DESDEO23 Forum: The Future of DESDEO

The DESDEO Team[1]

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Recap and Mission Statement

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- During our Forum, we have seen many tutorials on DESDEO and how it can, and has been, applied to address a wide array of problems.
- As a software framework, DESDEO has still to be further developed in many ways.
- We have identified *seven future directions* we intend to consider when developing DESDEO in the future.
- As a shorter-term goal, we are working on a minimum viable product to be released at the end of August, 2023.

Mission statement:
Make DESDEO more accessible, useful, and impactful.

The seven future directions of DESDEO

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User Friendliness and Accessibility

- Improving the user interface with a new web-based graphical user interface, supporting both single and **group decision-making**.
- Recommender system to support the selection of an appropriate interactive method(s).
- More and better tutorials, including trouble-shooting help, example notebooks, and potentially an open and public online course, e.g., on Coursera.
- Transition support from single to multiple objective optimization.
- Enhanced documentation with a more robust guide on how to contribute to DESDEO, and documentation targeted to student and researchers to help them get started solving their own multiobjective optimization problems.

The seven future directions of DESDEO

Expanded Functionality

- Extending support for various problem types, including mixed-integer problems.
- Connecting to single-objective solvers suitable for solving mixed-integer problems, and to other multiobjective optimization evolutionary software.
- Implementing appropriate evolutionary operators to address different types of variables.
- Implementing more interactive methods, including new and existing methods.
- Catering to the various needs of artificial decision makers and other needs of comparing interactive methods.
- Support for explanations and their visualization.
- Support for scenarios and deep uncertainty.

The seven future directions of DESDEO

Developer Support

- Simplifying the process of adding new methods and creating new UIs by utilizing existing modular components and creating new ones.
- Facilitating better bug-reporting and issue tracking.
- Future workshops aimed especially at developers interested in contributing to DESDEO.
- Extended testing of DESDEO, including integration and unit testing.

The seven future directions of DESDEO

Connectivity and Interoperability

- Facilitating connections with tools from other languages like Rust, Julia, and R.
- Better support for hybridization and switching of interactive methods.
- Extending the API (application programming interface) for various purposes including methods, questionnaires, and data analysis tools.

The seven future directions of DESDEO

Enhanced Data Analysis Tools

- Augment the graphical user interface with robust data analysis tools to ease the comparison of solutions.
- Implementing analysis tools specifically catering to the needs of evolutionary methods.
- Tools to generate and select representative solutions, e.g., clustering methods.
- Analysis tools to accommodate the needs of group decision-making.
- Implementing databases to store solutions and information related to interactive processes to better support decision-making, e.g., stepping backwards in a method.

The seven future directions of DESDEO

Improved Visualizations and Interfaces Supporting Interactive Methods

- Creating new and modifying existing visualizations to cater to the needs of interactive methods.
- Implementing these visualizations in a modular fashion so that they can be used flexibly in different applications.
- Providing modular, non-visualization related building blocks to readily construct customized graphical user interfaces for interactive multiobjective optimization methods.
- Catering to various user roles in our new graphical user interface: Guest, User, Developer.

The seven future directions of DESDEO

Academic Impact and Beyond

- Continue advertising and disseminating DESDEO at academic events to build the DESDEO community.
- Find incentives to make contributing to DESDEO (academically) impactful.
- Continue integrating DESDEO in teaching.
- Advertise DESDEO beyond academy attracting interest from the industry as well.
- A follow-up event to this Forum.
- **Remember to cite the DESDEO paper[1]!**

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[1]G. Misitano, B. S. Saini, B. Afsar, B. Shavazipour, and K. Miettinen. "DESDEO: The Modular and Open Source Framework for Interactive Multiobjective Optimization". *IEEE Access* 9 (2021), pp. 148277–148295. DOI: 10.1109/ACCESS.2021.3123825.

The minimum viable product

The minimum viable product

- We are set to release a minimum viable product (MVP) of DESDEO and its interface by the end of August 2023.
- The MVP includes:
  - support for mixed-integer problems,
  - a new and modern and modular web-based user interface,
  - interfaces for different interactive methods (both scalarization-based and evolutionary),
  - a database to store problems, solutions, and other data;
  - enhanced documentation,
  - support for guest users (to let people quickly try out DESDEO with test problems),
  - and more!
- After the MVP, we will continue pursuing the seven future directions of DESDEO[2].

Call to action!

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- DESDEO currently has only a few researchers constantly contributing to it.
- While the usefulness of interactive multiobjective optimization is evident, it still remains a niche in the industry.
- When developing interactive methods further, we should avoid re-inventing the wheel. Instead, we should aim at focusing our efforts.
- When it comes to interactive multiobjective optimization, DESDEO is unique in that it combines many different types of methods, making it an ideal candidate for future contributions as well.

We therefore invite all of you to consider utilizing DESDEO in your next endeavor related to interactive multiobjective optimization—ideally contributing your ideas as part of the framework!

We realize this might be daunting at first, DESDEO is far from perfect, but we are here to help you in your journey. Only together, we can build DESDEO into the ideal, *de facto* tool to be used when it comes to interactive multiobjective optimization!