

# **The EMOO Repository: A Resource for Doing Research in Evolutionary Multiobjective Optimization**

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## **Abstract**

This article briefly describes the EMOO repository, which has become much more than the simple list of bibliographic references that originated it. In its current state, the EMOO repository contains many Web resources, including Ph.D. theses, software, contact information of EMOO researchers and information about EMOO-related events. Such information has become a valuable source for students and researchers interested in this area.

## **1 Introduction**

This article on the evolutionary multi-objective optimization (EMOO) repository intends to provide a short introduction to some of the main features of this repository, including a brief discussion of its origins and my future expectations about its future.

## **2 Inception**

The idea of having a repository of bibliographic references on EMOO originated as a personal need to keep track of the field while writing my Ph.D. thesis between 1994 and 1996. However, time constraints kept me from crystallizing this idea for a few years. It was at the end of 1998 that I finally found the time to launch the first version of the EMOO repository, which was a simple list of about 100 bibliographic references. Such bibliographic references were used in a survey that I published in 1999 [1] and,

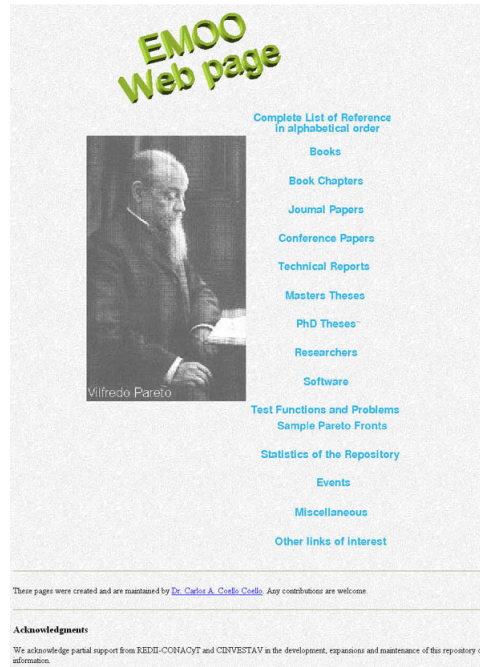


Figure 1: Initial Web page of the EMOO repository.

therefore, the generation of such list was straightforward. To facilitate the access to these references, I used some Web browsers to locate electronic versions of many of these papers and I put them in a Web site at LANIA (my workplace at that time).<sup>1</sup>

The original goal of the EMOO repository was to have, in a single place, a comprehensive list of bibliographic references on EMOO (i.e., journal and conference papers, Ph.D. theses, technical reports, etc.). Additionally, if an author made the actual document electronically available<sup>2</sup>, a local copy of such document would be linked to its bibliographic record. Such local copies aimed to avoid the problems caused by volatile Web sites.<sup>3</sup>

As it turns out, the repository started growing very fast. By July 1999, I decided to split the bibliographic list in several parts. Thanks to the help of some of my graduate students at that time (mainly, with the help of Efrén Mezura Montes), we could launch an entirely newly designed Web site by the end of 1999 (see Figure 1).

The idea of having mirrors was also something that started to attract my attention as the size of the list kept growing. In a very generous gesture, Dr. Sourav Kundu granted me access to the Web site of the *Journal of Evolutionary Optimization* so that I could place a mirror of the EMOO repository in there. Such a mirror, however, is no longer maintained. In 2002, Dr. Enrique Alba (from the University of Málaga,

<sup>1</sup>Current URL at LANIA is: <http://www.lania.mx/~ccoello/EMOO>

<sup>2</sup>Many authors release drafts or pre-prints of their papers.

<sup>3</sup>For example, the Web pages of graduate students tend to disappear quickly after they graduate.

Spain) kindly agreed to maintain a mirror of the EMOO repository in Europe (located at: <http://neo.lcc.uma.es/emoo/index.html>), but unfortunately (and mainly due to my own time constraints), this mirror is not updated as often as the sites located in Mexico.

### 3 Contributing to the EMOO Repository

Each new bibliographic entry is added to the EMOO repository using BibTeX records, since the list is generated using  $\text{\LaTeX}$ . Note, however, that today other types of contributions are also welcome:

- Public-domain software.
- Test functions (either academic or real-world problems).
- URLs of events of interest for the EMOO community.
- Contact information of those who want to be added to the database of EMOO researchers (name, affiliation, postal address, email, web page and photo, if available).

Currently, I have a strong interest in having additional mirrors of the EMOO repository in Asia, South America and Europe so that the access times can be decreased for people living in those geographical areas. If anyone is interested in hosting a mirror of the EMOO repository, please contact me at: [ccoello@cs.cinvestav.mx](mailto:ccoello@cs.cinvestav.mx). The space requirements are of about 1 Gbyte of hard disk space (to allow future expansions) and it is desirable to be able to access the site remotely via *sftp*.

### 4 Current Status

Since early 2001, the most up-to-date version of the EMOO repository is located at: <http://delta.cs.cinvestav.mx/~ccoello/EMOO>.

As of August 2005, the EMOO repository contained:

- Over 2100 bibliographic references, which included 120 Ph.D. theses, 21 Masters theses, 500 journal papers and 1200 conference papers.
- Contact information of 63 EMOO researchers.
- Links to Web sites of events of interest for the EMOO community.
- Statistics of the EMOO repository (see Figure 2).
- Public domain implementations of several multi-objective evolutionary algorithms (e.g., NSGA-II [5], the microGA [3], and MISA [2], among others).

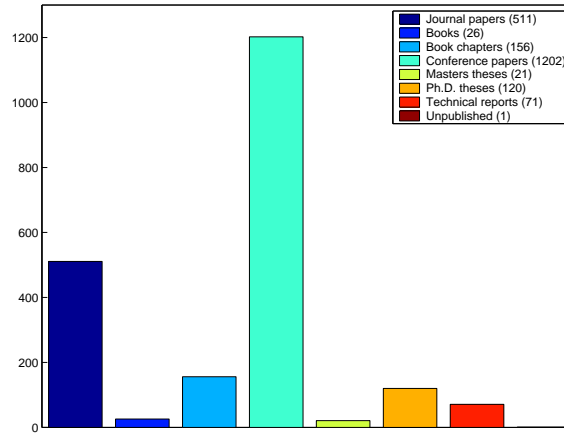


Figure 2: Types and number of publications recorded in the EMOO repository (as of August, 2005).

Publications of the EMOO repository are now classified as: books, book chapters, journal papers, conference papers, technical reports, masters theses, and Ph.D. theses (see Figure 2). Note, however, that this classification process is done manually (using scripts written in Perl), and the only web page up-to-date at all times is the complete list of references.

The considerable growth of research in EMOO can be appreciated by analyzing the EMOO repository. For example, Figure 3 (generated using statistics automatically extracted from the EMOO repository) shows the historical growth of the number of publications in the field. Analyses of this sort are included in a recent book on EMOO that I co-authored with David A. Van Veldhuizen and Gary B. Lamont [4].

## 5 Looking to the Future

I have many future plans for the EMOO repository. The main ones are related to developing more sophisticated tools that facilitate the addition of new references to the main list (using Web-based templates). It would also be very useful to develop a more detailed database that allows more precise statistics from the papers in the repository. It is worth noting that the updates of the main list of references is still done by hand (which explains the delays that some times arise). Nevertheless, the many positive e-mail messages and oral communications that I have received regarding the usefulness of the EMOO repository motivates me to continue updating it. Therefore, I will continue doing any updates required for as long as this is possible and as long as it is useful for people interested in evolutionary multi-objective optimization.

Needless to say, any contributions to the EMOO repository as well as suggestions regarding how to improve it, are welcome.

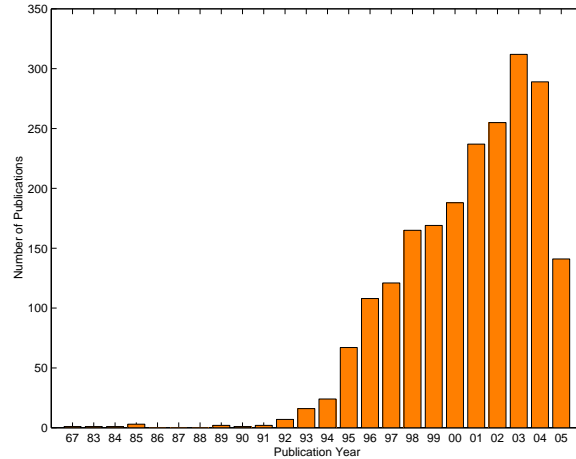


Figure 3: Number of publications on EMOO per year, as recorded in the EMOO repository (up to mid-August 2005).

## Acknowledgements

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## References

- [1] Carlos A. Coello Coello. A Comprehensive Survey of Evolutionary-Based Multi-objective Optimization Techniques. *Knowledge and Information Systems. An International Journal*, 1(3):269–308, August 1999.
- [2] Carlos A. Coello Coello and Nareli Cruz Cortés. Solving Multiobjective Optimization Problems using an Artificial Immune System. *Genetic Programming and Evolvable Machines*, 6(2):163–190, June 2005.
- [3] Carlos A. Coello Coello and Gregorio Toscano Pulido. Multiobjective Optimization using a Micro-Genetic Algorithm. In Lee Spector et al., editor, *Proceedings of the Genetic and Evolutionary Computation Conference (GECCO'2001)*, pages 274–282, San Francisco, California, 2001. Morgan Kaufmann Publishers.
- [4] Carlos A. Coello Coello, David A. Van Veldhuizen, and Gary B. Lamont. *Evolutionary Algorithms for Solving Multi-Objective Problems*. Kluwer Academic Publishers, New York, May 2002. ISBN 0-3064-6762-3.
- [5] Kalyanmoy Deb, Amrit Pratap, Sameer Agarwal, and T. Meyarivan. A Fast and Elitist Multiobjective Genetic Algorithm: NSGA-II. *IEEE Transactions on Evolutionary Computation*, 6(2):182–197, April 2002.