Generative Inventions: Boosting Corporate Innovations with Creative AI

Introductory lecture for R&D groups of technical companies

Key ideas behind Generative Inventions

- Creative AI engine uses newly published scientific effects and new materials to automatically generate all possible inventions for large number of technical problems.
- Novel ideas are generated immediately after papers on new effects are published.

Course outcomes

After attending this course, you should be able to:

- Understand the main benefits of Generative Inventions vs. conventional new product development and problem solving.
- Become familiar with basic principles of combinatorial semantics for automatic generation of novel technical ideas.
- Learn how to create customized knowledge base to start continuous generation of novel ideas for the most important projects of the company.
- See how Generative Inventions empower existing techniques: Value Engineering Analysis, TRIZ, QFD and others.

Introduction

To boost technical innovations leading corporations implement many techniques to help engineers in finding novel ideas. The only issue - quite costly implementation, because all of these methods require training. In the age of Artificial Intelligence there is a new approach which can dramatically increase the quality and quantity of novel ideas without need for training. It's called Generative Inventions [1, 2].

Objectives of the course

- Demonstrate how Generative Inventions approach can dramatically increase the quality and quantity of novel ideas in R&D groups.
- Run pilot mini-project on customization of Generative Inventions AI engine for internal use by client's engineers, inventors, researchers.

Benefits of Generative Inventions

- Because new inventions are generated right after new effects are published, users have access to novel solutions of problems before anyone else.
- Serious increase of quantity and quality of novel ideas to be discussed by R&D groups.
- Intelligent support for selection of the most promising conceptual ideas.

How Generative Inventions Improves quality of novel ideas

- The knowledge base is constantly fed with scientific effects and advanced materials.
- AI engine immediately generates novel ideas by using newly published effects, materials, research data.
- As a result, automatically generated ideas tend to be of high quality: they are novel, because are based on new effects.

Combinatorics and quantity of generated ideas

- Combinatorial matching of effects and problems provides engineers with rich space of potential solutions of problems.
- Hierarchical tree of technical functions is able to cover the vast majority of problems and can be used by the entire company.
- Semantic algorithms uncover hidden links between technical problems and scientifically driven solutions.
- Continuous feeding of Generative Inventions engine with new knowledge help R&D groups to stay on leading edge of technology.

Quickly choose the most promising idea with intelligent filters

- Quantitative filters: ideas are sorted by main technical parameter.
- Options: choose the most practical ideas, focus on research concepts with the highest potential, find ideas for easy implementation.

Qualitative filters

- List of advantages, information on validation.
- Theoretical concept, practical tests, pilot project by industry.
- Economics: cost, complexity.

AI software to support Generative Inventions approach

- True Machina is currently the only software that runs Generative Inventions algorithms.
- Case study 1: adding new effect and automatic generation of novel ideas.
- Case study 2: finding novel ideas for technical problem in the database of True Machina inventions, automatically generated by the software.
- Application of True Machina for concept generation phase for Value Engineering Analysis, TRIZ, QFD.

Summary

This introductory course shows how new AI approach will seriously boost innovations by automatic generation of novel technical ideas based on the newest scientific knowledge, advanced materials and research results. Generative Inventions can be positioned as a creative partner of human inventors and R&D groups, helping companies to innovate better and faster.

Questions and answers

1. Can computer really invent?

Answer - Yes:

- Turing machine, 1936: computer as universal information processor; if we can describe inventive thinking, the computer will be able to invent.
- AI system Pulsar, 1983 [3], practical proof, that computer can invent: combinatorial AI inventor which automatically generated 20 000 novel methods for signal detection in space noise.
- AI software by Invention Machine, 1992: [4] intensive support of human creativity with TRIZ-based modules and semantic engines for knowledge mining.

2. Generative Inventions means that AI creates inventions automatically. Will it replace human inventors?

Answer - No:

- AI engine generates many novel ideas, which are used by human engineers to come up with practical inventions.
- AI intensifies human creativity, helps inventors find better solutions in a shorter period of time. But detailed analysis of novel ideas, design of novel technical systems are done by humans.

3. Who are potential users of the software?

Answer - Corporate research departments, technologists. Engineers, researchers, inventors will be able to find promising and revolutionary ideas in a much shorter time frame.

References

1. V.Tsourikov. Generative Inventions. Proceedings of the 13th MATRIZ TRIZfest-2017 International Conference. September 14-16, 2017, Cracow, Poland, p. 178-184.
2. V.Tsourikov. Creative A.I. as an Equal Partner of Inventors. Invited talk. TRIZ future conference. Strasburg, France, 2018.
3. V.Tsourikov. Ph.D. thesis, 1983.
4. V.Tsourikov. Inventive Machine. Second generation. AI and Society, 7 (1):62-77, 1993

Pilot project. Optional

Customization of the knowledge base for the most important corporate projects and technical functions.

The objective of the pilot project is to measure an impact of True Machina on corporate technical creativity. To reach such a goal we build the knowledge base, customized for the most important projects of the company.

This simple and very affordable project has three short phases:

- Phase 1. Technical functions mining. True Machina and client researcher create a list of the most important technical functions or projects of the company.

- Phase 2. Core knowledge base design. R&D group of True Machina builds customized knowledge base of new effects and materials for the most important technical functions of the client. True Machina engine immediately generates novel technical concepts for listed functions/problems.

- Phase 3. True Machina team is adding new effects every day, client R&D group is using novel concepts, automatically generated by AI engine, to solve important problems or to design new products.

Management of client R&D group measures the impact of customized True Machina engine on number and quality of novel concepts accepted by R&D group.

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