> Here is an outline of that proof:
>>>>>>>
>>>>>>> Every node is represented by a terminating binary (starting at "." and
>>>>>>> terminating at the node itself in the tree above) which is like a
>>>>>>> subset

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>>>>> of the rationals, which are countable.
>>>>>
>>>>> Every unending path is represented by a non-terminating binary (also
>>>>> starting at "." but never ending), which surject onto the real interval
>>>>> [0,1], and are thus as uncountable as the reals.
>>>>>
>>>>> That WM choses to reject proofs that show him wrong does not invalidate
>>>>> such proofs.
>>>>>
>>>>> Cantor's proof is questioned, hence I do not accept it as an argument.
>>>>> Please find out at which step my arguing fails. As you seem to accept
>>>>> the first points, you may start at point 3.
>>>>>
>>>>> 1) Each number of (0,1) is given by a path stretching over infinitely
>>>>> many nodes (bits).
>>>>> 2) All nodes (bits) of the tree belong to a countable se.
>>>>> 3) A node can only exist within a path.
>>>>> 4) Any node increases the number of paths by 1 from 1 coming in, to 2
>>>>> going out. $2 - 1 = 1$.
>>>>> 5) Any node increases the number of nodes by 1.
>>>>>
>>>>> Regards, WM
>>>>>
>>>> WM conflates bounded paths, having terminal of leaf nodes with unbounded
>>>> unending paths which have no terminal or leaf nodes.
>>>>>
>>>>> 1) Each number of (0,1) is given by an unending path stretching over
>>>>> infinitely many nodes (bits).
>>>>>
>>>>> 2) All nodes (bits) of the tree belong to a countable set.
>>>>> 3) A node can only exist within a path.
>>>>> 4) Any node increases the number of ending paths by 1 from 1 coming in,
>>>>> to 2> going out. $2 - 1 = 1$.
>>>>> 5) Any node increases the number of nodes by 1.
>>>>>
>>>>> All unending paths in an unending binary tree contain infinitely many
>>>>> nodes.
>>>>>
>>>>> The number of leaf nodes exactly equals the number of ending or finite
>>>>> paths in any finite binary tree (in which all paths end).
>>>>>
>>>>> Considering the binary tree whose root is "." and each branch is
>>>>> indicated by a "0" or a "1", each leaf node, and therefore each path, is
>>>>> represented by a terminating binary fraction , but each unending path is
>>>>> represented by a non-terminating binary fraction.
>>>>>
>>>>> There are more of the non-terminating than of the terminating.
>>>>>
>>>>> So
>>>>>
>>>>> So what? As you pointed out, when you add a node, you add a node, a branch,

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>> and
>> a path. Actually, you need to add two nodes for each path, but that is
>> irrelevant. They are finitely proportional, so if one is finite, the other
>> is,
>> and if one is infinite, so is the other. Infinite trees have infinite nodes
>> and
>> paths. Finite tree only have finite numbers of nodes and paths. It's a fact.
>
> But it is also a fact that the set of nodes in an infinite binary tree
> bijects to the set of terminating binary proper fractions, and to \mathbb{N} ,
> while that set of unending paths in that same tree for which no such
> bijection exists.
>
> TO seems to have this desire to ignore what he regards as unpleasant.
> Mathematics does not allow that luxury.
>

I ignore what I regard as incorrect. All these conclusions on the part of Cantorians are wrong, as I have explained in detail for each one, using established mathematics from other areas. Mathematikers declare axioms and consider them law, but they are educated guesses. You have a system that you think "works", but the results it derives are at odds with reality. Sorry, cardinality of infinite sets is a sinking ship.

Real mathematicians solve problems, derive equations, and get results that are useful. Axiomatic systems are very good for this, but axioms are always questionable, unless universally justified in some manner, which is probably impossible. At least SOME justification is in order.

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Smiles,

Tony

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• *Follow-Ups:*

- ◆ **Re: Cantor and the binary tree**
◇ From: Virgil

• *References:*

- ◆ **Cantor and the binary tree**
◇ From: mueckenh
- ◆ **Re: Cantor and the binary tree**
◇ From: Virgil
- ◆ **Re: Cantor and the binary tree**
◇ From: mueckenh
- ◆ **Re: Cantor and the binary tree**
◇ From: Virgil
- ◆ **Re: Cantor and the binary tree**
◇ From: aeo6
- ◆ **Re: Cantor and the binary tree**

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◇ *From: Virgil*

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