EST Training Workshop 2005

September 5–9, Fischbachau

Zeit	Monday	Tuesday	Wednesday	Thursday	Friday
9.00		*Frank Wagner*: Théorie des Modèles et la Propriété d'Indépendance	*Michael Rathjen*: Proof Theory and Constructive Set Theory	*C.-H. Luke Ong*: Game Semantics	*Michael Rathjen*: Proof Theory and Constructive Set Theory
9.15					
9.30					
9.45					
10.00		*Dana Scott*: Sets, Topologies, Categories, and Computability	*Frank Wagner*: Théorie des Modèles et la Propriété d'Indépendance	*Michael Rathjen*: Proof Theory and Constructive Set Theory	*Dana Scott*: Sets, Topologies, Categories, and Computability
10.15					
10.30					
10.45					
11.00		**Coffee break**		**Coffee break**	**Coffee break**
11.15					
11.30	*Participants are asked to arrive by the end of lunch on Monday*	*C.-H. Luke Ong*: Game Semantics		*Frank Wagner*: Théorie des Modèles et la Propriété d'Indépendance	*C.-H. Luke Ong*: Game Semantics
11.45					
12.00					
12.15					
12.30	**Lunch**	**Lunch**		**Lunch**	**Lunch**
12.45					
13.00					
13.15					
13.30	*free time to unpack and get to know the area*	*informal discussions*	**Hiking** *We will do some easy hiking in the nearby mountains. The tour will be planed easy enough for every one to participate. This is meant to be more a social than a sportive event.*	*informal discussions*	*Participants can leave after the last lecture. However, lunch is provided for those who wish.*
13.45					
14.00					
14.15	**Opening**				
14.30	*Dana Scott*: Sets, Topologies, Categories, and Computability				
14.45					
15.00					
15.15					
15.30	*Michael Rathjen*: Proof Theory and Constructive Set Theory	*Andrej Bauer*: Synthetic Computability		*Dana Scott*: Sets, Topologies, Categories, and Computability	
15.45					
16.00					
16.15					
16.30	**Coffee break**	**Coffee break**		**Coffee break**	
16.45					
17.00	*Frank Wagner*: Théorie des Modèles et la Propriété d'Indépendance	*Diana Rativ*: From Classical Proofs to Programs		*Pietro Dello Stritto*: Measurable theories of groups and geometries	
17.15					
17.30		*Elliott Spoors*: Elementary Arithmetic		*Sonia L'Innocente*: Rings of definable scalars of Verma	
17.45					
18.00	*C.-H. Luke Ong*: Game Semantics	*Stan Wainer*: The Paris-Harrington Independence Result via Fast Growing Functions		*Andrej Bauer*: Synthetic Computability	
18.15					
18.30					
18.45					
19.00	**Dinner**	**Dinner**	**Dinner**	**Conference Dinner**	
19.15					
19.30					
19.45					
20.00					
20.15					
20.30			*Luca Chiarabini*: Generation of an Efficient Algorithm for the "Generalized Maximal Scoring Subsequences" (GMSS) Problem		
20.45					
21.00	**Welcome Party** *We plan some social event at the first evening of the workshop. The details are yet to be determined.*		*Mircea Dan Hernest*: Light Functional Interpretation	**Farewell Party**	
21.15					
21.30			*Basil Karadais*: Elaborating on Ishihara's "WKL implies FAN" proof		
21.45					
22.00					

Program Day by Day

Monday, September 5th

1100 - 1230	*Participants are asked to arrive by the end of lunch on Monday*
1230 - 1330	**Lunch**
1330 - 1415	*free time to unpack and get to know the area*
1415 - 1430	**Opening**
1430 - 1530	*Dana Scott*: Sets, Topologies, Categories, and Computability
1530 - 1630	*Michael Rathjen*: Proof Theory and Constructive Set Theory
1630 - 1700	**Coffee break**
1700 - 1800	*Frank Wagner*: Théorie des Modèles et la Propriété d'Indépendance
1800 - 1900	*C.-H. Luke Ong*: Game Semantics
1900 - 2100	**Dinner**
2100 - 2400	**Welcome Party**

We plan some social event at the first evening of the workshop. The details are yet to be determined.

Tuesday, September 6th

0900 - 1000	*Frank Wagner*: Théorie des Modèles et la Propriété d'Indépendance
1000 - 1100	*Dana Scott*: Sets, Topologies, Categories, and Computability
1100 - 1130	**Coffee break**
1130 - 1230	*C.-H. Luke Ong*: Game Semantics
1230 - 1330	**Lunch**
1330 - 1530	*informal discussions*
1530 - 1630	*Andrej Bauer*: Synthetic Computability
1630 - 1700	**Coffee break**
1700 - 1730	*Diana Ratiu*: From Classical Proofs to Programs
1730 - 1800	*Elliott Spoors*: Elementary Arithmetic
1800 - 1900	*Stan Wainer*: The Paris-Harrington Independence Result via Fast Growing Functions
1900 - 2100	**Dinner**

Wednesday, September 7th

0900 - 1000	*Michael Rathjen*: Proof Theory and Constructive Set Theory
1000 - 1100	*Frank Wagner*: Théorie des Modèles et la Propriété d'Indépendance
1115 - 1830	**Hiking**
	We will do some easy hiking in the nearby mountains. The tour will be planed easy enough for every one to participate. This is meant to be more a social than a sportive event.
1900 - 2030	**Dinner**
2030 - 2100	*Luca Chiarabini*: Generation of an Efficient Algorithm for the "Generalized Maximal Scoring Subsequence" (GMSS) Problem
2100 - 2130	*Mircea Dan Hernest*: Light Functional Interpretation
2130 - 2200	*Basil Karadais*: Elaborating on Ishihara's "WKL implies FAN" proof

Thursday, September 8th

0900 - 1000	*C.-H. Luke Ong*: Game Semantics
1000 - 1100	*Michael Rathjen*: Proof Theory and Constructive Set Theory
1100 - 1130	**Coffee break**
1130 - 1230	*Frank Wagner*: Théorie des Modèles et la Propriété d'Indépendance
1230 - 1330	**Lunch**
1330 - 1530	*informal discussions*
1530 - 1630	*Dana Scott*: Sets, Topologies, Categories, and Computability
1630 - 1700	**Coffee break**
1700 - 1730	*Pietro Dello Stritto*: Measurable theories of groups and geometries
1730 - 1800	*Sonia L'Innocente*: Rings of definable scalars of Verma
1800 - 1900	*Andrej Bauer*: Synthetic Computability
1900 - 2100	**Conference Dinner**
2100 - 2400	**Farewell Party**

Friday, September 9th

0900 - 1000	*Michael Rathjen*: Proof Theory and Constructive Set Theory
1000 - 1100	*Dana Scott*: Sets, Topologies, Categories, and Computability
1100 - 1130	**Coffee break**
1130 - 1230	*C.-H. Luke Ong*: Game Semantics
1230 - 1330	**Lunch**
1330 - 1500	*Participants can leave after the last lecture. However, lunch is provided for those who wish.*

Titles and Abstracts

Andrej Bauer: Synthetic Computability

Computability theory, which investigates computable functions and computable sets, lies at the foundation of logic and computer science. Its classical presentations usually involve a fair amount of Goedel encodings. Consequently, there have been a number of presentations of computability theory that aimed to present the subject in an abstract and conceptually pleasing way. We build on two such approaches, Hyland's effective topos and Richman's formulation in Bishop-style constructive mathematics, and develop basic computability theory, starting from a few simple axioms. Because we want a theory that resembles ordinary mathematics as much as possible, we never speak of Turing machines and Goedel encodings, but rather use familiar concepts from set theory and topology.

Luca Chiarabini: Generation of an Efficient Algorithm for the "Generalized Maximal Scoring Subsequence" (GMSS) Problem

We introduce the "Generalysed Maximal Scoring Subsequence" (GMSS) problem, we supply a formal proof of it and the associated extracted program by MINLOG, an interactive proof system. Several instantiations of this problem are took under consideration, in particul the MSS problem, where adding some supplementing additional hypothesis is possible to extract a linear time recursive dynamic program.

Mircea Dan Hernest: Light Functional Interpretation

We demonstrate how an adaptation of Berger's uniform quantifiers to the Dialectica-extraction context can be used to extract a more efficient program computing Fibonacci numbers. The program extracted by light Dialectica

coincides in this case with the program extracted by Berger's Kripke-style Refined A-translation and is more performant than the program extracted by the BBS Refined A-translation. In contrast, light Dialectica brings no improvement in the case of Dickson-2-2 Lemma. The Dialectica-extracted program is heavily unperformant in this case and is semantically different from the program extracted by the BBS Refined A-translation. MINLOG demo.

Sonia L'Innocente: Rings of definable scalars of Verma

Basil Karadais: Elaborating on Ishihara's "WKL implies FAN" proof

In 1990 Hajime Ishihara proved indirectly that the weak Knig's lemma implies the fan theorem. Here we reproduce a direct proof Ishihara provided for the same implication, which he presented in 2004 in Munich.

This is a work done within a coordinated attempt of the Mathematical Logic Group in Munich to formalize Ishihara's arguments in theorem proving environments, an aim which was met in late spring by S. Schimanski on Coq and K. Thiel on Minlog.

C.-H. Luke Ong: Game Semantics

Michael Rathjen: Proof Theory and Constructive Set Theory

Diana Ratiu: From Classical Proofs to Programs

Classical logic is known on one hand to be the most powerful in terms of the spectrum of provable formulae, but on the other hand of having little or no computational meaning. It has been shown, though, that both classical and intuitionistic arithmetic are able to prove the same Π_2-formulae (i.e. a formula of the form $\forall x \exists y B$) and that one has various techniques at hand enabling the transformation from a proof in classical logic into a constructive one. These methods provide the means for obtaining the witness for B, thus enhancing the proof with computational meaning. In this talk we shall refer to A-translation (or Friedman-Dragalin translation) in its refined version, as one of the above-mentioned techniques.

The Groebner bases theory has a growing significance ever since Bruno

Buchberger proposed the algorithm for their computation in 1965. Their importance is proven by the fact that on one hand, all current mathematical software implements routines for the computation of Groebner bases and on the other hand, there already exists software specialised in their application. This makes them suitable for a case study analysis of the algorithms resulting from the application of the refining methods mentioned above. To begin with, Dickson's Lemma, used to prove the termination of Buchberger's algorithm, has been extracted in Minlog for the of case $n = 2$. The work on case of $n = 3$ is also currently in progress.

Dana Scott: Sets, Topologies, Categories, and Computability

Set theory is usually considered infinitistic, but constructive and computable notions can be formulated using familiar ideas. In particular, every set has an intrinsic topology and continuous functions on sets can be easily singled out. Thus, a set-theoretical category can be defined equivalent to the category of T_0-spaces. Many categories have injective objects, but their properties depend on what families of subobjects are allowed. In the case of topological T_0-spaces, for example, two alternatives suggest themselves: (1) arbitrary subspaces, and (2) dense subspaces. Both notions are interesting. Thus, a space D is injective in sense (1) iff for any space Y and subspace X and any continuous function $f: X \to D$ there is a continuous extension $f': Y \to D$ of f. Injective spaces are easily proved to be closed under arbitrary products and continuous retracts, which facts provide many examples once a few such spaces are known. Perhaps it is not so obvious, however, that injective spaces are also closed under the formation of function spaces, once the space of continuous functions is given the right topology; indeed the category of injective spaces and continuous functions is a cartesian closed category. The series of talks will review old and new results about injective spaces, applications of the results, and a recent use of injectives to define a cartesian closed extension of the category of all T_0-spaces. This topological point of view makes it obvious that (untyped) lambda-calculus models exist in many forms. A suitable choice of an injective space also shows how a notion of computability transfers to many familiar spaces.

Elliott Spoors: Elementary Arithmetic

Pietro Dello Stritto: Measurable theories of groups and geometries

Frank Wagner: Théorie des Modèles et la Propriété d'Indépendance

J'introduirai les bases de la théorie des modèles (structures, satisfaction, compacité, types), et démontrerai un théorème récent de Shelah concernant les théories sans la propriété d'indépendance.

Stan Wainer: The Paris-Harrington Independence Result via Fast Growing Functions

A purely expository talk, showing how the Fast Growing Hierarchy can be used to prove that the Modified Finite Ramsey Theorem is independent of Peano Arithmetic.

References: J.Ketonen and R. Solovay, "Rapidly Growing Ramsey Functions", Annals Math. 1981
R.Graham, B.Rothschild, J.Spencer, "Ramsey Theory", Wiley-Interscience 1990

List of Participants

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