Variations on a Theme: A Bibliography on Approaches to Theorem Proving Inspired From *Satchmo*

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Abstract. This articles is a structured bibliography on theorem provers, approaches to theorem proving, and theorem proving applications inspired from *Satchmo,* the *model generation theorem prover* developed in the mid 80es of the 20th century at ECRC, the European Computer-Industry Research Centre. Note that the bibliography given in this article is not exhaustive.

1   Introduction and Contents

This articles is a structured bibliography on theorem provers, approaches to theorem proving, and theorem proving applications inspired from *Satchmo* [2], the *model generation theorem prover* developed in the mid 80es of the 20th century at ECRC, the European Computer-Industry Research Centre.

At the time of its development, *Satchmo* was a rather unusual approach to first-order logic theorem proving for a couple of reasons:

- *Satchmo* is a *tableau method,* i.e. its approach to theorem proving consists in an exhaustive, although controlled, search for Herbrand models of the first-order logic theory considered.
  The widespread opinion in the theorem proving community at the time *Satchmo* has been conceived was that an exhaustive search for Herbrand models was hopeless. This opinion is well reflected by the following citation from the introduction of Grard Huet's thesis [1]:
  > *"Les premier programmes* [de preuve auotmatique de théorèmes] *réalisés visaient à l'implementation du théorème de Herbrand, par génération de tronçons initiaux de l'univers de Herbrand d'une proposition. Une telle recherche exhaustive était vouée l'échec, et cette approche fut abandonnée."*
- *Satchmo* is a tableau method that makes use of the *resolution principle* [3]. *Satchmo* seems to have been the first theorem prover to combine a tableau method with the resolution principle.

- *Satchmo* is implemented in the high-level programming language *Prolog.*
  Satchmo seems to have been the first reasonably efficient implementation of a theorem prover in Prolog.
- *Satchmo*'s implementation in Prolog is *extremely short:* Its pretty-printed basic version is only 12 lines long.
  Satchmo seems to have been the first theorem prover to exploit specificities of a high-level programming language and its sophisticated abstract machine for its implementation.
- *Satchmo* combines *forwards* and *backwards reasoning.*
  Satchmo seems to have been the first theorem prover to do so.

Because of this, *Satchmo* can be seen as a landmark in the history of automated theorem proving. What is less known, is that *Satchmo* has also been a landmark in the history of ECRC, the the European Computer-Industry Research, which Hervé Gallaire established in Munich in 1983.

Shortly after *Satchmo* had been conceived, the question was raised within ECRC and the board of ECRC's 'supervisers' from its shareholder companies whether such a software should be published, and thus made known to the research community, or kept confidential for an exclusive use within ECRC and its shareholders. At that time, ECRC had no policy on the publication its research results.

In the case of *Satchmo,* the choice was made in favour of publishing it. Obviously, further research inspired by *Satchmo* as reported in this bibliography would not have taken place if *Satchmo* had been kept confidential.

A side effect of the decision to publish *Satchmo* was to firmly establish that ECRC's research outcomes would be published. This has greatly contributed to the reputation and success of ECRC as well as of its researchers.

This bibliography is structured as follows:

- Articles on *Satchmo*
- *Satchmo*-like Theorem Provers
- Formalizations of *Satchmo* and *Satchmo*-like Theorem Provers
- Search Space Reduction Strategies for Satchmo-like Theorem Provers
- Proving Finite Satisfiability with Satchmo-like Theorem Provers
- Generation of Minimal Herbrand Models with Satchmo-like Theorem Provers
- Applications of Satchmo-like Theorem Provers
- Miscellaneous

The bibliography given in this article is not exhaustive. However, it should list the major publications on theorem provers, approaches to theorem proving, and theorem proving applications inspired from *Satchmo.* The ommission of a relevant article does not reflect any negative bias or judgment from the authors. Instead, an ommission would only reflect that, even in the search engine age, compiling a complete bibliography remains a time-consuming and error-prone endeavour.

The authors would be thankful for hints at missing, wrongly cited, or falsely included articles, for hints at mistakes of any other kind, as well as for any suggestion for improvements.

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