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Transmathematica 2021: The 3rd International Conference On Total Systems

James A.D.W. Anderson
james.a.d.w.anderson@btinternet.com
88 Lower Henley Road, Caversham, Reading, England, RG4 5LE

Walter Gomide
waltergomide@yahoo.com
Department of Philosophy
Institute of Humanities and Social Sciences
Federal University of Mato Grosso
Brazil, 78060-900

Tiago S. dos Reis
tiago.reis@ifrj.edu.br
Federal Institute of Education, Science and Technology
of Rio de Janeiro
Brazil, 27215-350

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Abstract

Transmathematica 2021: The 3rd International Conference on Total Systems was held online, using Zoom, on 5th July 2021 from 12.45 - 18.00 London Time. Edited video recordings were uploaded to a new Transmathematica channel on YouTube. We now present the conference proceedings and announce Transmathematica 2022: The 4th International Conference on Total Systems.

1 Proceedings

Transmathematica 2021: The 3rd International Conference on Total Systems was held online, using Zoom, on 5th July 2021 from 12.45 - 18.00 London Time. No physical meeting took place because of the Covid-19 pandemic.

1.1 Opening Address

See YouTube for a recording of the Opening Address.

1.1.1 Conference

Participants were welcomed from 12.45 and talks started on the hour. Speakers spanned six time zones, attendees spanned thirteen time zones.

Authors who have published a paper in the Transmathematica journal, since the last conference, could speak at the online conference, free of charge. This makes these talks much like a workshop but with a high barrier to entry - authors must have published a journal paper.

Authors of Transmathematica conference papers could speak on the subject of the paper. This is the usual arrangement for conference presentations.

Participation in the conference has varied as follows. Transmathematica 2017, Rio de Janeiro, Brazil, 5 presentations in person. Transmathematica 2019, Reading, England, 7 presentations in person. Transmathematica 2021, online only, 4 presentations online. The largest real-time audience, 30, was in the Brazilian conference which was a stream in a multiconference. The YouTube recordings of the conference presentations have been viewed far more times than the live presentations.

After discussion it was decided to move form biannual conferences to annual conferences with the next one being Transmathematica 2022.

1.1.2 Society

The Transmathematica Society has a Society page on the Transmathematica journal's web site.

The Transmathematica Society used to exist as a Google$^+$ Community of about 800 members who engaged in lively discussion. When Google$^+$ Communities were closed, the Transmathematica Society reformed on LinkedIn, where it currently has about 80 members who mainly do not engage in discussion. The Transmathematica Society on LinkedIn is used to make announcements.

The Transmathematica Society has a weekly online drop-in meeting on Mondays from 17.00 to 18.00, London Time. The meetings used to take place on Skype but now take place on Zoom. Meetings have very low but regular attendance.

1.1.3 Journal

The Transmathematica journal is now archived automatically in the PKP PN network so papers will be preserved in perpetuity. This archive net-

work is currently located in North America. Papers are also archived, by hand, on FigShare. Authors are encouraged to archive their papers with other repositories, especially those outside North America. Author supplied links to archives are added to a paper's bibliographic record. Submissions are now checked automatically by a plagiarism detection system.

The journal currently has 52% acceptance, 7% rejection, and 41% under review. The number of papers under review is very high but partially reflects the journal's policy of encouraging authors to improve papers, rather than having them rejected. Authors are contacted in January each year to see if they wish to maintain papers in review. The number of views per paper is a mean of 322 and ranges from 17 to 944.

1.2 Jan Aldert Bergstra - Fracterm Calculus

YouTube recording Fracterm Calculus.

I will discuss results from my Transmathematica papers: Fractions in Transrational Arithmetic and Arithmetical Datatypes, Fracterms, and the Fraction Definition Problem.

Different fracterm calculi are distinguished: Suppes-Ono fracterm calculus, Carlstroem-Setzer fracterm calculus, common fracterm calculus and transfracterm calculus. Fracterm flattening terms is available only from common fracterm calculus.

As a second but related aspect the notion of legality of elementary arithmetical texts is discussed which has been developed in joint work with John Tucker.

1.3 Tiago dos Reis - Transreals from Hyperreals

YouTube recording Tiago dos Reis - Construction of Transreals from Hyperreals.

We construct the transreal numbers and arithmetic from subsets of hyperreal numbers. In possession of this construction, we propose a contextual interpretation of the transreal arithmetical operations as vector transformations.

1.4 Walter Gomide - Nullity Set in Superposition

YouTube recording Walter Gomide - Nullity as a Set in Superposition.

In this talk I will consider nullity as the superposition of all real numbers. This fact is the "cause" of the possibility of seeing nullity as the concept of indeterminacy, expressed in transreal numbers.

Before presenting such an interpretation of nullity, it is necessary to expound some ideas on the notion of "set in superposition," a concept that is still being developed. I guess it could useful in philosophical and metaphysical research.

1.5 James Anderson - Foundations

YouTube recording James Anderson - Foundations of Transmathematics: Turtles all the way down.

"Turtles all the way down" refers to an ancient concern with recursive definitions. Transmathematics has developed a chain of total definitions all the way from the physical world to the calculus of transnumbers. We review this chain and improve the handling of logic and the definition of a transet.

Earlier we introduced the perspective simplex, or perspex, as a monad that describes: the shape and motions of objects in three dimensional space; how objects look in the abstract four dimensions of perspective space; a computer instruction that instructs a super-Turing machine that may describe the motions of a human or direct the motions of a robot; an artificial neuron that provides a super-Turing machine for the instruction to execute on. The perspex is described in a continuous space with selection, which provides a mechanism to categorise continuous properties into discrete symbols and, thereby, describes how a brute physcial object may operate in the physical world and reason both somatically and linguistically.

Transmathematics is at an early stage of development and revises its definitions quickly. The total systems that have survived to the present day have been arranged according to one or more organisational principles. Transreal arithmetic arranges that its arithmetical operations are syntactically total and are consistent with real analysis. Transcomplex and the emerging transquaternion arithmetic further arrange that their transnumber spaces are obtained from the transreal number line by rotations that sweep out a ball, together with the point at nullity. The emerging Trans-Dedekind Cuts are totalised over all cuts, including the two partially empty cuts, which correspond to positive infinity and negative infinity, and the fully empty cut, which corresponds to nullity. The Trans-Dedekind Cut is a sufficient basis for all transnumber systems but to totalise all sentences of arithmetic we must have a total logic and a total set theory. Trans-Boolean logics and transets have been developed but we now revise their role in the chain of definitions.

The usual Classical or Boolean logic is already total. This logic is stated in terms of the explicit truth values True, T, and False, F, together with implicit handling of the semantic values Contradiction and Non-Existence. We are now content to adopt the usual logics as a foundation for transmathematics. However the usual set theories are not entirely satisfactory, for our purposes, so we revise the notion of a transet.

We adopt the usual set-builder notation but write the usual sets in square brackets and then use these to define transets, written in Latin braces. Thus transets are a meta language built on sets. Transets employ four semantic values which appear as the sets: Just True $[T]$, Just False $[F]$, Contradiction, $C = [TF]$ and Gap, $G = []$. As usual a set, s, appears as $s = [x \mid f(x)]$, which means that x is a member of the set s if and only if the membership predicate $f(x)$ is True and not False. We now extend this definition to say that x is a member of the transet $\{x|f(x)\}$ if and only if the membership predicate, $f(x)$, is Just True and not Just False and not Contradiction and not Gap. Thus x is a member of the transet $\{x \mid f(x)\}$ if and only if the set $[f(x) \mid T] = [T]$. Thus transets can be built on the sets of any set theory, have unlimited comprehension over all membership predicates, $f(x)$, and are immune to all set paradoxes by construction.

1.6 Plenary Discussion

All participants took part in a plenary discussion which was recorded but not published.

After discussion it was decided to move form biannual conferences to annual conferences with the next one being Transmathematica 2022.

1.7 Closing Address

See YouTube for a recording of the Closing Address.