Re: Cantor's "diagonal argument". My Objection.

Source: http://sci.tech−archive.net/Archive/sci.logic/2008−12/msg00401.html

---

- *From*: Jan Burse <janburse@xxxxxxxxxxx>
- *Date*: Sun, 07 Dec 2008 18:25:13 +0100

LudovicoVan schrieb:

> On 6 Dec, 17:46, Jan Burse <janbu...@xxxxxxxxxxx> wrote:
>
>> There are
>> many many(*) orders on the natural numbers.
>>
>> Here I give you an order of type omega+omega of
>> the natural numbers:
>>
>> 1 3 5 ... 2 4 6 ...
>
> This is very interesting. A couple of questions if you don't mind:
>
> 1) I take it to be something like: 1,3,5,...|2,4,6,... How would you
> define this sequence formally? (I am puzzled by the non−ending in
> between);

In this case I can do it formally based
on the natural numbers. Let J denote
the ordering on NxN. We can define it as
follows:

J(n,m) :<=> if odd(n) & even(m) then true
else if even(n) & odd(m) then false
else n<m

> 2) What is the cardinality of this sequence (should I say, of the set
> of the elements of the sequence)? I guess it is still Aleph_0, but I
> think I'd need the formal definition of the sequence to see exactly
> how.

The cardinality of the domain of J is the same as
the one of the natural numbers, as the domain

are the natural numbers.

> > (*) Actually an order on the natural numbers
> > can be coded in a real number. Guess why?

> This is just as interesting: could you please elaborate a little bit?
> I can't guess how that is.

We need to show that *any* J can be coded
by a real r.

First of all we code the pairs as single natural
numbers. Thus J(n,m) becomes H(<n,m>), where <.,.>
is an injective mapping from NxN to N. There
are many such mappings available. The simplest
mapping is based on traversing the grid:

```
+------------
|0 1 3
|2 4
|5
|
```

<n,m> = (n+m)(n+m+1)/2 +