Enhanced Innovation:
A Fusion of Chance Discovery and Evolutionary Computation to Foster Creative Processes and Decision Making

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Abstract. Human-based genetic algorithms are powerful tools for organizational modeling. If we enhance them using chance discovery techniques, we obtain an innovative approach for computer-supported collaborative work. Moreover, such a user-centered approach fuses human and computer partners in a natural way. This paper presents a first test, as well as analyzes the obtained results, of real human and computer collaboration powered by the fusion of human-based genetics algorithms and chance discovery.

1 Motivation

DISCUS (*Distributed Innovation and Scalable Collaboration in Uncertain Settings*) [1] is an endeavor to create innovation support mechanisms. Such innovation support mechanisms rely on the metaphor of genetic algorithms as models of human innovation. The metaphor establishes both a qualitative and quantitative pathway for the design of such systems, taking advantage of mechanism and analytical design theory developed for more than twenty years on competent GAs [2]. Human-based genetic algorithms [3] take this so-called innovation intuition and run with it, using common GA concepts and theory as a means to design pervasive and open-ended innovation support systems. From the more practical perspective of creativity consultants and practitioners, human-based genetic algorithms may also be regarded as the formal next step beyond face-to-face brainstorming [4] and electronic brainstorming [5]. DISCUS enhances the human-based genetic algorithms with two powerful tools (1) data- and text-mining, and (2) chance discovery [1]. Data- and text-mining tools provide the computational embodiments for frequent pattern extraction during distributed on-line collaboration. Chance discovery—when used together with genetic algorithms—provides a natural mechanism to identify salient fortuitous events [6,7], emphasizing rare events during the on-line collaboration.

2   Lessons Learned

The goal of the work summarized here was to use a first DISCUS pilot prototype—synthesis of elements to promote distributed innovation using web-based IT infrastructure—for discussing research topics about the linkage learning genetic algorithm [8]. The first test of DISCUS on a real-world problem involved 11 researchers in two countries, 8 in the USA and 3 in Japan, collaborating to brainstorm solutions for the improvement of LLGA. The collaborative team (1) improved their understanding of the linkage learning genetic algorithm state-of-the-art research, and (2) suggested solutions judged to be of high quality by linkage learning genetic algorithm experts. Strongly highlighted by discussion members was the simplicity to interact between geographically distant locations and researchers, as well as to reason in non-linear ways, sparking their creativity.

Current research and implementations, after this first DISCUS experience, focus on (1) improving the integration of the different available technologies, (2) creating a tutorial mode for learning purposes, (3) providing discussion structures for various innovation-supported scenarios, and (4) advancing in the theoretical understanding of human-based genetic algorithms and interactive genetic algorithms with and without the interaction of chance discovery and data- and text-mining tools using the Illinois decomposition methodology.

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